A. B. U. SCHOOL OF FISHERIES, BAKURA

BY

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DECLARATION

I declare that this thesis is purely my personal undertaking and that it does not include materials previously submitted for a degree or Diploma in any University or previously published material without due acknowledgement.

.....
Signature

Date:.....

DEDICATION

This thesis is dedicated to my beloved parents Mr. and Mrs. A.A. Joseph who saw the need to put me in school and have been providing me with the good things life could offer.

Above all, I owe it all to God. Lord I bless you for your love, Mercy and guidance throughout my stay in school. I thank you for the loving and caring parents you have blessed me with, I shall forever praise your name.

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ABSTRACT

Protein deficiency is the major form of Malnutrition in Nigeria. Although fish and fish products are ready sources of protein, the fishery potentials of Nigeria have not been fully tapped. The major hindrance to the development of an efficient fishery programme for Nigeria is the low level of man power with different technical capabilities in the fishery sector.

Fishery Education is the most neglected aspect of Agricultural Education in Nigeria today, thus the importance of the living resources of the sea and fresh water for the rapidly growing population has been underestimated for a long time. Uptil the present, only two (Ibadan and Nsukka) of the twenty-nine University campuses have undergraduate degree programme in Fisheries. And of the Forty-Middle level Colleges of Agriculture, only three (Kainji, Lagos and Lake Chad) offer courses in fisheries. 1/

The sad state of fisheries education in Nigeria is in Sharp contrast to Norway and Japan, countries that take up to ₦300,000,000.00 of our foreign exchange each year for fish imports. 2/

The success story of the fisheries industries of Norway and Japan is closely associated with the high annual turnover of well trained personnel in their universities and Polytechnics. For instance,

Japan has two full Universities of fisheries, five faculties of fisheries and eleven Departments of fisheries in other Universities. Every year, Japan turns out 1900 students with qualification in fisheries.

Quite recently, prominent scientists and statesmen have repeatedly emphasised the importance of the reserves of food and raw materials in the waters. They suggested that more attention should be paid to the exploration and development of these resources and called that task as important as space research. 3/

Considering the fact that many fishery projects are now coming up, e.g. the rock fish farm at Jos, Oluponna fish farm at Oyo, Panyam fish farm etc. I considered it necessary to embark on a project which will involve the training of fishery personnels. And as a student architect then, my basic goal is to provide an atmospheric environment conducive to teaching-learning process in intermediate fishery agricultural education.

The scope of the project include:

- An analysis of fisheries in Nigerian economy
- An appraisal of current fishery projects.
- Case studies of existing school of fesheries
- Review of fisheries programmes and syllabus, and administrative flow chart for the school.
- Design of Academic buildings.

FOOT NOTE

1. Report prepared by FAO/World Bank for Federal Department of Fisheries of the Federal Ministry of Agriculture, Lagos.

2. Fishery report prepared by Review Mission (Nigerian consultants) for Federal Department of Fisheries of the Federal Ministry of Agriculture, Lagos.

3. Report prepared by FAO/World Bank review mission for the Federal Department of fisheries of the Federal Ministry of Agriculture.

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CHAPTER ONE

I N T R O D U C T I O N

Management is one of the major factors in the development of a profit oriented self supporting fisheries programme. The level of Management is basically a product of the training and man power development in particular fields of agricultural (fisheries) education. The greatest problem that is likely to confront any bold step in fisheries development in Nigeria is the inadequacy of trained personnel in the fishery sector of the economy. In order to sustain a viable fishery industry in Nigeria, it will be necessary to expand the present scope of the fisheries training, research and extension services in Nigeria. Development in fisheries therefore depends on human agents which itself need to be developed through learning.

Education can and must contribute to the liberating change if it is faithful to its true vocation, that of emancipating man without violating his nature. Education is a means of liberation from ignorance, poverty and disease. If you educate a man, you give him the potential to improve himself in the words of Leon Sullivan.

> "Give fish to a man and he will fish for one day. Teach a man to fish and he will have fish for the rest of his life". 1/

Also a one time secretary General of the United Nations, late Dag Hammarskjold had this to say,

> "...fundamentally, man is the key to our problems not money, funds are valuable only when used by trained, experienced and devoted men and women. Such people on the other hand can work Miracles even with the small resources and draw wealth out of a barren land". 2/

Agricultural science has long been introduced into the curriculum of schools in rural communities, but these curriculum rarely had enough fisheries career. Ruppin (1979) had observed,

> "that an educational system that tends to by pass the fisher men's environment, vocation and way of life, may only convince youngstars as well as their parents that their life style and vocation are irrelevant to the modern world; that fishing is a calling only suited to the uneducated, the illiterate and the backward".

The logical reaction will be the drift into cities for better prestigeous careers, hence adding to the number of discontented groups. Therefore, to reduce this adverse psychological feeling in rural communities,

the recent efforts to introduce fisheries into schools serving fishing communities should be intensified.

The need therefore arise to train middle level man power to accomplish a successful fishery revolution in the country. The country can not rely on the three existing Schools of fisheries to produce all the needed man power in fisheries. Presently, a considerable amount of money is being spent on consultancy and importation of fisheries products to alleviate the situation. However, the best solution that will be instrumental in meeting the requirement of such needed fisheries revolution is the training of man power.

In establishing another school of fisheries, the Government will also be meeting the aspirations for higher education of secondary school graduates, and at the same time meeting the man power needs of the country, more so that many fish farms are coming up. A system of adult fishermen training will be carried out with youth training in fisheries and rural occupation, so as to make adequate use of the trained staff.

This thesis is aimed at boosting fisheries development using intermediate level education in fisheries agriculture as main instrument, through the provision an atmosphere which is very conducive for learning-teaching processes.

1.2 BACKGROUND STUDIES.

1.2.1 Institutional Training in Fisheries in Nigeria.

Man power training in fisheries must have begun when the fisherman passed his knowledge of fisheries unto his children and his appretices. What may appear to be a thing of the past is still being carried out the world over, namely the training of peasant fishermen by the master fisherman.

Apart from the above generalised mode of training as fish industry, formalised and institutionalised form of training in fisheries began in Nigeria with the creation of the Federal Marine Fisheries School, Lagos in 1969. Later, the fresh water school of fisheries at Kainji and Lake Chad were established in 1976. The main thrust of the training for the subsequent seven years at Lagos fisheries school was the upgrading of the knowledge of fishermen in modern fishing methods and gears, and also conducting refresher courses for candidates wishing to take Competency Certificate. examination in the Federal Ministry of transport. The only Senior Level Course was the anual six week induction course for newly recruited fisheries/ Research officers. 3/

These training programmes appeared to meet the training needs of the industry for that period.

However, with a sudden improvement in the national economy, the industry had a boost as from 1972/1973, more inshore vessels were licensed, more local fishermen could afford to purchase motors for their boats and thus increase their fishing regimes. Aquaciolture became more popular and inland fishing effort along the main rivers and creeks were also intensified, thus new training programmes to meet these needs.

The training of personnel for both Inland and Inshore fisheries therefore became imperative. The diploma courses for the fisheries assistants and superintendants (OND and HND respectively) was thus started in 1976 as a reactionary attempt to train the backlog of untrained middle-level personnel who had been managing our Inland fisheries sectors. 4/

The formal training of the inshore fishing personnel did not start until 1981, when the first batch of secondary leavers were admitted for a two year training course for the mate fishing and motormen Grade II courses. The first batch of this group completed their courses in July 1983 and were presented to the Federal Ministry of transport for the relevant competency examinations under the Merchant Shipping Act of 1962.

The man power turn out of these three schools however, will not meet the man power needed in fisheries education.

The need for the establishment of more schools of fisheries can not therefore be over emphasized.

According to the UN/FAO recommendation and projections, Nigeria would require 3500 fishery Development officers, 2600 fishery research officers and many more fishery officers, fishery superintendants and fishery extension workers. While the Development and Research officers would necessarilly come from the Universities, the Superintendants and extension workers would have to be graduates of Schools of fisheries.

Presently, the number of graduates from the three existing fisheries schools is far less than the projected number for 1985. For instance the Kainji School of fisheries as at December last year has graduated only about 197 diplomates and about 100 certificate holders. 5/

The proposed school of fisheries would be responsible for the training of fishery officers, fishery Superintendants and fishery extension workers, so as to meet the demand.

1.3 Goal

The basic goal of this thesis as earlier mentioned, is to provide an environment or an atmosphere which is very conducive for learning-teaching processes.

1.4 Aims and Objectives

Aims and objectives are means of achieving ones goal. The aims and objectives of this thesis work are as follows:

- To design a school in which flexibility and adaptability which are the most important virtues in school design will be achieved.
- To site the school in a site which satisfies the Natural features required for successful fisheries research and fish culturing.
- To analyse and use the materials which will provide the needed environmental comfort.

1.5 Motivations

The thesis was motivated by the following:

1.5.1 Economy

The economy of the Nation is in such a declining state that efforts have to be made to exploit other sources of income instead of depending on oil alone. The training of fisheries personnels will go a long way in enlightening and mobilising the country's fish farming population, for more effective fish farming, handling, processing and Market, which will in turn have a positive effect on the economy.

1.5.2 Man Power Need

Meeting the fisheries agricultural man power need or demand in the country to sustain fisheries projects is very important. As earlier mentioned, for Nigeria to be able to sustain any viable fisheries project to meet the protein need of the rapidly growing population, emphasies have to be laid on the training of fisheries peronnels.

1.5.3 Higher Education

Nigerians have high capacity for learning, with adequate training in various aspects of fisheries, Nigeria will be able to maintain and sustain any gigantic programme that is envisaged in fisheries.

1.5.4 Assistance to Fishermen

Fish farmers need more assistance and guidance in adopting the modern trends of fishing. The training of fisheries personnels will go a long way in meeting the fishermen's need in terms of assistance and guidance in the adoption of the modern trends of fishing.

1.5.5 Interest

The thesis is also motivated by my personal interest in fish culturing.

1.6 Research Methodology

The research work was preceded by data collection analysis of the collected data. Published as well as field data were collected. The published data included the related literature on theories of fisheries development, problems, prospects and constraints to the development. Deductions and conclusions were later made from the data.

A study of Nigeria's fisheries education policies, public yearnings in the news papers, fishermen's opinion, personal observation as well as visits to the existing schools of fisheries were instrumental in the compilation of this Thesis work. Magazines, journals and other relevant publications were consulted to find architectural precedence of school design in general.

All the above mentioned data collected were analysed and relevant information extracted, which culminated to a set of design criteria on which the design has been based.

Space standard, sizes, shapes and functional relationship of spaces were derived from the case studies, relevant architectural books and the functional space requirement.

FOOT NOTES

1. Adams, B. "Skills for Development", Topic Issue No. 31, p.57.

2. Chang, C.W. Rural Asia Marches Forward. University of the Phillipines, College of Agriculture Textbook Board, College, Laguna, Philipines 1969, p.10.

3. Annex 6 Paper 2 - Fisheries Research, p.207.

4. Review Mission, Nigerian Consultants Reports on Fishery Education p.198.

5. Fisheries Man power Development in Nigeria. Paper presented at the Fisheries Society of Nigeria (FISON) Symposium: Maiduguri. By. A.A. Olaniawo.

CHAPTER TWO

FISHERIES DEVELOPMENT IN NIGERIA.

2.1 Evalution of Fishery Sector in Nigeria - A Historical Perspective.

Records have shown that the history of fisheries Development in Nigeria is a comparatively recent one, although Regan C.T. in his publication dated 1920 and titled "Reports on the fishes of the Colonies" revealed that a fishing company operated off the coastal waters of Lagos long before 1915. However, concrete efforts aimed at the development of the Nigeria's fisheries date back to the second World War (1939 - 1945) when increased domestic fish production was encouraged because of the naval blockage of the high seas. 1/

In 1914, a fisheries Development branch headed by a Senior agricultural officer was established in agricultural department of the Colonial Office. He was charged with the responsibility of conducting a survey of the Industry with a view to determining its potentials. Early in 1945 this fisheries branch was temporarilly transferred to the Development branch of the secretariat and for the first time a fisheries Development officer was appointed. Following this, a five year development plan for fisheries (i.e. 1945 - 1950) was formulated and incorporated into the ten year development plan and welfare in Nigeria (1945 - 1955). This was tabled for consideration of the

Legislative Council on 13th December 1945. Later on, active and extensive services spread to other coastal areas of Nigeria in order to demonstrate the benefits of improved fishing techniques and gear to the indegenous fishermen. A sub-station was later opened and a start was made in fish pond culture in the Inland areas, this later culminated in the establishment of the 160 ha Ponyam fish farm in 1951. 2/

Between 1952 - 1957 the bulk of Marine biological was undertaken by West Africa Fisheries Research Institute (WAFRI) based in Freetown, Sierra leone while a unit of WAFRI which was located at Bimin Kebbi conducted research into the fisheries of River Sokoto. However, the withdrawal of Nigeria and Ghana from WAFRI led to the institute being disbanded on 31st March 1957. From December 1945 - 1947, the fisheries branch was a section of the Department of Commerce and Industries with a principal fisheries officer in charge of it. Between 1948 and 1950 the artisanal fisheries Development efforts were intensified and consequently, the fisheries research activities were expanded to cover development responsibilities. 3/

Under the 1954 constitution of Nigeria, the fisheries organisation was split up between the Federal and Regional Government as follows:-

i) Federal Fisheries services of the Federal Ministry of Economic Development.

ii) Western region fisheries, Division of the Western Ministry of Agriculture and Natural resources.

iii) Eastern region fisheries Division of the Eastern Ministry of Agriculture.

iv) The fisheries section of the Ministry of Agriculture, Northern region.

v) The Northern Region fish farm at Panyam.

The constitution then directed that research should be a 'concurrent' subject, one in which regional and Federal Government were equally competent to engage in while the development of fisheries was solely a regional responsibility. The situation which gave rise to this ruling was that the federal fisheries service became responsible for research and development within the Federal territory of Lagos, and in the international waters of the Nigerian Coast, and for research throughout the federation of any fisheries question which a regional Government invites it to investigate. Each of the regions was responsible for development within its won territory and might either engage on research itself, or call in the Federal Service for assistance.

The Federal fisheries services (FFS) from 1954, operated under the Ministry of Economic Development till it came under the Federal Ministry of Agriculture around 1966 when the Federal Initiative to control the nation's. Agriculture was set in motion. The Federal Fisheries Service was upgraded in Jonusry, 1970 to a Department under the Federal Ministry of Agriculture andand Rural Development. In 1972, the Research Division was enlarged to include a new fish Technology branch, the Marine School having been established in 1967 and started in 1969.

The present development-oriented Federal Department of Fisheries came into being on 1st April, 1976 as part of the measures taken to give an effect to Federal Government policy of accelerating fish production. Thus, Nigerian Institute for oceanography and Marine Research, Kanji Lake Research Institute and Lake Chad Institute were carved out of the Old Federal Department of Fisheries by the Research Institutes order LN 107 of November, 1975. The New development therefore became responsible for advising the Federal Government on matters relating to the development of fisheries and fishing industry in Nigeria. Its specific activities include fisheries statistics, planning, Economics, Surveillance/Inspectorate, implementation of Federal fisheries development projects, coordination of states

fisheries projects, fishing Regulation and licensing of fishing vessels among others. These activities cover both Marine and Inland Fisherics.

Although, agriculture is in the concurrent legislative list of the 1979 constitution, fishing and fisheries other than fishing and fisheries in rivers, lakes, water ways, ponds and other Inland waters within Nigeria are in the exclusive legislative list - vide item 27 part I Second Schedule of the Constitution for the Federal Republic of Nigeria. 4/

2.2 Government Efforts: Past and Present

The Government of Nigeria has in the past made some efforts, and she is still making efforts in fish production and towards self sufficiency in fish production. The efforts however have not been very successful because the aspect of man power training has not been fully intensified.

In 1965, the Federal Government of Nigeria requested the food and agricultural organisation (FAO) of the United Nations under the U.N. Development programme to undertake fishery research in Nigeria - Benue River Basis.

The report submitted by the Inland fishery biologist Dr. M.P. Motwani, emphasized on the establishment of training Institutes for fishery personnel.

In accordance, the Federal Government established the Lagos, Kanji and Lake Chad research institutes and eleven River Basin Development authorities. Schools of fisheries were opened in Lagos in 1969, Kanji and Chad in 1976. 2/

Furthermore, the Government provided the following:

a) generous credit facilities.
b) 50% subsidy on fishing gear.
c) five-years tax holiday for investors
d) Abolition on import duties on fishing equipment
e) Incentive to foreigners to own up to 60% of total shares.
f) favour granted to fish production and processing
g) Capital and Investment allowance of 10% was granted on all expenditure incurred.

Attempts were also made in 1982 to get the FAO. World bank to finance fish Industry in Nigeria, but the attempts met with failure because there is a justified apprehension that lack of trained fishery personnel and fish statisticians would wreck any huge investment in fisheries.

Inspite of all the efforts, the fisheries Industry continues to lag behind all the other sectors of agriculture, because the total fish

production indicates an increasing dependence on importation of fish products. By 1980/81 session more than half of our fish was imported, and Nigeria spent a total of ₦287,400.00 on the importation. This resulted among many other things from l ck of adequate intermediate fishery personnel and fisheries extension workers. 6/

2.3 Fish Agriculture in Nigerian Economy.

Nigeria is essentially an agricultural country. Before the emergency of oil on the economic scene shortly after independence, 80% of her working population were engaged in the production of major cash crops, food and fish. Agriculture thus was a major source of employment in Nigeria. It was the main stay of the country's economy and a major source of her exports.

Then came 1960, the country attained Independence, there was a large drift of rural population of Urban Centres, fascinated either by city life or white collar jobs. This created and still creates shortage on farmlands and in fish production, with the resultant decline in fish production.

With the discovery of oil, people became eager to seek alternative sources of attaining a living. Such as employment in other sectors of the economy.

The situation has degenerated to the extent that Nigeria now imports substantial amount of food yearly. The contribution of fishery agirculture has declined from 81% at the end of 1973 to around 50% in 1979 - 1980 and less than 50% at present inspite of the use of modern fishing gears. 2/

The need to diversfy the nation's economy can not be over emphasised. The country must no longer depend on the present one commodity economy, based on availability of fuel which has in the past years made our economy bouyant, while our agriculture is not producing enough food and other materials to meet our needs when it could actually do so.

The current world economic recession which has led to a sharp fall in demand and price of our oil in the world market, and which has brought to us severe economic austerity measures and increased unemployment in the last five years is a sure sign of the need for a strong diversification of the economy and the need to go back to the various aspects of agriculture.

Considering the resources we have for fish production, if we adopt appropriate technologies to them, there should be no reason why we should not be able to feed adequately more than double of our present population. We can also comfortably earn additional foreign exchange from our fish production to supplement very substantially, what we earn now from oil.

Current fish production level of approximately 550,000 tons per annum is less than 50% of the total fish demand in Nigeria. There exists a wide gap between fish produced and fish made available to the consumers. Fish preservation, handling and storage methods in the artisanal sector of the industry are traditional characterized by lack of adequate precaution aginst spoilage and heavy contamination, resulting in about a loss of 45% in the original weight of fish produced. The loss is colossal since artisanal sector accounts for over 90% of the total annual fish production. In 1983, for instance the loss of 45% in the total artisanal production of 501,139 tons represented 225,513 tons valued at N112,756,500.00 at a cheap rate of 50 k/kg of fish. 8/

It is obvious from above account that efforts to increase fish production by local fishermen are immediately negated by substantial losses of fish during processing, storage, handling, transportation and marketing. This of course could be attributed to their level of preservation knowledge. There is therefore the need to train more people who will in turn be able to help the fishermen by teaching them the modernized traditional ways of preservation, hence bridging the gap between the fisherman and the fisheries scientist.

Agriculture (fishery) will continue to be the main stay of the country's economy and will sustain us for

a very long time after oil would have finished as it surely will someday. It will however not do so, unless it is improved by training and becomes an economic undertaking which is attractive both to the present and prospective farmers.

2.4 Fisheries Resources of Nigeria.

The existing fisheries resources of Nigeria fall into two major sectors, namely the artisanal and the industrial sector.

The artisanal sector is made up of Coastal (Marine) water fisheries, brackish water fisheries, fresh water fisheries and fish culture. While the industrial sector is made up of coastal and distant water fisheries.

2.4.1 Coastal (Marine) Water Fisheries.

Made up of fishing activities along the coastline directly in the sea, and is one of the underdeveloped sectors. The sector offers the greatest scope for expansion for the next few years. The training of more personnel will be of great advantage for the expansion of this sector.

2.4.2 Brackish Water Fisheries.

Made up of the fishing activities in the areas along the coast where the fresh water flowing down the river mixes with the salty water moving up with high tide. This area with the vastnetwork of

creeks and estuaries is of great importance at present, and of all the sectors the most intensely fished.

2.4.3 Fresh Water Fisheries.

Made up of fish activities of the rivers and lakes. Fresh water fisheri s in general hus some very important economic value, being the major source of fishing in the inland.

2.4.4 Fish culture

Peasant-scale fish farming has been practised in a number of pl ces in Nigeria for many years, but apparently, nowhere does it occupy so important a place in the economy of the country as in other part of the world such as Japan, despite the considerable amount of interest shown in it by fisheries departments over the years. There has been a certain amount of artificial stocking of reservoirs e.g. panyam, in plateau, Oluponna in Oyo State and Rock fish farm at Jos. In most cases, the new source of food has been appreciated by the local people, though there have been apparently no proper management, this could be attributed to lack of adequate training in fisheries.

2.4.5 Fishery Potential

The fresh, brackish and marine water support harvested at the artisanal and industrial levels.

Various attempts have been made to survey these resources and to estimate their potential among other parameters. These include the fisheries survey in the former Western and Mid-western regions of Nigeria (FAO 1969) and the fisheries of the Niger delta of Nigeria (Scott, 1966). The former had concentrated on the shrimps, while the later also investigated the prawns in addition to fishing in the inshore brackish and fresh waters of the Niger delta.

The Guinea Trawling Survey in 1963, and 1964, the fiolent survey in the 1976 and the Fridtjof Nansen survey of 1981, had worked at varying ranges in the sea. These surveys had provided useful information for some stocks, but have each been limited by vessel size and time to be fully comprehensive and final.

National efforts by the Marine biological division of the Nigerian institute of oceanography and Marine Research have been largely directed at filling the gap and updating. These however, should lead to a more reliable assessment of the potential of the fisheries resources.

These fisheries resources can be categorised as follows:-

Fin fish (fish proper).

Shell fish (shrimps, oysters etc).

f ne fish (demersal inshore industrial).

2.4.6 Fin Fish (Demersal Inshore Industrial)

The potential of the fin fish inshore trawl fishery has recently been estimated at 15,000 metric tonnes per annum, using the global models (Ajayi 1982). This is expected to increase moderately when the mesh regulation is fully complied with. The good sized fin fish harvestable on the shrimp grounds are estimated at about 25000 metric tonnes annually. All put together, the potential of the fin fish in the inshore waters harvestable by the industrial fleet is about 21,000 metric tonnes.

2.4.7 Fin Fish (Demersal Offshore Industrial)

The 1976 fiolent survey of the Nigerian waters obtained 10,000 metric tonnes.

2.4.8 Fin Fish (Artisanal Mainly Demersal)

A large traditional fishery operating within the first two nautical miles non-trawling zone is commonly designated the artisananal fishery. This covers the initial 3,500 km^2 of the shelf in addition to the expansive brackish waters. The potential of this resource in 1976 was estimated at 10,000 metric tonnes. This however was later believe to be less than what the potential should be, the adequate figure is not yet been given.

2.4.9 Fin Fish (Artisanal Pelagic)

Assessment of these resources, using the mean catch per fisherman on monthly trips to Okoroete (Cross River), Orioke Iwamimo (Ondo state) and Yovogan (Lagos State) put the potential of Ethmalosa fimbriata at over 100,000 metric tonnes, and 20,000 metric tonnes for sardinella spp. Making a total of 120,000 metric tonnes.

2.4.10 Fin Fish (Off Shore Pelagic)

The annual yield of off shore pelagic has been estimated at 29,000 metric tonnes.

2.4.11 Shell Fish (Artisanal Inshore)

A traditional fishery for shrimps flourishes particularly in the estuaries and coastal waters of the Cross River and Bendel States. Recent estimates (Marioghae 1981) put the annual catch rates of the Nketo and Nkoto traditional gear at 12.04 and 8.97 metric tonnes per fisherman respectively. An anual estimate of 48,000 metric tonnes has been given.

2.4.12 Shell Fish (Inshore Industrial)

The mud substrate of the continental shelf of the delta support a Commercial Fishery for penaeus duorarum. The resource has a potential yield of 3,500 metric tonnes, Bayagbona (1979) and Ajayi (1982).

Kanji Lake Fishery

Kanji lake is a shallow man made reservoir impounded in 1968, covering an area of 1260 km^2.

A pre-impounded estimate of 540 tones annually was made (Daget and Bayagbona (1961). Enumerating the number of boats on the new lake, a catch of 4600 tonnes per annum was predicted (Lalek (1971) and 7200 tonnes Henderson 1971). Catch assessment Surveys showed an annual catch of 17,000; 28,600; 11,000 and 10,000 tonnes in 1969, 1971, and 1973 respectively. Basigos (1971, 1972 and 1974). If 28,000 tonnes are taken as biomass, a potential of about 10,000 tonnes should be within reach according to Gulland's formula

$$\text{Potential yield} = 0.5 \times m \times B$$

$$m = 0.4$$

$$B = 25,600$$

$$\text{Potential yield} = 0.5 \times 0.4 \times 28,600$$

$$= 10,000 \text{ tonnes.}$$

The current annual catch within the region is however about 5,000 at present, which shows that the lake is still moderately fished.

Lake Chad Fishery

Lake chard on the other hand is a natural lake which has been affected by the Sahelian drought. Its water volume hashowever been improving. Estimates of Current potential are about 40,000 metric tonnes.

Rivers and Reservoirs

Nigeria is blessed with numerous rivers and tributaries, of which the Niger and Benue are the biggest. The total fresh water area is tremendous. This supports an artisanal fishery with an estimated current potential of 130,000 metric tonnes. Large tracts of these rivers are still only moderately fished at the moment, giving room for future expansion. 2/

FOOT NOTE

2/ Report prepared by FAO/World Bank Fishery Sector Review Mission, for Federal Department of fisheries of the Federal Ministry of Agriculture, Lagos.

DOMESTIC FISH PRODUCTION AND IMPORTS

Domestic fish production is inadequate to meet demand and is thereforesupplemented by fish imports. Production and import figures from 1973 - 1983 and from 1973 - 1980 respectively are presented in Table I.

Table I shows that fish production had a growth rate of 10.90% between 1973 and 1983, but its percentage contribution for the same pperiod exhibited a declining trend.

Fish imports, on the other hand, increased with years between 1973 and 1983. They rose from 106,111 tons valued at ₦7,054,635 in 1973 to 441,156 tons valued at ₦265,009,906 in 1980 as presented in Table II.

Fish imports are presently alarmingly high and may have the tendency of not stimulating domestic fish production. It is suggested that, as a matter of national policy, fish importation should be restricted to stop the massive drain of foreign exchange stimulating domestic production is a means of promoting local investiments in the development of the fishing industry. It will also provide increased employment for Nigerians and optimise the exploitation and utilisation of available fish resources.

Domestic production as a percentage of projected fish demand varied from 54.73% to 59.78% between 1980 and 1983 as presented in Table III.

Table 1V presents domestic fish production by sectors between 1973 and 1983. The artisanal sector, comprising coastal canoe fishery, lagoon and brackish water fisheries, riverine and lacustrise fisheries accounts 95.67% to 98.83% of total productions for the period under consideration. The industrial sector on the other hand, comprising inshore demersal trawl fisheries, had a contribution varying from 1.17% to 4.33% of the total fish production. Average annual contributions by artisanal and industrial sectors for the 11-year period were 97.35% and 2.60% respectively. Inspite of the modern fishing gears and Government policies, importation has been on the increase, this could be attributed to rise in population but even with the increase in population, Nigeria could still be self reliance in fisheries if we have adequate manpower, because the fact still remains that our fisheries resources are not fully tapped.

TABLE I

CONTRIBUTION OF TOTAL DOMESTIC FISH PRODUCTION
AND IMPORTS TO TOTAL FISH SUPPLY
1973 - 83 COMPOSITION

YEAR	TOTAL FISH SUPPLY	TOTAL DOMESTIC FISH PRODUCTION		TOTAL FISH IMPORTS	
		Wt.(tonnes)	%	wt. tonnes	%
1973	571,186	465,075	81.22	106,111	18.58
1974	565,262	473,220	83.72	92,042	16.28
1975	754,862	466,236	62.76	288,626	38.69
1976	769.378	494,766	64.31	274,612	35.69
1977	793.472	504,014	63.52	289,458	36.48
1978	893,405	518,567	58,04	374,838	41.96
1979	980,582	535,435	54.60	445,147	45.40
1980	874,907	430,751	49,23	444,156	50.77
1981	N.A	496,211	-	-	-
1982	N.A	511,915	-	-	-
1983	N.A	515,249	-	-	-

Source of Import figures: Nigerian Trade Summary
(Various years)

TABLE II

NIGERIAN FISH IMPORTS AND VALUES (1973-80)

YEAR	QUANTITY TONNES	VALUE ₦
1973	106,111	7,054,633
1974	92,042	6,693,754
1975	288,626	38,771,162
1976	274,612.51	76,802,789
1977	289,458	77,836,841
1978	374,835.30	140,634,192
1979	445,147.30	143,548,433
1980	444,156	265,099,906
*1981		287,400,000

Source: Nigerian trade Summary (Various years)
Compiled by Federal Office of Statistics.

TABLE III

PERCENTAGE OF PROJECTED FISH DEMAND IN NIGERIA, 1980 - 1983

YEAR	DOMESTIC FISH PRODUCTION (TONNES)	PROJECTED FISH DEMAND (TONNES)	%
1980	430,751	787,000	54,73
1981	496,211	830,000	59,78
1982	511,915	874,000	58,57
1983	515,249	920,000	56,00

Source of Figures: Nigerian trade Summary
(Various year)

TABLE IV

DOMESTIC FISH PRODUCTION BY SECTORS

1973 - 1983

YEAR	INDUSTRIAL SECTOR TONNES	% OF TOTAL DOMESTIC PRODUCTION	ARTISANAL TONNES	% OF TOTAL DOMESTIC PRODUCTION
1973	5,449	1.17	459,626	98.83
1974	7,830	1.65	465,290	98.35
1975	10,172	2.18	456,664	97.82
1976	10,488	2.12	484,278	97.88
1977	15,992	3.17	488,022	96.83
1978	17,155	3.31	501,412	96.69
1979	11,130	2.11	524,125	97.89
1980	18,640	4.33	412,111	95.67
1981	14,538	2.93	481,673	97.07
1982	18,577	2.63	493.338	96.37
1983	14,110	2.74	501,139	97.26

Source: Nigerian Trade Summary (Various year)
Compiled by Federal Office of Statistics.

CONSTRAINTS TO FISHERIES DEVELOPMENT IN NIGERIA

The constraints of fisheries development in Nigeria are of education, suitable credit facilities, and fishing and preservation methods. All these had adversely affected the growth of fisheries agriculture in Nigeria.

Education

Artisanal fisheries presently accounts for over 95% of local fish production, (In 1979, of the 535,435 metric tonnes local production, the artisanal sector accounted for 524,127 metric tonnes. The main characteristic of this important sector is its rural traditional setting in which traditional methods of fishing and preservation (which of course are not very efficient) are adopted.

The most serious problem encountered in the course of development of fishery production is the shortage of man power. Presently, most of the fisheries officers in Nigeria are senior officers who are engage mainly in research work. Hence there exist an unbridged gap between the fishermen and the researchers.

The fact still remains that most of the fish farmers in the artisanal sector are not educated, so they have to be helped or assisted in the use of the modern gears to boost their fishing..

Suitable Credit Facilities

Finance has also been a constraint in fisheries fisheries development in Nigeria. This has affected the rate of putting up of various infrastructures required for proper preservation and storage.

Peasant farmers find it almost impossible to finance the cost of construction of dams and ponds, which are most needed at present. Loan schemes operating in the Agricultural sector is not applicable to fish farmers at present time. The subsidy scheme introduced for the Capture fishery does not affect the local fish farmers, consequently, there are at present so many incompleted private and community fish ponds.

Fishing and Preservation Methods

The traditional fishing, preservation and storage methods are very inefficient as will be discuss in Chapter three. This could however be attributed to the lack of education. The methods of fishing, preservation and storage could therefore be improved by training. 10/

Possible Solutions to the Problems Training

The solution to the problem of man power shortage in the fishery sector of agriculture can best be handled through massive training of personnel to handle fishery projects.

As earlier mentioned in Chapter two, the need to creat more schools of fisheries where middle-level manpower need could be trained, and where local fishermen could have vocational training in the use of modern gears, and have more knowledge about effective preservation, could not be over emphasised. In order to bridge the gap between the researchers and local fishermen, fisheries training has to be intensified.

The idea of posting completely inexperienced officers to fish farms should be discouraged. It would appear that fisheries has reached a stage where the officers should be able to specialize in the marine or Inland fisheries. A specific training need should be mounted for officers on pond construction and management. Any invectment in fisheries without adequate manpower would be wrecked.

Finance

As a matter of urgency, the Government should look into the issue of subsidy to fish farmers. The financial and technical assistance on fisheries development should

be implemented. Famers should be encouraged to complete ponds already started and efforts made to ensure that there are fish ponds all over the country.

Use of Kanji Gas Kiln and other Recently manufactured Kilns in the Country.

Farmers should be taught and encouraged by means of finance (as mentioned above) in the use of the locally manufactured kilns, such as the kanji gas kiln. The use of the gas kiln produce better and hygienic fish products.

Incentives

Incentives should also be given to fish farmers in rural places by the Government. The provision of modern amenities such as electricity, pipe borne water, good roads and others, will prevent rural-urban drift, hence more fishermen in the riverine places, and higher fish harvest.

FOOT NOTES

1. Fishery Review Mission (Nigerian Consultants) Page 36.

2. Fishery Review Mission (Nigerian Consultants Page, 36 - 37.

3. Fishery Review Mission (Nigerian Consultants) Page 37 - 38.

4. Fishery Review Mission Nigerian Consultants (Page 38 - 40).

5. Review Mission For Federal Department of Fisheries of the Federal Ministry of Agriculture Lagos. (Page 41 - 46).

6. Justification for course in fishery Resources Management. Paper presented by Nigerian fisheries Consultants (1984).

7. Opaluwa, A.I. M.Sc. Arch. Thesis, 1983.

8. A review of fish Industry in Nigeria. Technical Paper No. 17, By. J.G. Tobor (1984).

9. Fisheries Resources of Nigeria. Paper presented by Nigeria Consultants (1984).

10. Constraints to fisheries Development in Nigeria. FAO Fisheries Technical paper, 264.

CHAPTER THREE

STATUS OF FISH PRESERVATION OF NIGERIA.

Fish within 1 - 3 hours of being caught is in a fresh state, it is characterized by brilliantly coloured gills, with no odour, firm flesh with intact abdominal wall, bulging eyes with black brilliant pupils and irridescent lustrous skin with transparent mucous (Enokpao 1978). Unprotected against bacterial and autolytic spoilage, the fish loses the above organoleptic characteristics and becomes progressively more unacceptable for human consumtion with time. 1/

The agents of spoilage, bacteria and autolytic enzymes operate under certain optimum conditions. Bacteria require water to exist and are sensitive to heat, salt concentration and pH. Enzymes activities are sensitive to temperature changes and are inactivated by chemicals and irradiation.

Preservation is a process of keeping the fish close to its fresh state or minimize changes in its physical appearance, taste and texture. This can be achieved by creating conditions on or inside the fish, which is totally unsuitable for the optimum operation of bacteria and enzyme activities. Spoilage bacteria and enzymes can be killed by heat irradiation and recontamination prevented. Activities of bacteria and enzymes can be suppressed by the application of low temperature

chemical compound e.g. salt and smoke and by removal of water by solar, wood or wind processed. Various methods of fish preservation and those adopted by Nigerian fishermen are presented in Table

DISPOSAL AND METHODS OF FISH PRESERVATION IN NIGERIA.

Sector of fishing industry	Live	Fresh & unchilled	Smoke-drying	Sun-drying	Salted and sun-drying	Icing	Freezing	Canning	Irridiation	Intermediate Moisture Food technology
Artisanal Fish	✓	✓	✓	✓	✓	-	-	-	-	-
Shrimps	-	✓	✓	✓	-	-	-	-	-	-
Crabs	✓	✓	-	-	-	-	-	-	-	-
Molluscs	✓	✓	✓	-	-	-	-	-	-	-
Industrial:										
Fish	-	-	-	-	-	✓	✓	-	-	-
Shrimps	-	-	-	-	-	✓	✓	-	-	-

✓ = Yes

Percentage composition of different methods of fish disposal in the artisanal sector is as follows: Live fish, 7%, fresh but chilled, 27%, smoked-dried, 45%, sun-dried 20%: salted and sun-dried 10%. The composition in the industrial sector is as follows: Ice chilled fish 80% and frozen fish 20%.

The table shows that artisanal fishermen dispose off their fish live or fresh but unchilled with ice or preserve them by smoke or sun drying, and salted before drying. The industrial sector, on the other hand, adopts standard methods of preservation either by freezing or chilling with ice. Canning and irradiation techniques or the application of intermediate moisture technology for fish preservation are not in practice in Nigeria. Each of the methods of disposal and preservation of fish is described below.

Fish Preparation in the Artisanal Sector and their Effectiveness.

Live Fish:

Fishermen keep some species of fresh water and marine fish live and sell them. The fresh water fish so marketed are characterised by specialised breathing organs which confer on the fish the ability to withstand low oxygen tension. The species of fish include protopterus Senegalus, Clarias lazera and Ophio Chephalus obscurus. They are kept with some water in containers such as Kerosine tins, pots and basins where they can remain alive for some time.

Marine and brackish water species caught alive either with hooks or nets are kept in cages, woven of local materials and submerged in water. The position of a cage is marked with a float. In this way, fish can be kept alive for 5 - 6 months.

Fresh fish unchilled with ice

There is no preservation of any kind for fish sold fresh and unchilled. The fish conditions range from fresh to advanced stage of putrefaction. The fish are normally sold within a radius of about 5 - 15km from landing sites. Some fish are even rubbed with sand or covered with grass to delay the process of dehydration. The sand and the grass provide rich sources of microbial contamination. Generally, the fish are exposed to flies and wind and laid for sale on bare ground or at best on dirty mats and tables.

By then, most species of fish are in their postrigor mortis stage with consequent on set of bacterial decomposition, accelerated by consumers who introduce further contamination.

Spoilage results from the various contaminations and is accelerated by exposure to high ambient temperatures. Except when caught and sold immediately within 1 - 3 hours. Most fresh fish, unchilled with ice and displayed for sale, have already lost organoleptic qualities characterizing freshness in fish as earlier mentioned.

Consequently, consumers buy fish which are generally characterized by the following qualities: slightly discoloured to yellowish gills with rancid to putrid odour, elastic to soft flesh with soft to fragile abdominal wall, slightly sunken eye with duller pupil and the colour of the skin varying from dull to faded and that of Mucus, milky to Opaque, (Enokpae 1978).

Smoke-Drying:

The process involves descaling, beheading and removing fins and guts, the fish is then cut into chunks approximately 25.0cm to 10.0cm. Small size fish are however smoke dried whole. The chunks are spread on mats to dry in the sun for 1 - 3 hours before smoking over fire for 2 - 4 days. Smoked fish are then dried in the sun from time to time to prevent fungal attack. (Fadayome et al, 1982)

The smoking kilns which are crude in appearance, and made of clayey bricks are of various shapes, circular square or rectangular with openings in the wall through which fire wood is fed into the kiln. A wire gauze placed over the top of the kiln serves as a platform for the fish which are covered with mats.

As a general practice, fishermen smoke fish which they are unable to sell on time after they are caught and exposed to ambient. temperatures of over 80°F.

Such fish have already lost their good org noleptic qualities and smoking them result in very poor products. (Meyboom, 1975).

Smoke-dried fish found in the markets hardly exhibit uniformity in product characteristics. Some smoked fish which are very dry with low moisture contents, suffer from heavy insect infestation. Others, not so dried and have medium to high moisture contents, suffer from both bacterial attack and mould contamination. The latter condition is common in smoked catfishes, clarias sop and ophiochephalus obscurus. Contaminations with sand and ashes from fire wood are common.

Tobor (1969) reported on fish preservation practised on the shore of lake chad noted that smoked fish were semi-rotten inside and infested with maggots. Shelf life of smoked fish is between 5 - 20 days. Longer shelf life is however possible with good packaging and storage practices. Some dried shrimps, on the other hand have a shelf life of 2 - 3 months, and rarely suffer from insect infestation. They are however contaminated from exposure when displayed for sale.

Banda Smoke-Drying:

This is a version of the above method. It is practised mainly in the northern part of the country. The fish are dressed cut into chunks and spread on mats to dry in the sun for 1 - 12 hours. The semi-dried chunks

are spread on grass which is then set on fire. The ensuing flame which lasts for 5 - 15 minutes simply scorches the fish and leaves it charred and inadequately dried with high moisture contents of over 50% (Fadayomi et al 1982).

The charred fish locally known as 'banda' are spread on mats to dry in the sun for some days, they are later packed in heaps and covered with mats for days again. The banda is packed in jute sacks and transported to Lagos, Port Harcourt, Onitsha, Ibadan and some other cities in the South for sale.

Banda is a product which is unhygenically prepared and characterised by serious infestation by dermestes adults and larvae. The product is sandy and contaminated with pieces and grass and ashes. Tobor (1972) noted that 1.40 kg of banda prepared on the shore of Lake Chad lost approximately 43% of its original weight within 60 days of storage and was infested with 28 adult houseflies, 20 and 85 of their larvae and pupae respectively. Dermestid beetles according to him were 6 in number and their larvae, 22. There were 266 pupae and one adult of an unidentified insect (family muscidae).

Sun-Drying

Sun-drying too as a method of fish preservation is largely practised in the northern parts of the country where ambient temperatures are high, ranging from 90° to 92°F

(32 - 33°C) and relative humidty low, reaching 10 - 20% in January and February. The process of dressing as described in smoke-drying. Drying may take 5 - 7 days. The sun-dried fish suffers from inadequate drying especially durin, rainy season, resulting in semi putrefaction and offensive odour. It is heavily infested with insects and contaminated with sand and micro organisms as a result of exposure in the open field for several days. Packaging in old jute bags and poor handling pracrices further contribute to contamination and substantial waste of fish.

Salting and Sun Drying.

In this method, the fish are washed, scales, fins, heads and the guts removed, The fish are then cut into broad longitudinal strips and the back bone removed. Longitudinal scores are made on the cut surfaces before the fish are thoroughly washed and salt liberally applied both on the cut surface and into the scores to facilitate salt penetration. The treated fish are packed in layers on a concrete platform with a liberal sprinkling of salt between layers and on the topmost layer. The fish are covered with mats and pressed down with heavy weights for 20 - 24 hour before are removed to be dried in the sun for 2 - 3 days (Bermergui et al 1979) and (Scott 1957).

The product is far better in quality than banda. If it is well prepared, properly salted and well packed in air tight containers, it has a shelf life of 2 - 3years. Badly prepared product however suffer insect infestation and rancidity. Tobor (1972) reported that a sample of 16.45kg of salted and sun dried fish prepared at Baga on the shore of lake chad and brought to Lagos for sale had the following insect and larvae composition: Adult dermestes 22, adult mecrobia 4, larvae of both dermestes and necrobia 130. The product was oily, badly damaged and had offensive odour.

Salted and sun-drying method of fish preservation is an improvement on smoke drying, but hardly practiced by fishermen. The fishermen however have their own reasons practising this method very often, and the reasons are as follows. They (the fishermen are reluctant to invest on salt. Secondly, the product is not easilly acceptable to consumers because of the problem of deslting it properly before cooking. Thirdly, the fishermen abhor the labour involved in dressing the fish and resulting loss in weight. (Tobor 1969) estimated that the loss in weight varied from 38.18% to 43.20% for lates niloticus, Heretotis niloticus, Distichodus rostratus, Labeo Coubie citharius spp among the species of fish in lake Chard. 2/

Fish Preservation in the Industrial Sector

The Industrial sector use modern methods in the preservation and handling of fish. Chilling with ice and freezing are the common methods.

Chilling with Ice

Chilling is reducing the temperature of the fish from ambient temperature, say 25°C to 1°C. Shrimpers and fish trawlers operating in the inshore waters either on daily basis or over periods of say 15 - 24 days use ice to chill their catches which are normally packed in boxes and stored in cold rooms on board. Shrimps meant for local markets are chilled head on. Generally, fish and shrimps are landed in good quality and are either sold immediately to retailers or kept in Cold stores before sale in subsequent days (Amu and Disney 1973) and (Roach 1974).

Freezing.

Fish and shrimps are chilled before freezing is generally not a standard in Nigeria. (Eyo and Ita 1977).

Fishing companies in Nigeria maintain cold stores close to their jetties to limit days during discharge and subsequent storage. This prevents any adverse effects of exposure of frozen fish or shrimps to air (Watanabe 1986)).

For local marketing of frozen fish, either locally produced or imported, fishing companies maintain chains of cold stores of capacity of 8 - 20 tonnes in large hinterland cunsumer centres. Insulated vans are used for the transportation of frogen fish to centres. (Eyo 1982). 3/

Other methods of Fish Preservation

There are other methods of fish preservation which are not yet practised in Nigeria. These are canning, irradiation and application of intermediate food technology.

Canning.

Canning requires availability of large quantities of suitable raw materials all year round. Presently, tuna fish is the most suitable raw material for canning. Recent studies in the Marine Research have confirmed the availability of tuna fish in commercial quantities in the exclusive economic zone of Nigeria. Canning of tuna will be an import substitution industry. (F.O 1970).

Irradiation of Fish

Food irradiation research has been conducted over three decades in developed countries and efficacy of its application to control insect infestation and reduce spoilage micro-organisms has been demonstrated. According to an article on "Cold process to preserve Food" which appeared in the "observer" of 2nd august, 1984,

the international Atomic Energy Agency based in Vienna (FAO/IAEA/WHO 1981) has recommended the use of radiation for the preservation of food. The article rightly pointed out that irradiation could help post-harvest losses, but that objections to the use of radioactive material on food have already arisen in some European countries. Nigeria is however not technologically developed enough to apply irradiation as a means of fish preservation without health hazards.

Intermediate food Technology

This is a process of Osmotic dehydration whereby spoilage micro-organisms are deprived of the water indispensable for their activity. Products so produced have moisture contents (up to 50%) and are shelf stable at ambient temperature. The process renders unavailable water to support deteriorative chemical reaction capable of lowering organoleptic and nutritional qualities of the products. (Bonsu 1976), Bermerqui et al, 1979), (Scott, 1957) and (Talbi, 1982).

Evaluation of Preservation Methods

The above review shows that the status of fish preservation in Nigeria is low, highly traditional and underdeveloped technologically. Where good methods are adopted as in the industrial sector, the efforts are negated by the handling practices of retailers who have no access to cold storage facilities and lack the means of insulated transportation of chilled or frozen fish.

The technologically low status of fish prevervation results in heavy losses which are of different types, weight, quality and monetary. Weight loss is caused by insect infestation and quality loss, by several factors such as contamination by mould, micro-organisms and sand. Loss of nutritive value when fish are charred also result in quality loss.

Monetary loss is due to the above losses and may also result when catches can not be sold immediately after landing and cold storage facilities do not exist in most of our rural areas.

The high level of post harvest losses has the effect of further increasing the gap between fish demand and domestic production. This calls for a programme of technological development and improvement of the traditional methods of preservation to guarantee high quality products and its greater availability to consumers. The successful implementation of development and improvement programme could only yield positive effect through training. Fishermen could be trained also and encourage in the use of the newly designed KANJI KILN which of course is cheap and gives better product than the traditional one which they still use. 4/

FOOT NOTES

1. Amokpae, A.O. (1978). Organoleptic assessment of quality of fresh fish. Niomc occasional paper No. 17.

2. J.G. Tobor, (1984). A review of fish preservation methods and future growth prerequisites to cope with anticipated increase in production.

3. Fish preservation in the Industrial section Amu and Dismey (1973) and Roach, 1974.

4. FAO/IAEA/WHO (1981) paper present.

CHAPTER FOUR

CASE STUDIES

4.1 Lake Kainji School of Fisheries

The school of fisheries is located within the Kainji lake fisheries Research Institute New Bussa, and it is at the extreme end of the staff accomodation area.

Lay-Out

The school consists of separate buildings which are not linked by walk ways, except the offices and classrooms area. The administrative and teaching areas are grouped together, and this is the only area linked by covered walk ways.

The library complex is to the right hand side of the administrative and the teaching area, there is no link whatsoever between these two areas.

The boat repairs area which is made up of three separate buildings is behind the classroom area, there is also no defined link between these areas.

The dinning facilities and the student hostels are to the left hand side of the administrative and teaching area. The dinning hall is on the opposite side of the hostel, but there also exist no defined link between them.

A little space for parking (though not designed as parking space) exist just in front of the administrative area.

The general layout of the building is to be appreciated except for the fact that there are no well defined links between these buildings and no landscape of any nature. The buildings could all be said to be standing in isolation.

Structure

Concrete frame construction is the structural system used in most buildings in the school, with columns some of which are regularly spaced within each building. The infilling material is the concere follow block between the columns.

The administrative area, teaching area and the student hostels are two storey in height, while the dinning area, library and the repair sheds are single storey in height. Mono-pitched roof is adapted almost through-out the school, except the repair sheds which of traditional double pitched roof. See Figure 4.1 and 4.2.

General Critique (Observation)

Ponds and hatcheries which are characteristics of school of fisheries are not existing in the school.

The school is not properly landscaped, the whole place is made up of buildings and bare ground, there is no single plant on the site, this makes the place not to look natural.

Shopping facilities are not in existence inspite of the fact that the school is very far from the town.

Facilities for sporting and extra curricular activities are grossly inadequate, as only a small room by the entrance to the hostel is the only available space for table tennis only. Students always have to go to some other places for their sporting activities.

The use of the library complex is not well defined, as part of the complex is being use for seminars and as classroom. The space use for reading can not accomodate more than fourty students at a time.

There is no room that is capable of holding a large number of students together under one roof for public lectures, seminars, film shows, symposia and other communal activities, exceptthe dinning hall which as a matter of fact is not conducive for such gatherings.

There is no well defined entrance to the school.

Parking space is not well defined, cars are seen parked all over the place, this is as a result of poor of lack of landscape.

Ventilation and lighting are however well taken care of. The orientation of buildings is also alright, as onger sides of the buildings face the North-South direction.

4.2 Marine School of Fisheries Lagos.

Location.

The school is located on the victoria Island in Lagos. It is within the area of the Nigerian Institute for Oceanography and Marine Research Lagos. It is also very close to the atlantic ocean.

Lay-out

The school consist of two separate buildings which are accomodating the classroom, laboratories, offices library and workshops. There is a bungalow within the school compound, and the principal stays there.

The school is fenced with a gate and a gatehouse at the entrance to the school. Very close to the gate is the parking space which is quite in-adequate when compared to the number of cars always parked in the school area.

A platform exists within the courtyard, which is use as convocation ground. Between the two separate buildings are some hatcheries and a Reservoir.

The lay-out of the school could not at all be said to be interesting.

Structure

Concrete frame construction is the structural system used in the buildings in the school, with columns which are not regularly spaced. The infilling material is the concerete hollow block between columns. The two buildings are two storey in height. Concere and traditional double pitched roofs are the adapted roofing structures in the two separate buildings of the school. See figure 4.3 and 4.4 .

General Critique (Observations)

Facilities for proper practical work are grossly inadequate, the students end up knowing just the theories but not practical knowledge for fisheries.

There is practically no zoning in the school, the buildings were just build to accomodate the various functions in the school. The grouping of the classrooms, laboratories and offices together in the same place with the workshops makes the place very noisy and non-condusive for the learning process most of the time.

Facilities for sportings and extra curricula activities which are necessary in a school are non existence in this school.

There is no adequate accomodation for students of the school. The only available students hostel is far from the school.

Landscaping is also non-existence in the school, infact the two separate buildings are not even linked by a walk way.

4.3 Ostridge College Scotland

Layout

There are two distinct blocks within the college, the workshop block and the teaching/accomod. ion/ administration block. Internal circulation and the disposition of unctions could be said to be okay.

The ground floor contains the front and rear entrances, administration and communal rooms with access down to dinning room and kitchen. Taking advantage of the slope of the ground, service access to the kitchen is directly off the entry road. Teaching spaces are to the noth, grouped round a stair case and residences to the west are similarly located about staircase access off the principal floor. Flats for wardens and assistant wardens are in a supervisory position between commund spaces and residences.

The grouping of residential and teaching accomodation off stair cases avoids excessively long corridors and allows an informal l yout of spaces. Fragmentation of the overall form of clustering accomodation and use of changes of level has minimised the institutional overtones common to many rural schools.

However, with the windowless main corridor, low level of artificial lighting and the dark grey of the concrete blocks, the principal route through the building is unnecessarilly muted.

The library is located at the fulcrum of the building which comprises main entrance hall with stairs down to the dinning hall, entry to games hall which can cater for outside functions, corridor to administration area and further on, to the classroom and laboratory complex.

The teaching area has a back entrance to handle a large volume of day students, and like the student residences, it is built up around a quarter landing stair with two or three rooms taken off at each stage.

The laboratories are at the lowest level with an exit to the agricultural machinery workshops which form the semi enclosed, countyard at the rear. The quarter landing stair then leads up to the classrooms, some of which have back lighting by means of specially cranked trusses making an interesting internal finish. See section A-A.

Construction

The College is conceived as a series of cantilevered concrete boxes at first floor level perched on rough textured blockwork, all interlinked in domestic-sized

Volume with traditional pitched roofs. The concrete is board-marked externally with horizontal lifts defined by bands formed by 50mm x 12mm. Fillets on the shuttering, and contrast with the textured block work.

Structurally, the blockwork is used as an inner leaf to the insitu concrete boxes with weep holes at the base of the cavities on the cantilevers. The insitu concrete material is light weight aggregate concrete.

The residential blocks and the basement storey to the concrete classroom areas are carried out in traditional cavity blockwork. See figure 4.5 and 4.6 1/

Observations

Windows are small in certain areas which makes supplementary artificial lighting necessary. In some cases the day lighting of the classroom in harsh, resulting in dark corners and surfaces.

The main corridor in the ground floor is windowless, which makes the principal route through the building to be unnecessary muted.

The compact nature of the complex is interesting but makes expansion very difficult.

The grouping of residential and teaching spaces off staircases avoids excessively long corridors.

Appraisal

Ian Appleton*

For most city dwellers, the image of the farm remains rustic; but the straw-chewing farmhand has long since disappeared. Economic necessity has meant improved farm management techniques requiring the combined skills of businessman, technologist and agriculturalist. Expressions such as 'meat subsidies', 'maximum yield' and 'Common Market agricultural policy' represent the reality of present-day farming.
The Oatridge Agricultural College takes boys from the age of 17 for either a 36-week course (leading to a National Certificate of Agriculture), or 5-week block courses, in the practical and theoretical aspects of modern farming: both courses are residential. So far, 60 per cent of the students have come from the central belt of Scotland and the borders, and the rest from all over the UK; half are farmers' sons. Fifty-four students, of whom 19 are on one of the full-time courses, are resident, while up to 100 students from surrounding areas attend day-release courses.
Full-time students spend half their time working on Oatridge Farm and in the workshops: formal classes are taken in accounting, management, and detailed knowledge of livestock, crops and machinery.
The college also runs short residential courses for schoolchildren to 'learn from the land'. Various youth groups, not necessarily related to farming, occupy the college in vacations.
The present principal was appointed just after the signing of the building contract: the briefing had been sorted out by his predecessor and the Scottish Education Department, with a cost allocation similar to that of a polytechnic building. The Scottish Education Department continued in an advisory capacity during the design stages. The architects were handed a broad schedule of accommodation, now seen with minor adjustments in built form: the cost limit was achieved, but the contract period well exceeded.
In 1967 Alf Cooper took on the West Lothian County Architect's Department as the youngest county architect in Scotland and brought in a group of young architects including Colin Webster and Alex Cuthbert. With reorganisation the office is no more: Alf Cooper is in private practice, Colin Webster in the Edinburgh District Council and the Oatridge College stands as an example of what enthusiastic teamwork can achieve, **1, 2.**

Site

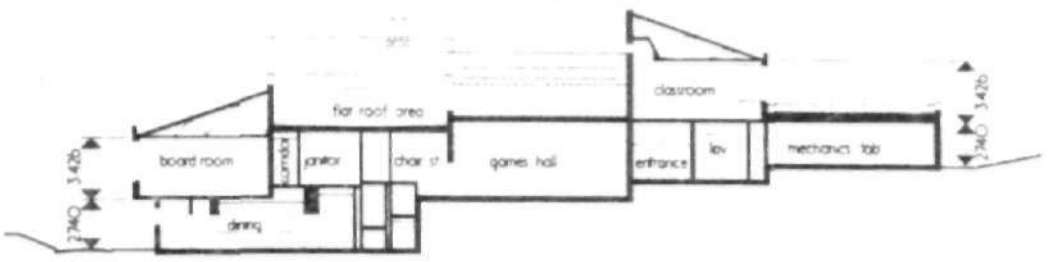
Oatridge Farm, purchased in 1967, is 12 miles west of Edinburgh in an undulating landscape crossed by roads, pitted by mines and dotted with small settlements. The farm, managed by the college as a teaching farm since 1968, is able to offer a broad range of experience, from hill farming to pig rearing, within its 280 hectares, while still being economically viable. During construction of the new building temporary hut classrooms were located near the existing farm buildings and students lived in local hotels.

** Ian Appleton is a lecturer in the Department of Architecture, Edinburgh University, and is a regular contributor to the AJ.*

Oatridge Agricultural College



B *Site plan.*

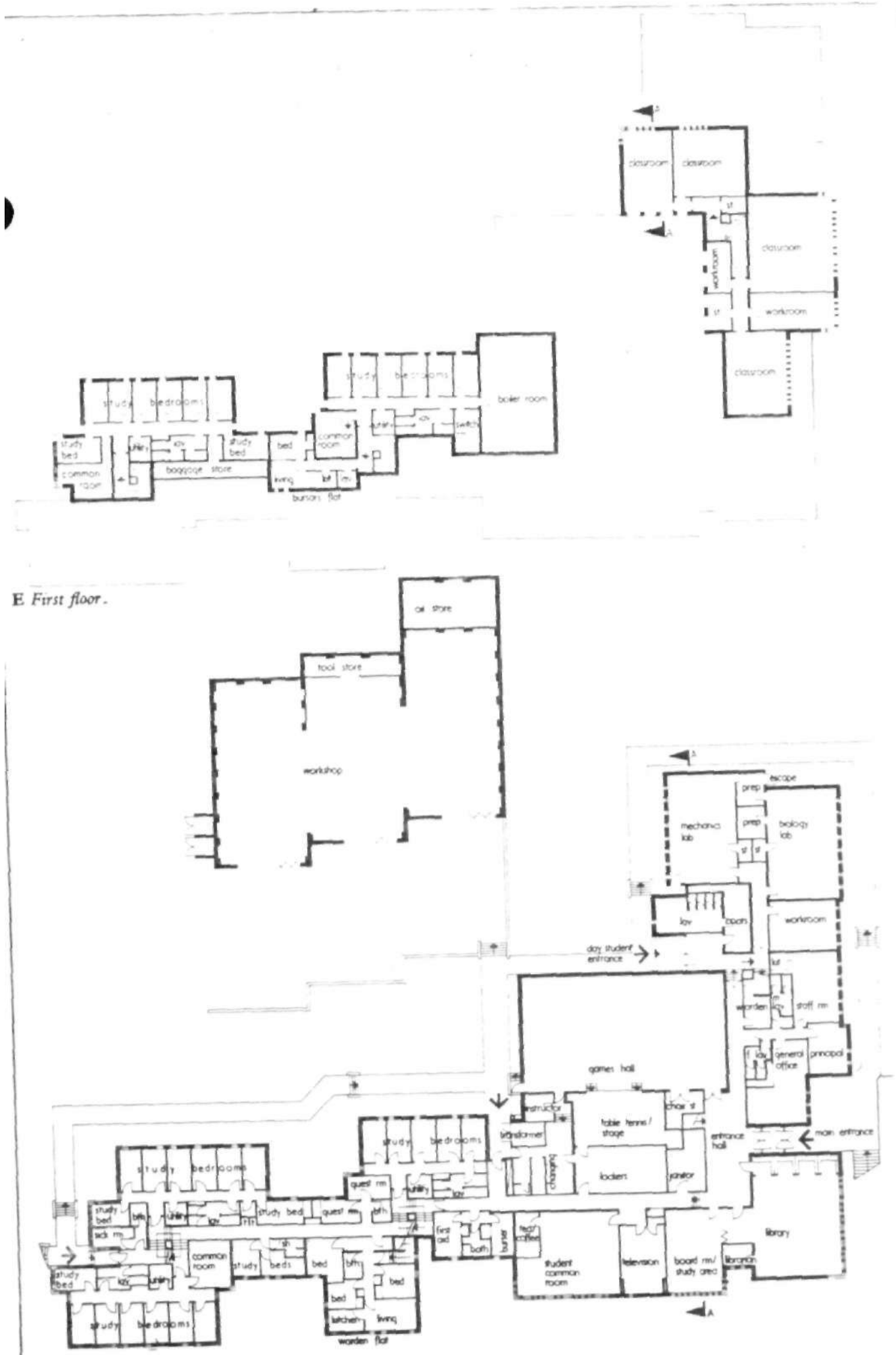


C *Section AA.*



D *Lower ground floor.*

FIG. 4·5



E *First floor.*

F *Ground floor.*

FIG. 4·6

The multifunctional use of space is also appreciated. Examples are the boardroom which can also act as an extension to the library when there are no board meetins, and the table tennis which acts as a stage to the hall.

4.4 College of Agriculture, Samaru

Lay out

The layout of the school is such that the teaching area is seperated by the residential area by a major highway - Funtua road, this is a great short coming.

The orientation of the buildings within the school is satisfactory in that the long sides of most buildings face North and South. This reduces the cost of providing shading devices.

The agricultural mechanisation department is detached and located far from the other teaching area on the north side of Funtua road. This is not economical, as duplication of teaching facilities arises from such decentralisation and enormous time and hardship is encountered in changing over for lectures.

There is no room for future expansion of the teaching facilities on the present site.

Structure.

Concrete frame construction is also the structural system used in most buildings in the school. The

infilling materials is the concrete hollow block between the columns.

Most of the buildings in the school are two storey in height. Simple traditional pitched roof is used almost throughout the school. Some end walls have stone facing treatments. See figures 4.7 and 4.8.

General Critique (Observations)

Facilities for sporting and extra curricula activities is grossly inadequate.

No adequate office accomodation for staff members. "Staff members are either three or four in an office meant for one or have cubicles as offices.

Facilities for dining are virtually non existent in the school.

The agricultural mechanisation department is housed in ramshackled structures which do not offer a conducive atmosphere for teaching/learning process.

The library can not accomodate more then 50 students reading conviniently in a school of over 900 students.

There is no accomodation capable of holding a large number of students together under one roof for public lectures, seminars, symposia, film shows and other communal activities.

Facilities in the new student's hostels are grossly inadequate.

COLLEGE OF AGRICULTURE
(13)

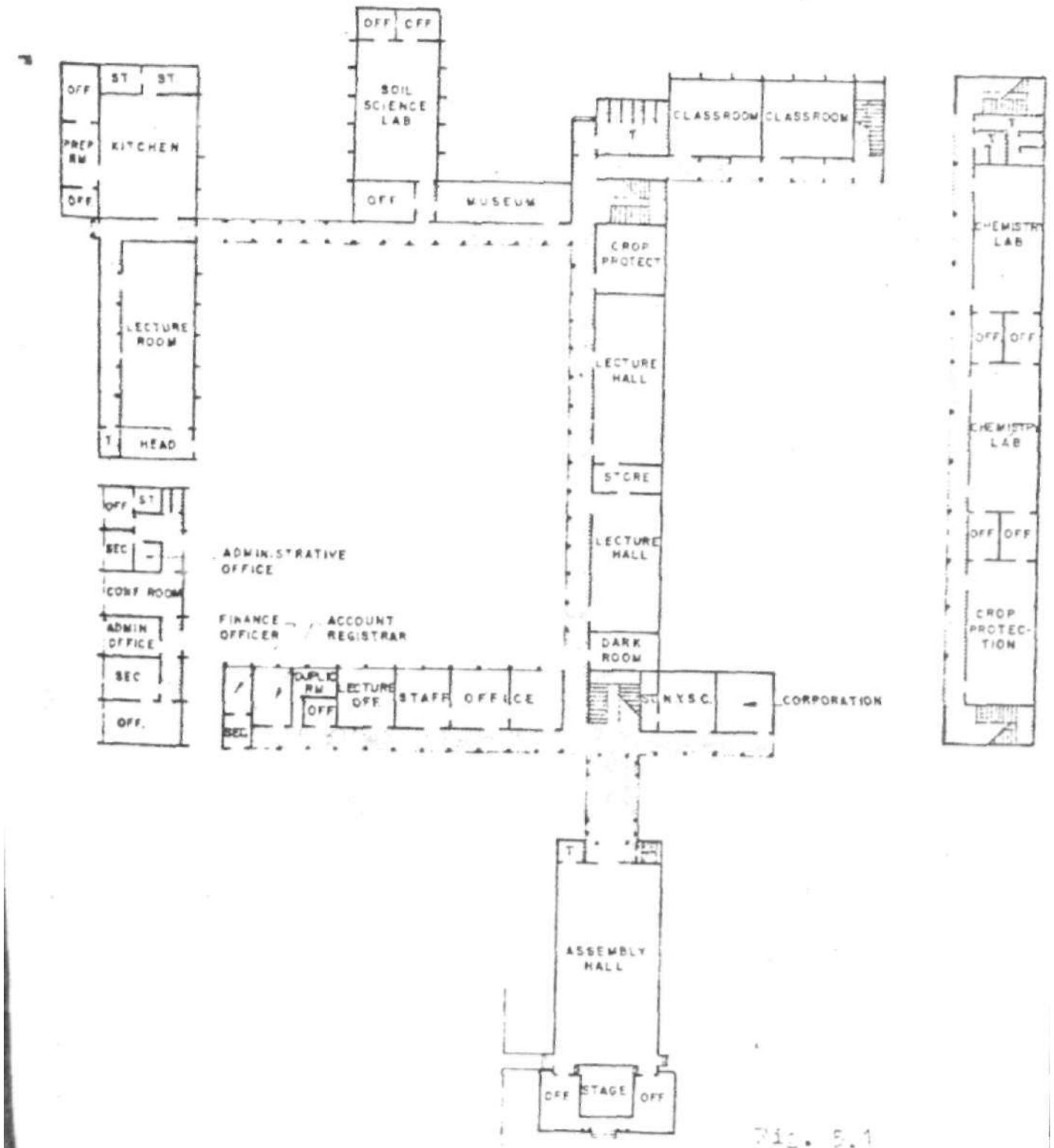


Fig. 5.1

GROUND FLOOR PLAN

COLLEGE OF AGRICULTURE
(13)

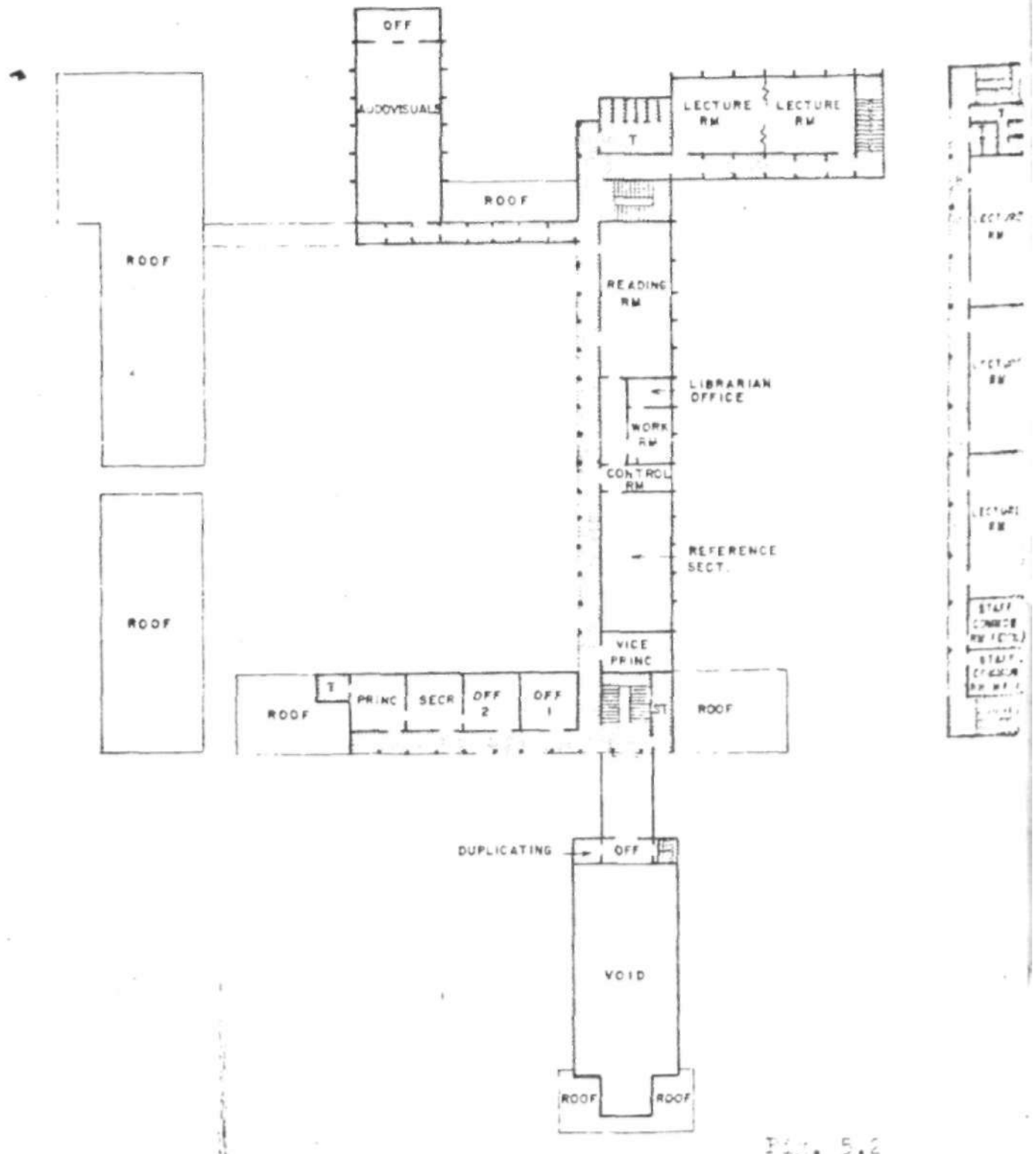


FIG. 5.2

FIRST FLOOR PLAN

4.5 West Essex College of Further Education in Harlow

Location.

The site is at the south-West of the Civic square which has to a large extent influenced the planning of the facilities, as they serve both the students and the community.

Lay Out

The main entrance is from a small public square of which the college buildings form two sides, the others being formed by the civic theatre and a church.

There are three main teaching blocks linked together by single storey buildings containing the Communal and administrative rooms. The workshop block and the 3-storey laboratory block and part of the administration block shields a courtyard to be used for an outdoor workshop. The laboratory block flanks the West side of the square.

The dinning room, the student's common rooms and the gymnasium are placed in a block extending to the south.

Phasing.

The original intension was to build the college in two instalments. Later it was decided to proceed in three instalments, the third being the completion of the workshops and the gymnasium .

At the end of the second instalment, the hall will temporarilly be equiped for gymnastics.

Structures.

The construction was carried out by means of concrete frame structure. The loads are transferred from the floor slabs to the beams which in turn transfers it to the columns which are regularly spaced within the various units. This system allows flexibility in arrangement of interior partitions.

Most of the buildings have flat roofs except the administration block which is covered by folded plates.

The workshop block, one storey in height, has roof lightings to give adequate and even illumination to the interior.

The assembly hall has traditional pitched roof construction. See figures 4.9, 4.10, and 4.11 2/

Observations

Students are made to pass through the administration area, before getting to the dinning hall, games area, laboratory blocks and the workshops . This might cause a lot of inconviniences to the administrative staff.

The orientation of the dinning hall, building workshop and laboratory block exposes them to blazing sunshine from east and west.

The landscaping is scanty. The large paved areas will cause glare.

The 7-storey general purpose block might be economical given the small site of 5½ acres. Most of the rooms are adequately lit and ventilated.

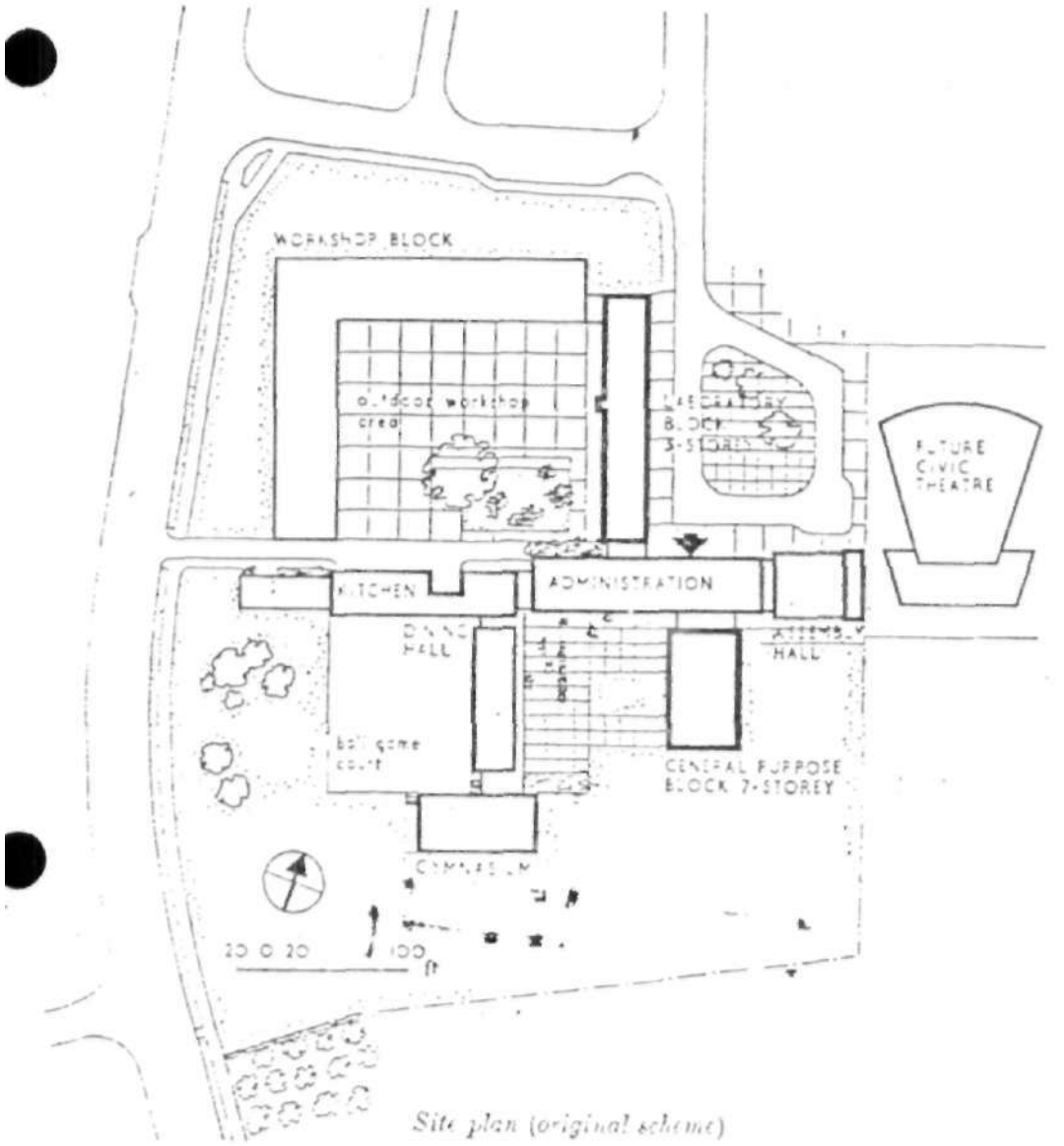
The planning of the school allows for ready future expansion.

FOOT NOTES

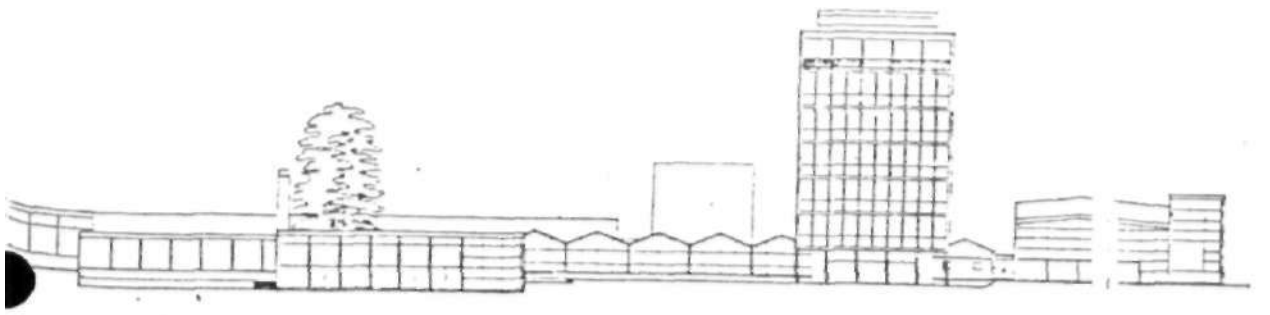
1. Architects' Journal
   Volume 162, No. 42
   October 1975, p.791 - 802.

2. Barbara Price, 'Technical Colleges and Colleges of further Education', B.T. Batsford Ltd.,
   London, 1959, p. 136 - 137.

HARLOW



Site plan (original scheme)

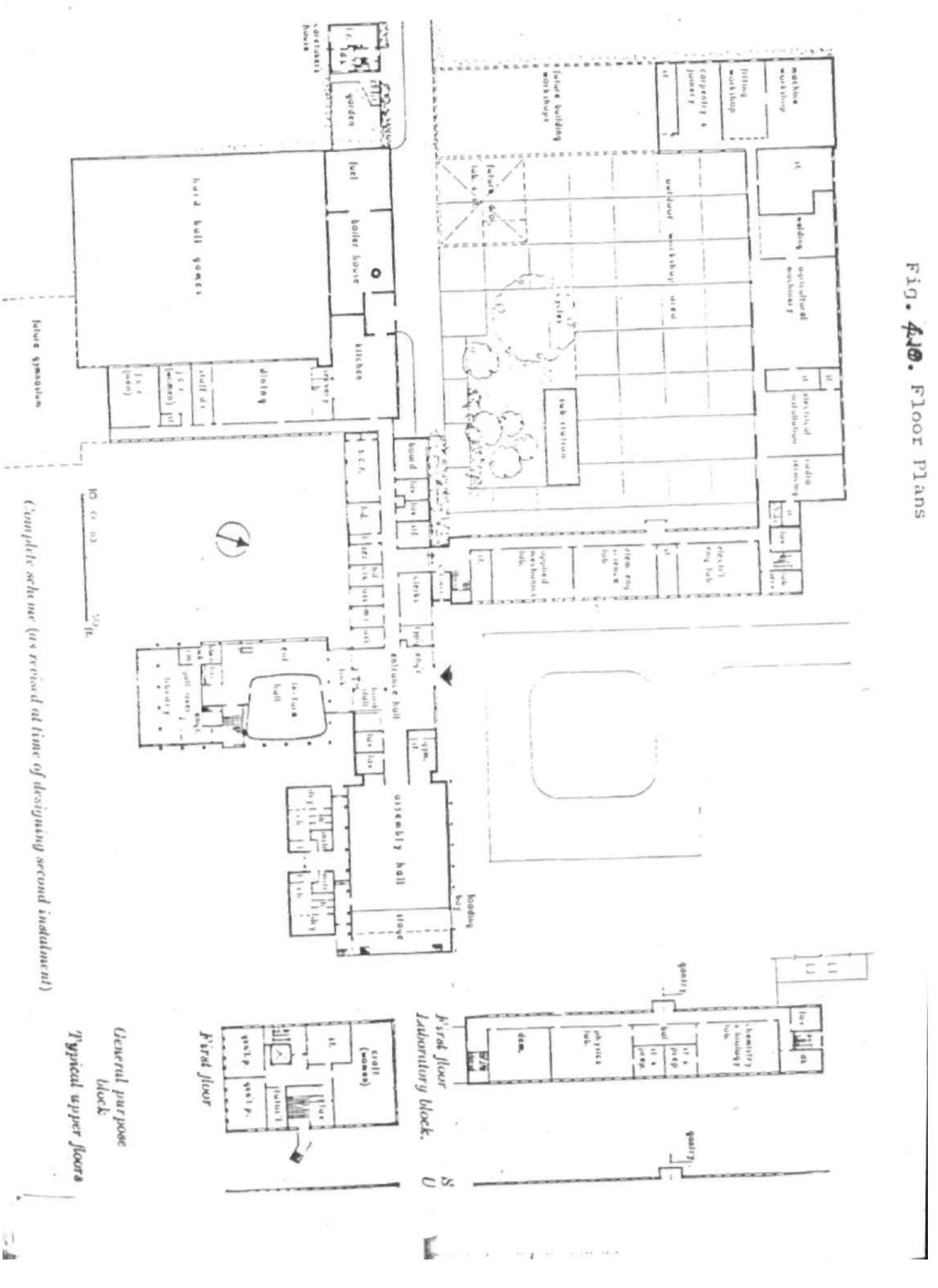


South elevation (original scheme)

fig 45. *Harlow: West Essex College of Further Education*

Fig. 5.7. Floor Plans

Fig. 4.10. Floor Plans



CHAPTER FIVE

L O C A T I O N

5.1 Regional Considerations

Sokoto state of Nigeria measures square kilometres which is of Nigeria size of 927,339.4 square kilometres. It is located in the North-Western end of the country. It is surrounded in the north by the Niger Republic in the East by Kaduna State, in the South by Niger state and in the West by the Republic of Benin.

It has a population of about which is of Nigeria estimated population of 100m.

Physical Feature

The Sokoto and its tributaries constitutes the major physical feature of Sokoto State, but in an almost semi-arid area, the Sokoto System is more than a feature of landscape. As the main source of water for man, beast and plant, the Sokoto and its effluents are an important factor in the location of economic activity as well as in the distribution of population and settlements.

Geology and Physical Landscape of Sokoto State

Sokoto state as a whole is roughly divided into three geologically. The Eastern part of the state which forms the biggest portion of the three is made up of pre-cambrian basement complex rocks. These basement complex rocks include the oldest known rocks in Nigeria and principally composed of Igneous and metamorphic rocks such as granite, gneissues, migmalties and extensive areas of schists, quartizite and metamorphosed derivatives of ancient sediments.

Diagonally from the North-Eastern part of the state to the South-West of the state is the cretaceous sediments. The third portion, which is the North-Western part of the state is made up of tertiary sediments.

Bakura and Lake Natu stands strategically in the middle of the precambrian ancient basement complex rocks. See figure .

Economic Activities

Agriculture is the main stay of the economy of the state. Fishing and some other small scale Industries are also part of economic activities of the state. Argungu and Bakolori are well known for their fishing activities.

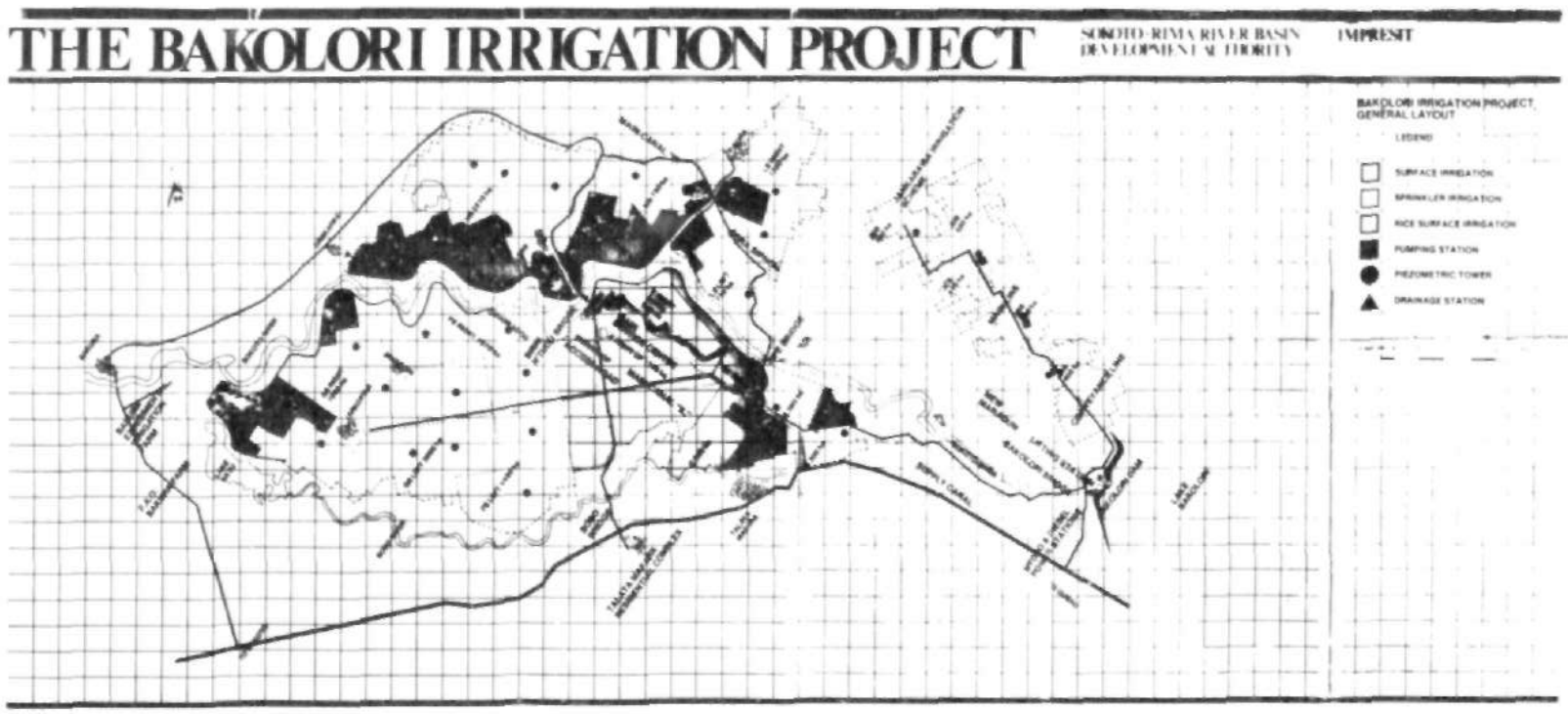

THE BAKOLORI IRRIGATION PROJECT
SOKOTO-RIMA RIVER BASIN DEVELOPMENT AUTHORITY
IMPRESIT
BAKOLORI IRRIGATION PROJECT, GENERAL LAYOUT
LEGEND
SURFACE IRRIGATION
SPRINKLER IRRIGATION
RICE SURFACE IRRIGATION
PUMPING STATION
PIEZOMETRIC TOWER
DRAINAGE STATION

FIG. 5.1

The soils which occur along the extensive fadamas or seasonally flooded river valleys differ from the general description of Sokoto state soil. In the first place, they provide more fertile farmlands except where the drainage is very poor, in which case only swamp rice can be cultivated. Secondly, the fadamas are very close to sources of water for dry-season irrigation. Irrigation and drainage schemes in the Rima basin include the 4,500 acre Wurno scheme, the 1,950 acre Kwarre scheme and the 7,000 acre Sunni fadama scheme. All of which are designed to control soil water in order to facilitate maximum exploitation of the Fadama soils.

Farming in the Rima basin is dominated by a grain economy based on the cultivation of millets, guinea corn, upland rice and maize for food as well as money crops like cotton, groundnuts and tobacco.

Bakura.

Bakura extends from latitude 13N and longitude 6°E, standing on approximately 305m above sea level. It is found in Sokoto state, 90km south from Sokoto and 296km north from Zaria. Lake Natu which is found in Bakura area, can be located on the same latitude and longitude. The lake is bounded to the North-West by the Bakura experimental irrigation farm, to the

South is Lambe, to the South-East is the Gwinji village, to the East is Yarkofoji village and to the North are the old and New Bakura villages.

The Bakura project is located on the Southern Shores of Lake Matu and is lying near Sokoto Rima Valley, a catchment area of 6.405 km^2. Lake Matu can be reached from Zuria at kilometre 296, and from Sokoto at 92 km. At these two points is a junction which leads 4.8 km land inward to the project, then another 2.0 km off the tarred road to the Lake.

Lake Matu covers an area of about 500 acres on its minimum level and at the end of the rainy season, it has a surface of 600 acres.

Population

The population of Bakura and the surrounding villages have been given as listed below:-

Bakura - 19,750 people as of 1982 records
Yarkofoji- 8,250 people (1982 records)
Gaunji - 11,090 people (1982 records)

Source (Various district heads of the villages).

Socio-Economic activities

Majority of the adult in the villages engage themselves in dry and wet season farming, while some are full time fishermen. However, because of the crude implements used, the yields both on the farmlands

and water are submaximum. This situation is very crucial in their lives, since their demands will definitely exceed their supply. The consequence of poor dieting especially with the type of food they eat which no doubt lacks some nutrients like protein necessary for the body building are most serious amongst the children. Almost all the fish caught is sold out by most of these people, to meet their economic demand.

Observations of the peer groups in the villages and answers to some oral questions show that newly weaned babies are left to receive only starchy food that may be rich in calories but poor in protein.

Royce, in (1972) made a general statement that cases of malnutrition is widespread among children in Asia, Latin America and Africa.

Socio-Cultural Data

The Bakuru people and those around them in the neighbouring villages have a culture of not welcoming any unknown visitor. Infact a visitor is not allowed to sit under any tree or stay around their villages without the knowledge of the village head, who later introduces him to the villagers. They can show much hospitality when they get to know the visitor very well.

So any visitor around is expected to go and introduce himself to the village head before moving about in the village for anything.

Their compounds are built round in most cases with mud wall. The buildings are mostly rectangular, though some few circular buildings could also be seen around.

Religion.

Religiously speaking, all the fishermen on Lake Natu are muslims. This is a true picture of the Major population of the village Bakura, where at least 80% of them are muslims.

Family Structure and Life Style

The fact that the majority of the people in Bakura are muslims can be seen in the family structure, where a man has more than one wife and many children. This however, can be said to have affected their living standard, since as most cases it is the man alone that provides for the needs of the whole family.

Macro Locational Factors.

Many towns and places were considered for the possible location of the school, and Bakura was finally selected because the reasons discussed below.

There was a negotiation between the Federal Ministry of Agriculture in 1982 with the FAO/World Bank for the financing of fisheries education and projects, which is to be handled by a University. ABU being in the forefront of all the Nigerian Universities, could therefore, be given the responsibility for the establishment of the school of fisheries since she has many colleges of Agriculture, to which the school of fisheries could be attached. Presently, ABU has colleges of Agriculture in four different places namely, Bakura, Kabba, Kaduna and Zaria. The school is to be attached to one of these existing colleges of Agriculture.

The college of Agriculture in Kabba deals mainly with general Agriculture, Kaduna deals with livestock Agriculture, Zaria deals with Mechanized Agriculture, while Bakura deals with anything irrigation.

Considering the favourable minimum temperature of 18^{0}C for fish culturing, Zaria Kaduna and Bakura could be taken as possible places for the location of the school. However, a school of fisheries has to be located by a body of water for practical purposes. The only source of water in Zaria is the Zaria dam which is not even enough for local consumption in the dry season because of the fall in the water level, not to talk of using it for irrigation purpose.

Moreover, ABU hasn't got a land by the dam, the school can, therefore, not be located in Zaria. Kaduna has the same problem as that of Zaria, so the school can not be best located there.

Bakura on the other hand has all the facilities needed for the location of a school of fisheries. The temperature is alright for fish culturing. There is an existing irrigation system in Bakura, and also a College of Agriculture. Facilities and staff of both institutions can be shared since the institutions are closely related. Hence an economic and functional approach to site selection.

Again, since ABU and World Bank forms the committee of the school establishment, Bakura stands the best and justified of all the available locations, because ABU has a college of Agriculture there and the FAO/ World Bank too has an irrigation farm there. The activities of the school can, therefore, be closely and effectively monitored by the Committee.

The many lakes around the place, and especially the big Bakolori dam which is mainly for irrigation purpose guarantees the present or availability of water all year round.

Furthermore, the creation of the school in a rural place which has got all the necessary supporting facilities will bring about rural development and a reduction in rural Urban drift. See figure 5.1.

Micro-Location Factors.

Around the Bakolori irrigation project area, three sites were analysed at various points within the area, and Lake Natu site was finally selected because of its proximity to the following:-

1. ABU College of Agriculture Bakura.
2. The major road leading to Sokoto.
3. Availability of service to the site.
4. The FAO/World Bank Kakura farm.
5. The Bakura experimental irrigation farm.
6. Fishing villages surrounding the site.
7. Talata Mafara Residential Complex and development area.

See Bakolori Irrigation project map on Figure 5.2.

FOOT NOTE

Geographical Regions of Nigeria. Reuben K. Udo.

Bakolori Irrigation Project file.

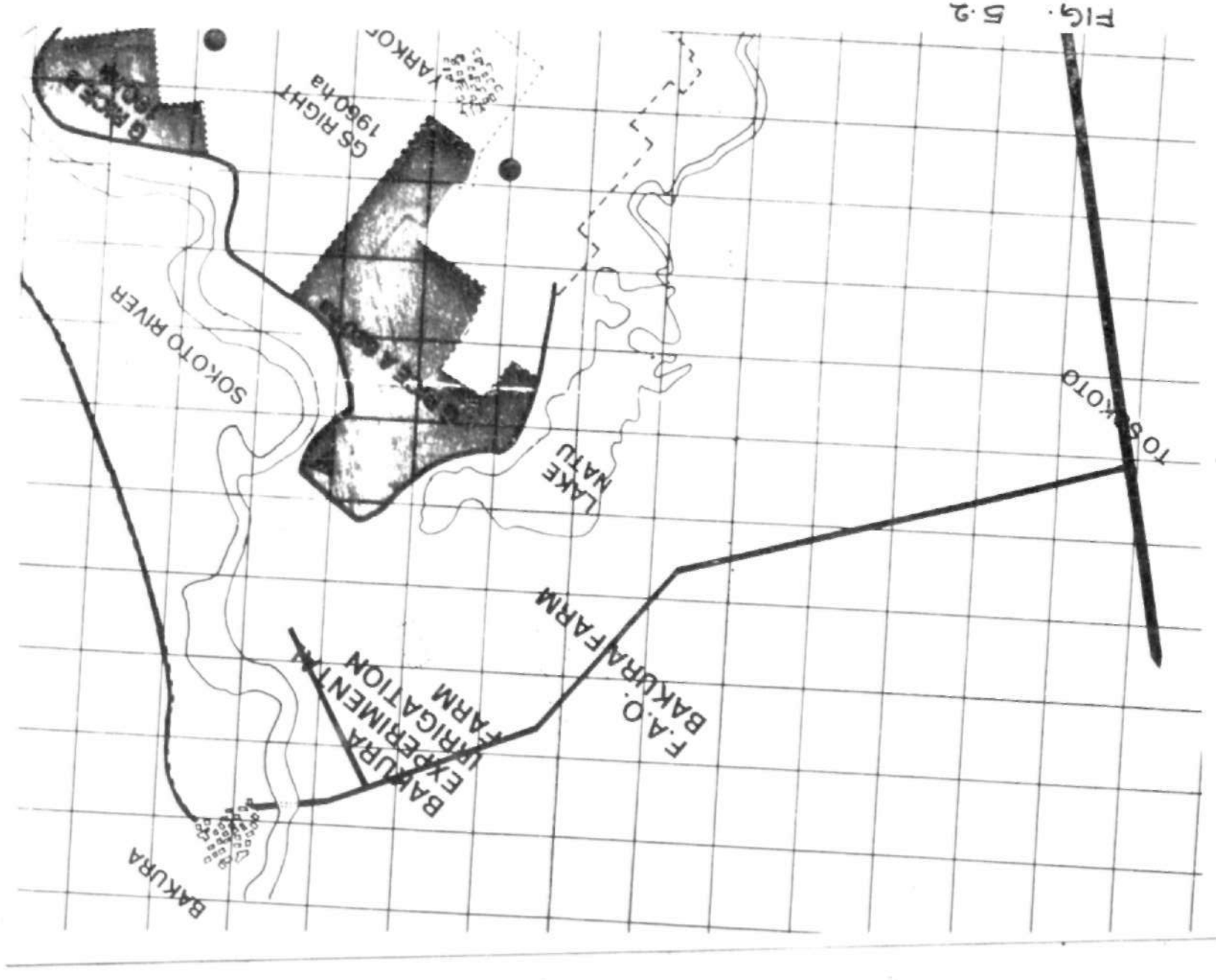

GS RIGHT
1960 ha
YARKOR
SOKOTO RIVER
LAKE
NATU
TO SOKOTO
F.A.O.
BAKURA FARM
BAKURA
EXPERIMENTAL
IRRIGATION
FARM
BAKURA

FIG. 5.2

CHAPTER SIX

SITE ANALYSIS

The project site is on the same Latitude 13°N and Longitude 6°E as Bakur Village. It is located at about 5km South of Bakura. The site is bounded on the North-West by the experimental irrigation farm, to the South is Lamba Village and the main road leading to Sokoto, to the South-East is Kinji Village, to the East is Yarkofoji village and to the North are the old and New Bakura. Very close to the site is Lake Natu which forms the boundary of the site in the North and North-East side. The site is also bounded in the West by the minor road leading to Bakura.

Natural Features

The site is largely covered with grasses which is characteristic of savannah region. The site slopes gently towards the lake Natu and Kobo river. The slope however, is about 2% which is very negligible. The present land use pattern of the site is that of scattered small farms all over.

Utilities

The site has direct and efficient link to the minor road leading to Bakura village. It also has a link to the main road leading to Sokoto.

Irrigation system, Electricity and water can easilly be obtained on the site, because of the existence of Bakura College of Agriculture, irrigation farm project and the FAO farm which are already in existence very close to the site.

Environmental Conditions

By its location, the site has no noise interference except for the traffic noise on the minor road leading to Bakura. The effect of this however is minima, because there are trees along the road which will serve as noise brokers. Adequate set back of buildings and dense plantings will also serve to control the noise from the road.

Vegetation

The Bakura Irrigation Scheme and Lake Natu are all located in the Sudan zone where Combretum spp, Acacia spp, and Commiphora spp are the most common trees and Andropogon gayanus is the main grass type of the area. During the last rainy season, many nomads fulani were observed in this area because it is one of the favourable areas in the state for livestock See figure

Soils.

The soils of Bakura and Lake Natu consist of (Wind blown) sandy materials over heavier sub-soils. The depth at which the heavier soil horizons start,

varies with the soil unit. The sand fraction, also in the heavier sub-soil is characterized by large percentage of silt and coarse sand are relatively small. The humus contents are very low (except on the lowest places in the south-west corner). This resulted in sandy surface soils with high infiltration rates, low water holding capacities and weakly developed structures that are very unstable especially when wet.

Sokoto state generally is divided into two zones in reference to soils. The lower half of the state is made up of red laterites while the upper half is made up of red-brown soils of dry tropical zones. The former tropical soils are described in terms of D'Moores, legend to the soil map of Africa and appears to form the normal products of soil formation in most of Northern Nigeria (tropical climate with a well separated dry season in winter and a wet season with appreciable amount of water in the summer). See figure

Climate

Like most part of the state and the country as a whole, Sokoto has two main seasons, the wet season from April/May to October, and the dry season stretches from November to April.

The dry season is related to the presence of masses of hot and dry air coming from the North-east, whereas the wet (rainy) season is caused by the deep equitorial air blowing in from South-West namely from the Gulf of Guinea. See Table 6.1 and figure 6.1.

The minimum temperature occurs in December and January with values of about 15°C during harmattan. The temperature rise in January and reaches its highest value of about 38°C and 40°C in April. See Figure 6.2 and table 6.1.

The average relative humility rises to the maximum of about 90% in August and drops to less than 1.2% in the last days of February to the first few days of March. See Figure 6.3 and table 6.1.

The highest rainfall is observed in the month of August, total amount of rainfall is 780mm. The total evaporation is about 1671mm with the peak in the month of April and May. See table 6.1.

Meteorological Data

The Meteorological data of Bakura started as far back as 1952, but a comprehensive records keeping started around 1973 after the feasibility study of the area had been carried out. As at now, adequate records are being kept by the College of Agriculture, One of the early meteorological data used to calculate the evapotranspiration rate of the area include.

TABLE 6.1

METEOROLOGICAL DATA , MONTHLY MEANS

MONTH	t	h	n/N	R_A	v
Jan.	23.9	23	80	726	2.28
Feb.	27.2	21	82	796	2.71
March	30.0	22	75	894	2.10
April	32.2	32	68	897	2.44
May	32.2	47	71	894	2.62
June	29.4	59	73	888	2.89
July	27.2	72	58	838	2.00
August	26.1	80	51	891	1.90
Sept.	26.6	77	56	873	1.51
Oct.	25.4	81	84	808	1.48
Nov.	26.1	37	87	743	1.96
Dec.	24.4	28	84	702	2.02

Source: Meteorological Research Centre (I.A.R).

KEY

t = temperature (^{o}C)

h = Relative humidity (%)

n/N = Ratio between sunshine hours and total hour of possible sunshine %

R_a = Total short wave radiation, at the top of the atmosphere at 12^{o} 30' (cal. cm^{-2} day^{-1}).

v = Wind speed at a height of 2 metres (m sec^{-1}).

Rainfall

Rainfall decreases from the south to the North. The rain starts around April/May in the extreme south and North respectively. The rains come to an end around early October. See table 6.1.

The main characteristics of rainfall in Sokoto like any other place in the state are its variability from year to year and the variation in amount and the irregularity in frequency especially in the beginning of the rainy season. Usually before April/May, and after October end, traces of rainfall may occur. The extent to which rainfall in this area can be regarded as a reliable contribution to the water supply to raise the water level is called effective precipitation. To derive effective precipitation from the mean rainfall, a multiplication factor of 0.3 has been assumed for those periods with a standard deviation higher than the mean, and a factor of 0.7 in the periods with a standard deviation smaller than the mean rainfall. See Fig. 6.1

Temperature

The mean monthly minimum and maximum temperatures for 1982, 1983 and 1984 were used, out of which the mean were calculated. The minimum temperature occurs during the month of December because of the harmattan, and the maximum temperature occurs during the month of April.

Relative Humidity

Generally, the climate of sokoto state and Bakura in particular reveals an interesting picture of varied circumstances.

The highest relative humidity of about 90% occurs in August which is the wettest month, and falls as low as 21 in the month of February.

Geology

Bakura stands strategically in the middle of the pre-cambrian ancient basement complex rocks, comprising both igneous and metamorphic rocks. The igneous rocks are mainly intrusive cropping in the stream valleys. They are composed mainly of Quartz, Oligoclase and biotite of medium to coarsed grain mainly foliate rocks. The older granite are seen on the surface in the form of inselbergs.

. Superficial deposits include older and younger laterite and alluvium. The laterites are distinguished by a num variables. While the older ones are red-brown in colour, cellular, relatively free from impurities and up to 20ft thick, the younger ones are dark-brown, less free of impurities and rarely more than 6ft in thickness. 1/

Sunshine

The variation of sunshine hours throughtout the year is fairly even, and reasonably high. This implies that day lighting is possible all year round. See figure 6.4 and table 6.1.

Wind Speed

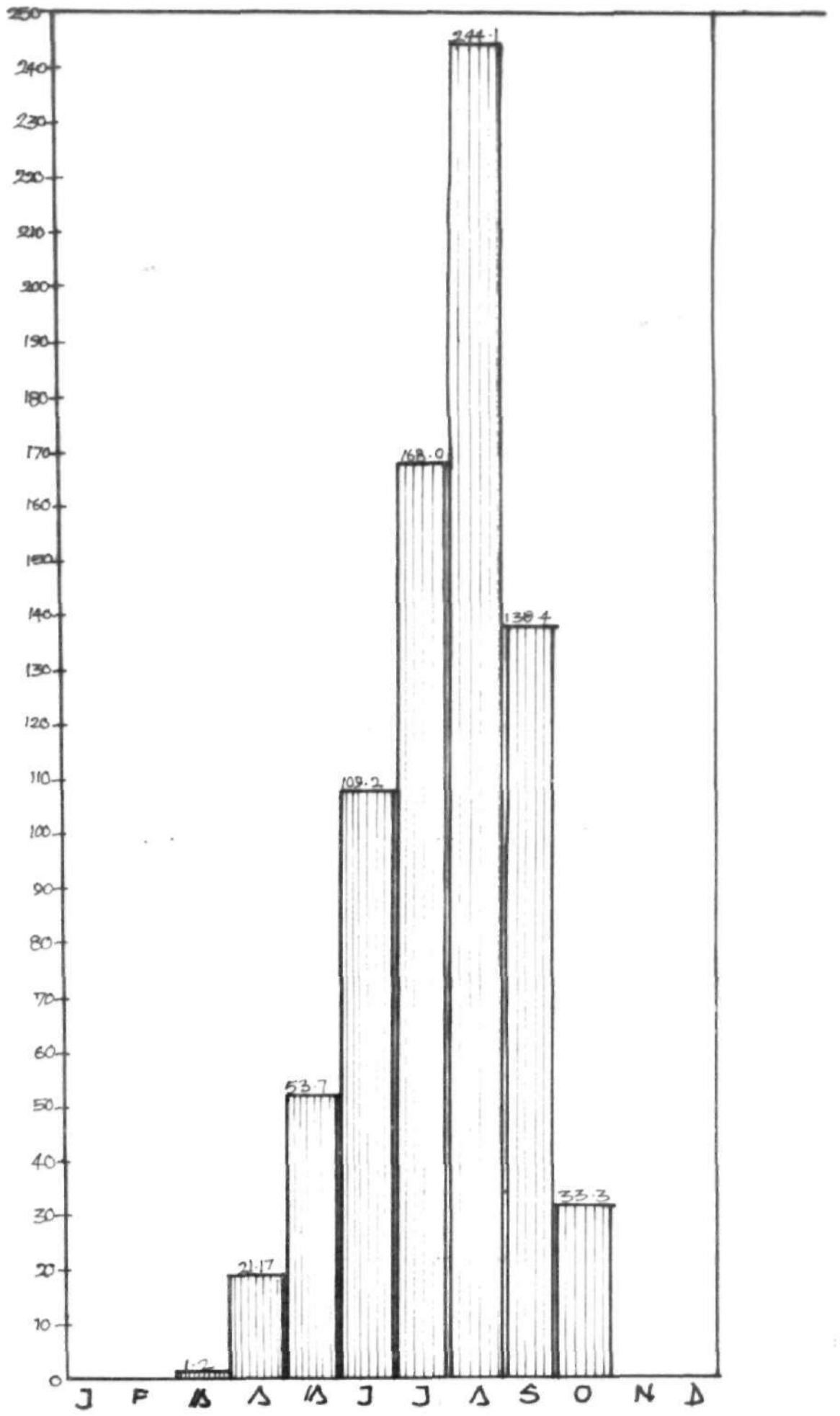
The variation in wind speed throughout the year is not much. October has the lowest wind speed, while in the months of May and June the highest speed of wind are recorded. May and June happens to be rainy months, planning of the site and design should see to this. See figure 6.5 and Table 6.1.

Evaporation

The lowest evaporation is recorded in the month of August, while April has the highest. The provision of pools and plants to create a micro climate will help in solving the problem of high evaporation rate. See figure 6.6 and table 6.1

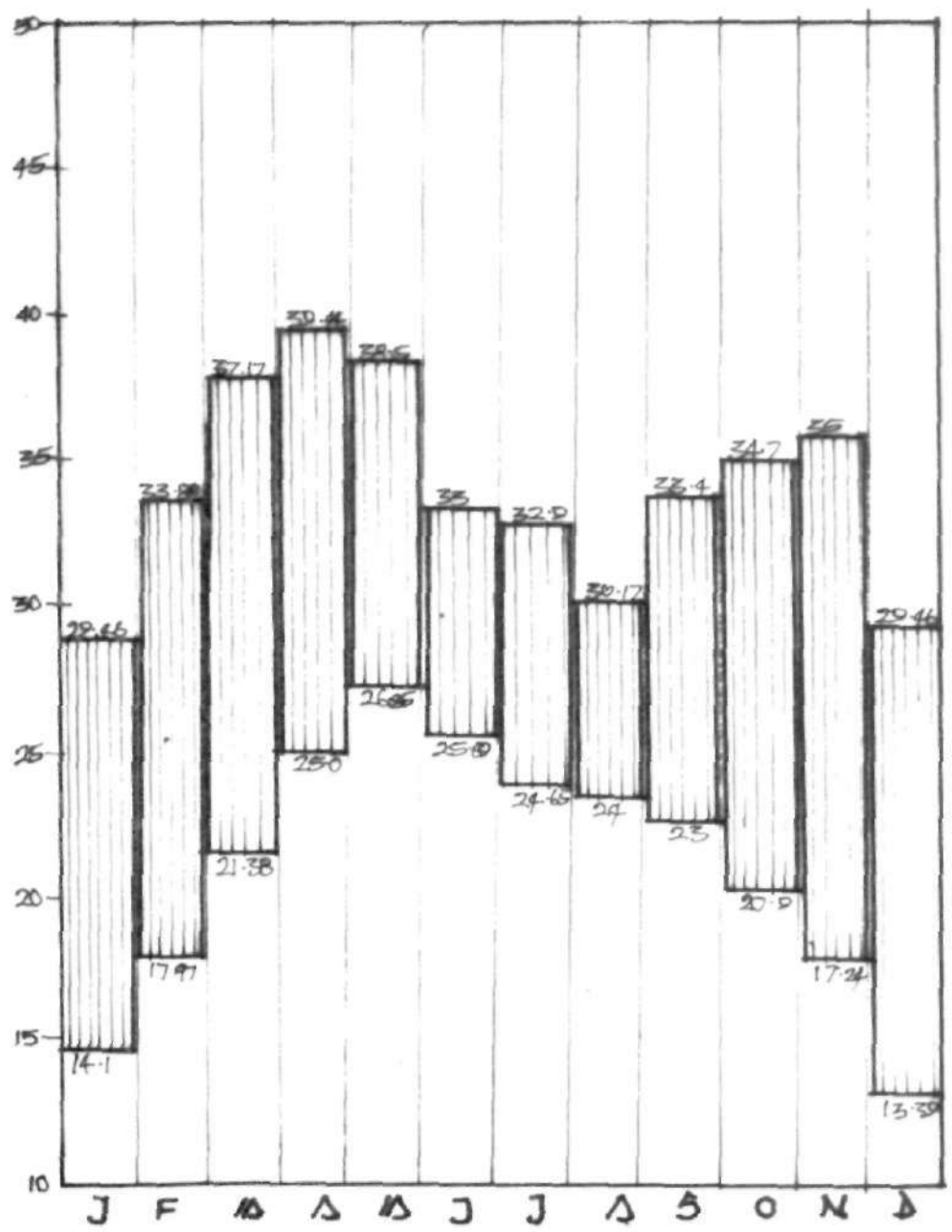
Radiation

The month of December has the lowest record of radiation, this could be attributed to the harmattan effect. The months of March to September has fairly even rate of radiation. See Figure 6.7 and table 6.1. 2/.



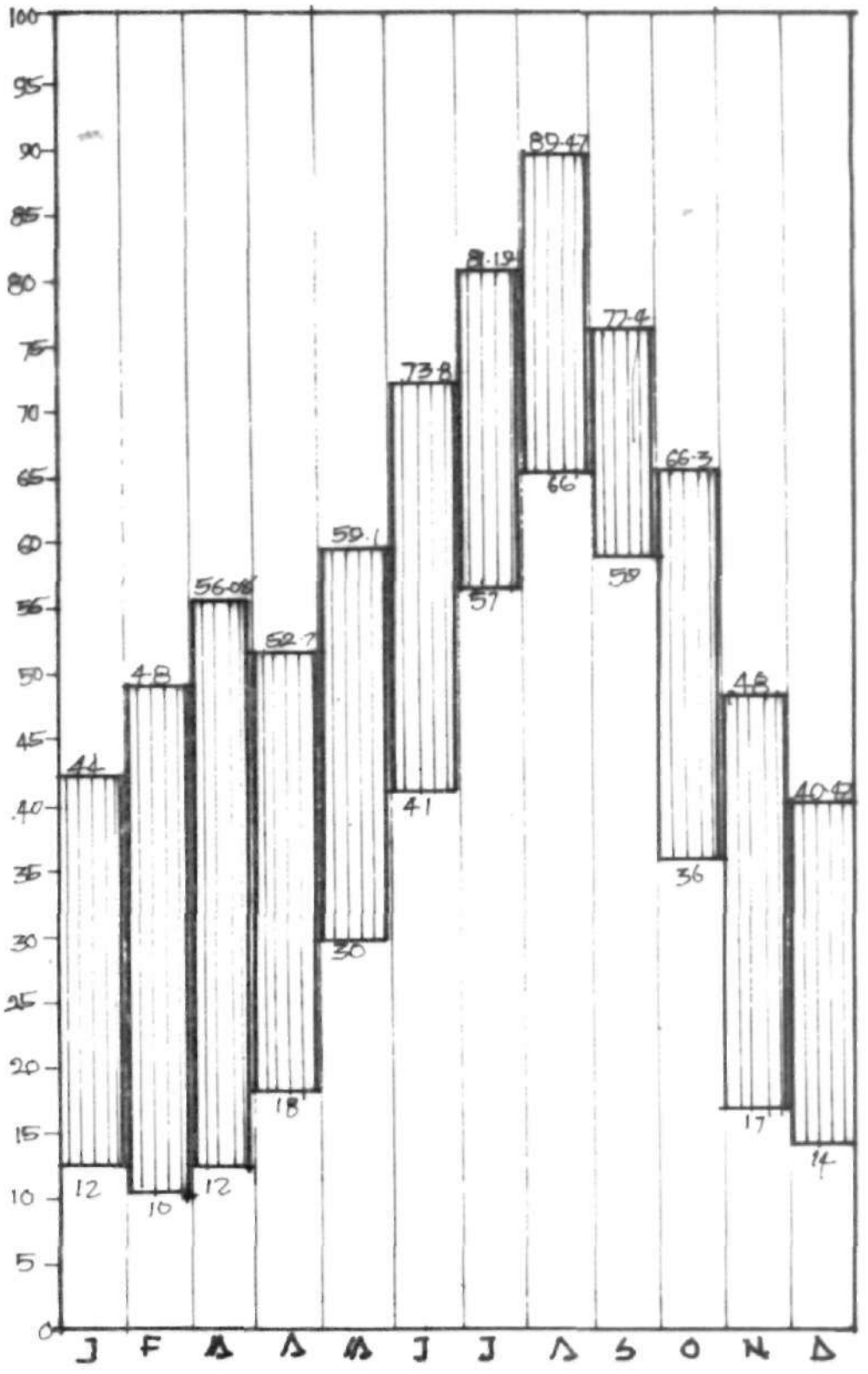
AVERAGE MONTHLY RAINFALL

FIG. 6.1



AVERAGE MONTHLY AIR TEMPERATURE

FIG. 6.2



AVERAGE MONTHLY RELATIVE HUMIDITY

FIG. 6.3

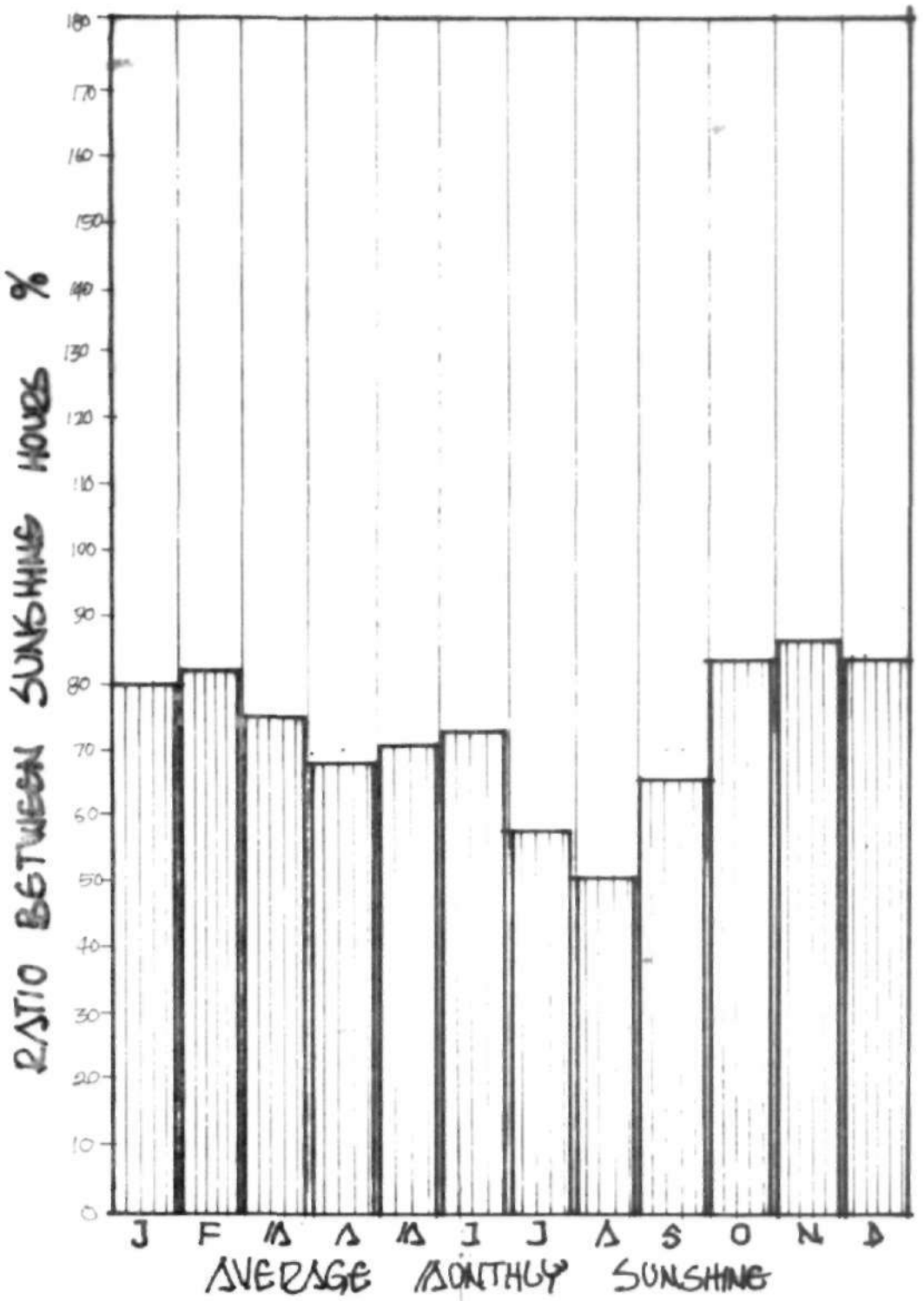

RATIO BETWEEN SUNSHINE HOURS %
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
J F M A M J J A S O N D
AVERAGE MONTHLY SUNSHINE

FIG. 6.4

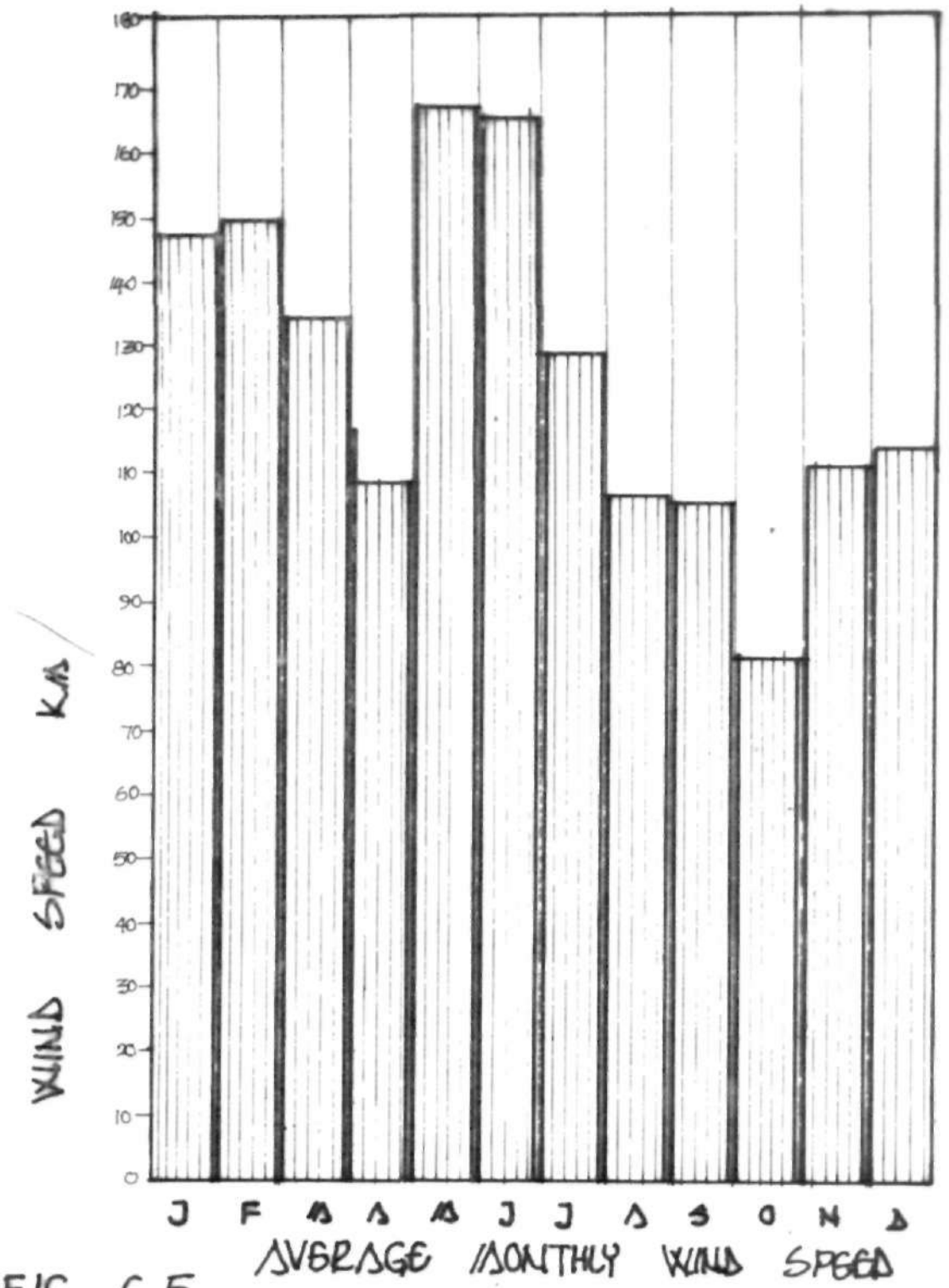

180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
WIND SPEED KMS
J F M A M J J A S O N D
AVERAGE MONTHLY WIND SPEED

FIG. 6.5

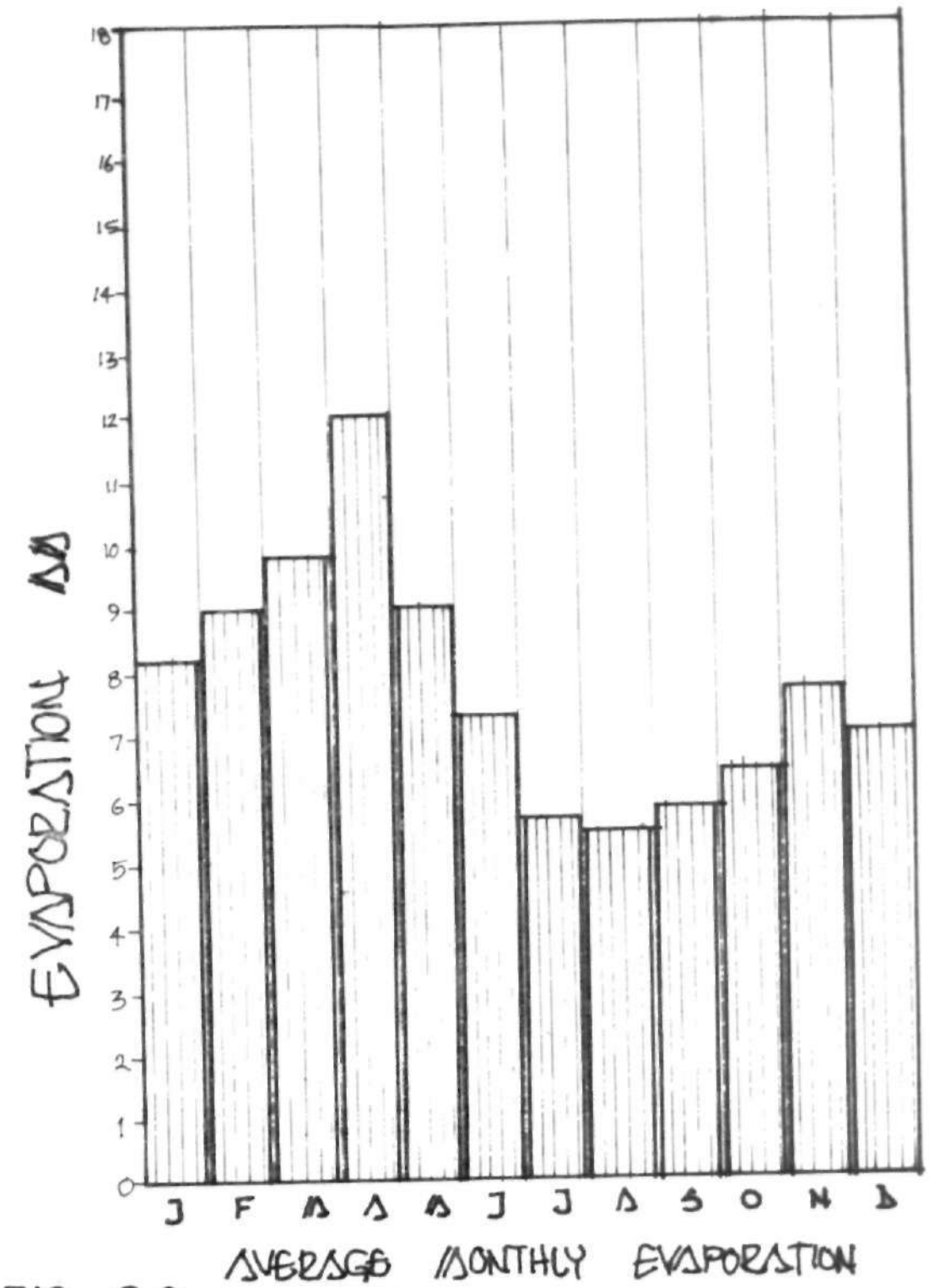

EVAPORATION MM
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
J F M A M J J A S O N D
AVERAGE MONTHLY EVAPORATION

FIG. 6.6

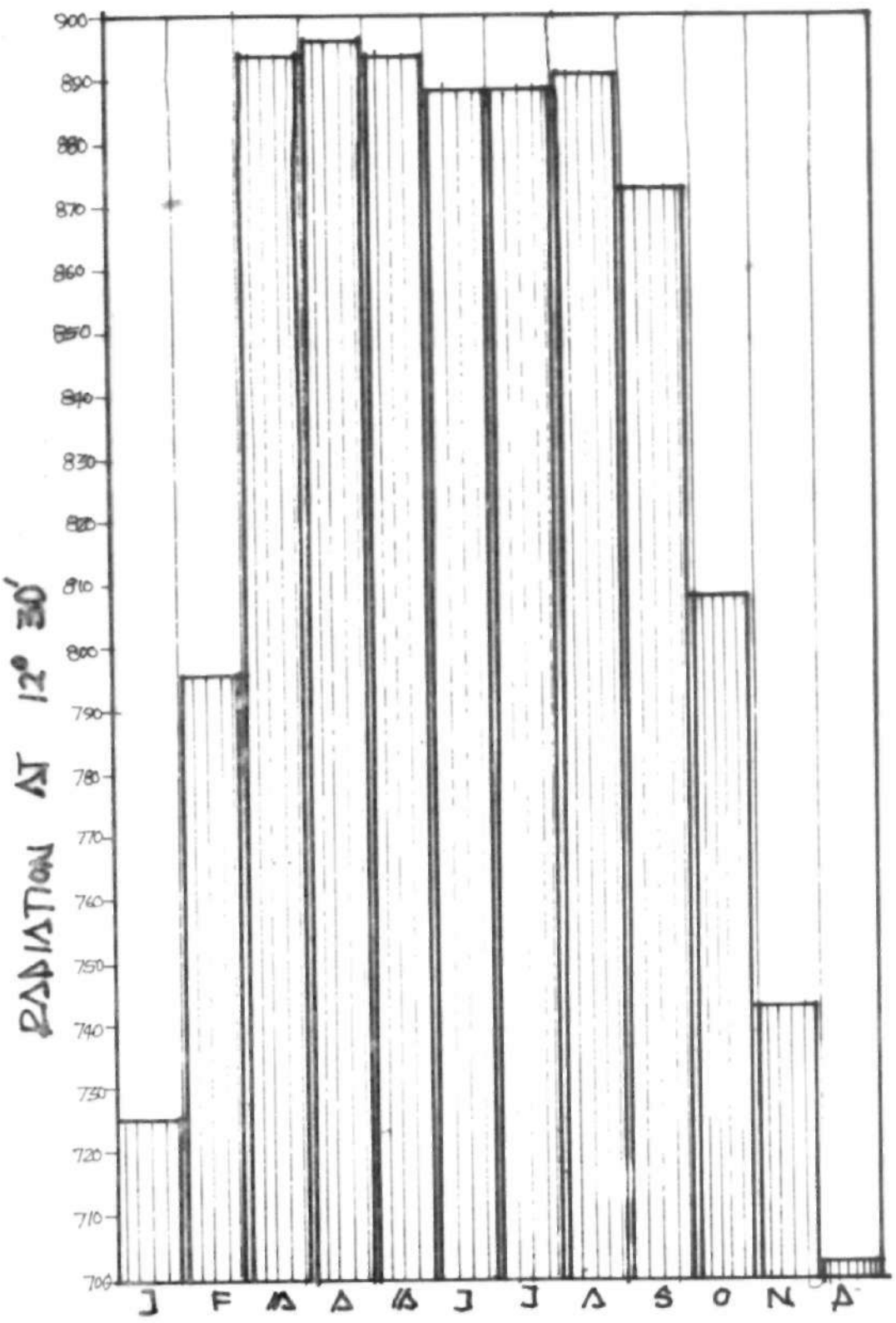


FIG. 6.7 AVERAGE MONTHLY RADIATION

Conclusions From Climatic Data.

During the months of November to April, the temperature ranges are lowest and highest, the global radiation are lowest and highest, the North-East wind which is dust-laden, cold and dry is predominant, the lowest relative humidity also occurs. The Combined effect of all these factors is of great significance for the design of a comfortable human environment.

Solutions.

To achieve the needed climatic comfort, buildings could be grouped around courtyards for effective cross ventilation.

Trees could also be planted to serve as wind brakers against the dry and dust-laden North-East wind.

The orientation of buildings in the North and South direction will also help in improving the climatic condition.

Of major importance lag in in the choice of building materials. The following have been recommended for Bokura:- 3/

Walls and Floors: Heavy, over 16 hours time lag.

Roofs: Heavy, over 8 hours time lag.

Size of Openings:- 20 - 35%.

The following are Satisfactory Examples of Heavy Walls.

1. A composite wall comprising of the following layers.
   - A hollow block cavity 25mm thick.
   - Solid concrete block 100mm thick (min).
   - An outside surface painted white, cream, yellow or light red.

2. A composite wall comprising of the following:
   - Compacted earth or earth cement block 300 mm thick.
   - An outside surface painted white, cream, yellow or light red or light rendering.

3. A composite wall comprising of the following.
   - Any sheet material.
   - A cavity 25 mm wide.
   - Solid concrete block 200mm thick.
   - An outside surface painted white, yellow, light or bright red or any pastel shade.

4. A composite wall comprising of the following:
   - Any sheet material
   - Expanded polystyrene 25mm thick.
   - Solid concrete block 100mm thick.
   - An outside surface painted white, yellow, light or bright red or any pastel shade.

The following are Satisfactory Examples of Heavy Roofs.

1. A roof made up of the following layers
   - a thick layer of white chippings.
   - felt or other water proof membrane.
   - 30mm expanded polystyrene.
   - 100mm minimum concrete slab.

2. A roof made up of the following layers
   - 30mm shading block and 30mm cavity in the form of solar slabs.
   - Asphalt or other water proof membrane.
   - 50mm Vermiculite or lightweight screed.
   - 100mm concrete slab.

3. A roof made up of the following layers:
   - Corrugated aluminium sheet.
   - Cavity.
   - 30mm expanded polystyrene.
   - 50mm precast concrete planks or concrete shell.

4. A roof made up of the following layers.
   - 70 to 100mm cement screed laid to fall.
   - 20mm expended polystyrene.
   - 1 to 3 layers of bituminous felt according to rainfall.
   - 100mm concrete slab.

5. A roof made up of 300mm compacted earth on timber planks. This traditional solution gives adequate time lag, but does not reach the same standard of insulation as the examples of composite construction given above.

FOOT NOTES

1. Reuben K. Udo. Geographical Regions of Nigeria (p.167 - 177).

2. Bakura meteorological data file

3. Prucinel Ogunsote B. and Ogunsote, O.O. 1985a Programme motels. A computerization of the Mahoney Tables for the determination of Architectural and planning design recommendations based on Climatic Data.

6.2 Site Concept

The built up area of the site is given a central location for easy access to any part of the whole site. See figure 6.2.1.

Two access roads both in the North-Western direction are the main communication routes to the site. The main road provides direct access to the academic area, student hostels, school clinic, recreational facilities and the staff quarters. The academic area forms the focal point of the main road. To emphasize this focal point, the path along the first is enclosed by planting.

About 120m to the academic area, and to the South-Eastern side of the road are the students' residences, dining hall, common rooms and recreational facilities. Directly opposite the Student hostels on the North-Eastern side of the road are the school clinic and Junior and intermediate staff quarters.

The second road which is located on the North-Eastern side of the main road provides access to the junior and intermediate staff as well as the senior staff residences. A green belt of trees are provided to reduce vehicular noise, as well as serving as wind breakers.

An important feature of the site is the existence of the NASU L.KN and irrigation canal which could be use for practical fishing, as well as for the supply of water to the ponds and hatcheries. The ponds and hatcheries are located at a close proximity to the lake.

Workshops, ponds and hatcheries are located at about 100m from the teaching core on the Northern part of it.

Elements of the Plan

Open space, Recreation and Natural Conservation

Open spaces and recreational facilities are important aspects of siteplanning, as they help to define specific aspects of the school structure. They perform recreational and leisure functions, satisfying physical and psychological needs and in that capacity, they contribute to the well-being of the school community.

Open spaces can also be used for the conservation of land and for reserving land designated for future expansion. Open spaces are created around the staff Quarters for future expansion, recreation and farming. For the purpose of this planning, open spaces contained in the sitelayout can be classified under two main categories:-

Open spaces dictated by Natural features

Certain areas of the site have valuable trees and are therefore preserved. The land along the lake is also open, the ponds and hatcheries are sited here.

Open spaces created to perform Specific functions.

i. Cluster Open Space

Open spaces are created bet een the clusters of various buildings on the site. The sizes of such spaces depend on the distance apart for adequate lighting and ventilation and other functions of such spaces.

ii. Open Spaces for recreation

A large open space to the western side of the student hostels is designated for outdoor recreation which include a football field, hockey, basketball, volleyball and lawn tennis.

Open spaces exist in the academic areas which provide resting places for students bet een lectures. Such open spaces with plantings also soften the environment and modify the micro-climate of the area.

Orientation

The greatest influence on this design is orientation. Most of the buildings on the site have their long faces facing North and South directions so as to economise on the use of Sunshade devices. However, some few

buildings which are not directly North and South in orientation have plants and adequate shading devices around them.

Circulation

"Access is a prerequisite to the usefulness of any block of space. Without the ability to enter, leave and move within it, to receive and transmit information or goods, space is of no value, however vast or rich in resources. 1/

Communication routes usually serve for delivery of essential services to users. Services usually include surface drainage water borne wastes and pressure pipes supplying water. Others are electricity and telephone. The Vehicular rights of way are likely the most critical communication routes, as the other channels more or less are patterned in conformity with this dorminant system.

The roads are laid out in gridiron pattern. The grid, however, are curved in some cases to accomodate blocks of unequal spaces as in the Senior Staff quarters. Vehicular circulation are limited to the periphery of any block of land use area. In the Senior Staff Quarters, the major access road is limited to the periphery of the housing modules, while access to individual houses is provided by cul-de-sac with T-shaped dead ends.

In the academic area, movement is essentially pedestrian. However, parking facilities are provided for members of staff, students and visitors.

Future Expansion

No expansion is infinite. A 50% expansion is envisaged in the entire school open spaces are conserved and incorporated in each sector of the school to take care of this expansion. These areas are conserved under plant materials in the interium.

6.3 Sectors of the School

Academic area

This sector is the main concern of thisthesis. The first building on approach to this area is the administrative wing of the school. The museum and library are contained in this block. To the left hand side of this block are the laboratories, demonstration hatcheries and classrooms. To the right are the teaching staff offices, bookshop and theatres. Almost at the centre is the assembly hall.

Student Residences

Student hostels are conceived as clusters of rooms round closed courts. The hostels are in blocks of two and three storey heights. The common room is located centrally for easy access.

The female hostel is detatched from the male hostel, and fenced round with a pattern of room arrangements similar to that used in the male hostel. A dinning hall is provided to offer catering services to the students.

Intermediate/Junior Staff Housing

In the Intermediate staff housing, various housing modules are clustered together, each having an internal court and sharing walls with two other units. This type of development allows for social intercourse and offers an economical construction.

Senior Staff Housing

It is considered advantageous and a necessity to provide single family houses for members of senior staff. Each module has adequate spaces for gardening, playing, parking, and other outdoor uses.

About four to six units are clustered and access to them is through a cul-de-sac. Pedestrian accesses from each unit leads to a common recreation ground which has a lawn tennis court and indoor recreational facilities.

CHAPTER SEVEN

7.1 Course Contents of The College

The educational background to any project consists of the various types of course which are likely to be in demand by the local community and the nation as a whole. The task of planning a school is that of forecasting the demands for courses.

Oral interview with a fisheries consultant and some Researchers expressed the urgent need for training in the following areas of fisheries were established.

- Pre-Technical course.
- General fishery agriculture.
- Fish processing
- Aduaculture
- Gear and Craft Technology
- Ponds Management.

Pre-Technical Course

The pre-technical course is meant to raise and improve the background of candidates in basic sciences and in English preparatory to their entry into the regular diploma courses. It is a required course for ponds overseers and WASC or GCE holders who do not have the required science background, and ponds instructors who have had long and valuable experience,

but few of them had adequate educational background at the secondary level.

Processing Course

Processing course is intend to provide basic training and practical skills in construction and operation of fish processing and fish preservation equipments, e.g. fish smoking kilns. Also to determine the quality of fish and fish products, and then transfer the acquired knowledge to the users.

Aquaculture Course

The course is to equip the students with the skill in design, construction and management of fish farms, and also to extend and popularise the practice of aquaculture.

Gear and Craft Technology

This course aims at importing practical skills in the construction and operation of various types of fishing gears (nets, traps, lines etc). Also the operation and maintenance of different types of fishing crafts and engines, and to demonstrate and teach fishermen and extension agents in the use and maintenance of modern gears and crafts.

Pond Management Course

The course aims at imparting basic training in feeds production, feeding of fry, fingerlings and fish. And also the general pond management.

CURRICULUM IN FISHERY RESOURCES MANAGEMENT
ORDINARY DIPLOMA FISHERIES NEWLY
PROPOSED

TERM CODE	COURSE TITLE	DURATION HOURS L	P	TOTAL
1st	Introduction to agriculture	10	-	10
	Agronomy	20	20	40
	Chemistry	40	20	60
	Botany	20	20	40
	Zoology	30	20	50
	Mathematics	40	-	40
	Geography	20	-	20
	Sociology	30	-	30
	Livestock Husbandry	-	10	10
	Ponds Mechanics	-	10	10
Fish 101	Fisheries Management I	10	20	30
	Forestry and wild life Management I	10	20	30
		230	140	370
2nd	Agronomy	20	20	40
	Chemistry	20	10	30
	Soil Science	20	10	30
	Botany	30	20	50
	Zoology	20	20	40
	Microbiology	10	20	30
	Mathematics	20	-	20
	Geography	20	-	20
	Sociology	10	-	10
	Extension	20	-	20
	Livestock Husbandry	-	10	10
	Ponds Mechanics	-	10	10

Curriculum (Cont'd)

TERM	COURSE		DURATION HOURS		
	CODE	TITLE	L	P	TOTAL
2nd	FISH 201	Fisheries Management	10	20	30
		Forestry & Wildlife Management II	10	20	30
			210	160	370
3rd					
	FISH 311	Hydrobiology	15	30	45
	FISH 312	Fish Biology	15	30	45
	FISH 313	Fish Microbiology	15	30	45
	FISH 314	Fish Physiology	15	30	45
	FISH 315	Fish Taxonomy	15	30	45
	FISH 316	Fishing I	-	100	100
			75	250	325
4th					
	FISH 421	Gear Technology	15	30	45
	FISH 422	Fish Technology	15	30	45
	FISH 423	Fish Harvesting	15	30	45
	FISH 424	Fish Preservation	15	30	45
	FISH 425	Fish processing	15	30	45
	FISH 426	Fishing II	-	100	100
			75	250	325
5th					
	FISH 521	Aquaculture	30	60	90
	FISH 522	Fisheries Management	15	30	45
	FISH 523	Fisheries Statistics	15	30	45
	FISH 524	Fisheries Regulations	15	30	45
	FISH 525	Fish Cooperatives	15	30	45
	FISH 526	Fishing III	-	100	100
			90	280	370

Curriculum (Cont'd)

TERM	COURSE	DURATION HOURS		
CODE		L	P	TOTAL
6th				
FISH 621	Commercial Fisheries	15	30	45
FISH 622	Fish production	15	30	45
FISH 623	Pond Construction and Management	15	30	45
FISH 624	Fish Marketing and Distribution	15	30	45
FISH 625	Fish Pathology and Health	15	30	45
FISH 626	Fishing IV	-	100	100
		75	250	325

SUMMARY

TERM	COURSES	LECTURE HOURS	PRACTICAL HOURS	TOTAL
1	1	230	140	370
2	1	230	140	370
3	6	75	250	325
4	6	75	250	325
5	6	90	280	370
6	6	75	250	325
	TOTAL	775	1310	2085

TEACHING MODULES

		LECT.	PRACT.	TOTAL
Module I	General Agriculture	230	140	370
Module II	General Agriculture	210	160	370
Module III	Fish Biology	75	250	325
Module IV	Fishery Technology	75	250	325
Module V	Aquaculture	90	250	370

DESIGN BRIEF

When fully operational, the college is expected to have a student capacity of 700. Distribution of students in courses are as follows.

COURSE	OND		HND	
	I	II	I	II
Fish processing	40	40	40	40
Aquaculture	40	40	40	40
Gear and Craft Tech.	40	40	40	40
Pond Management	40	40	40	40
TOTAL	160	160	160	160

Pre-Technical course - 60 students.

That is 160 x 4 + 60 = 700 students.

The curriculum of various programmes are usually reviewed and updated to meet various requirements as time goes on. The college should be able to adapt to changes in the future if need be.

Pre-vocational training of people in fisheries will be taking place during vacations so as to help farmers and others who will be interested in fish farming.

The school isresidential in nature with catering services provided. Accomodation will be provided for the Diploma students who will be about 90% of the student population.

The school should be attractive and inviting. The experience of doing and thinking things together in the same place creates a bond between students, and stimulates a respect and affection for the school. The more inspiring the environment, the more profound and valuable is the experience and the deeper the affection.

It is also desirable that corporate life be fostered among the students, staff members and the community as a whole. The welfare of students and staff should be given priority, as this hasdirect bearing on teaching and learning processes. Ample opportunity for recreation should, therefore, be given proper considerations.

Majority of the work done in workshops and laboratories involve the handling of small or complex objects or taking accurate readings from small scales or instruments, where high values of illumination are needed.

ARCHITECT'S BRIEF

The teaching-learning process affects, and is affected by, the design of the spaces. Not only should a school actively and attractively suit the educational functions it serves, it should also constitute a very special environment for learning and teaching.

In an attempt to meet the financial limitations due to the austere period in which we are, functional and structural necessities will be given higher priority than archtectural beauty in the design. Judicious use of space, structure, materials and finishes is therefore advocated. However, economy of design is not the same as cheapness. Economy in this sense strictly eliminates all that are not very necessary in the design.

As a way of meeting the needs of the proposed school, the following will be provided:-

Teaching Accomodation

Adequate classroom which will respond to the need as well as changes in course structure is desirable. There are basically two types of teaching rooms in this school.

These are the *general teaching rooms* and the *Specialised teaching rooms*.

General teaching rooms are rooms used for instruction, which principally the giving of lectures illustrated by a form of notes on a chalkboard.

Specialised teaching rooms on the other hand include workshops, laboratories and indoor hatcheries.

Administrative Accomodation

A bulk of the administrative work is carried out in the principal's office. Other administrative staff are the Registrar, Bursar, Vice principal and the secretary to the principal. Adequate accomodation will be desirable for these staff.

A general office, store, conference room and toilet will also be desirable here.

Library

The library serves the school, and its main function is the provision of facilities for references, reading and also borrowing.

The school being a technical one will need technical periodicals for students and staff, a space for the display of this will be desirable.

KASHIM IBRAHIM LIBRARY
RECEIVED
FEB 1987
ZARIA, NIGERIA
Ahmadu Bello University

30283!

An office for the librarian and a store for reference books and other things are necessary.

The library being a reading place, should be very conducive for the reading purpose.

Multi-Purpose Hall

This hall provides a forum for interaction among students and lecturers where necessary. It is a place used for assembly, symposia, public lectures. Exhibitions, drama, film shows etc.

Students accommodation

About 90% of the students as earlier mentioned will be accomodated in the hostels. Two students are to share a room. Adequate residential facilities are to be provided.

Dining Room

The room provides space for catering to the students and provides opportunities for the interaction of students too. The hall will be built to cater for increase in population.

Common Room

The Common room is the room used for relaxation and welcoming of visitors. Student union rooms could also be provided within this unit.

Gymnasium

The gymnasium provides a place for physical exercises. In-formal games such as badminton, judo, tennis and basket ball could be played here. Sports promote good health, there should, therefore, be adequate provision for it.

Games Field

Out-door recreational facilities are desirable for sporting and leisure time activities. The facilities should include football/athletics field, hockey ball field, lawn tenice courts and others.

Bookshop

This isrequired to give students the opportunities to purchase the right types of books and to get the books easilly and convinently.

Fish Ponds

Practical training in fishing is necessary in a school of fisheries. It, therefore, becomes necessary to have ponds.

Hatcheries

Hatcheries are needed for raising of fish, since aquaculture is one of the courses to be offered in the school.

Office Accomodation

Staff office are mainly used for the preparation of notes and lessons, setting and

marking of examinations, and also for consultations by students. It, therefore, becomes necessary to have adequate provision for offices.

Staff Occomodation

It is very desirable that members of staff be housed on the site, as this will protect the school against the activities of shylock land lords, hence social and economic benefits for the school

Design considerations

The design of a school has to respond to changes in accomodation and admission requirement, as well as changes in structure of courses. This has to be taken into account by the designer before embarking on the design work.

Factors of Classroom Design

The major factors usually considered in designing a classroom are:-

1. Seating and writing space.
2. Use of wall space and chalkboard.
3. Ventilation.
4. Acoustics and lighting.
5. Aesthetics.

Seating and Writing Surfaces

The seating arrangement is usually the most important feature in determining shape and size of a classroom. This arrangement should provide every students with good view of the front chalkboard. Other consideration such as proper illumination and space for good setting of books are important.

The use of Tablet armchair permits close spacing of seats, but it major short comings is its inadequacy as a writing surface.

Each seat has a strip for writing in this design.

Visibility in a classroom can be improved by the evoidance of obstructions, elevating lecture platforms, maintaining good viewing distance and extreme vertical and horizontal angles. Installation of vertical sliding chalkboards is another way of improving visibility.

Lighting and acoustics

"Light is a form of red radiant energy, a force to which all but a few organisms react either consciously, subconsciously or both. In man at least, the reactions are a complex of physical and psychological reactions.

In all the classrooms, light is admitted through the windows on the sides. No teacher is required to face the windows when lecturing in normal lecturing position.

Similarly, students are not required to face any window directly from a normal seating position.

Serious acoustics are normally not encountered in small classrooms as normal speech is audible for a distance of about 20 - 30m in the direction of speech. No special reflectors are therefore required in the classrooms. Echoes also do not usually arise, because the time interval between direct and reflected sound is small.

Ventilation

Cross ventilation which will not cause drought is desirable in classrooms. The dimension of openings should allow quick air change. Windows are normally located such as to meet the lighting and ventilation requirements of rooms.

Specialised Teaching Rooms

The main physical requirements of the specialised room which affect planning are:-

1. Size and weight of equipment, work tops and surfaces.
2. Deliveries of bulky materials and removal of rubbish.
3. Noise production.
4. Dirts and fumes production.
5. The complexity of services.

The need for direct access routes for deliveries of materials and equipments are important. Noisy and dirty areas are to be apart from the teaching accomodation area.

Laboratory

Some special requirements of a laboratory building are adequate drainage, service distribution, layout of benches, fire protection, storage and preparation spaces, lighting, ventilation, position and types of fume cupboards.

Bench lay-out

There are three major types of bench layout:-

1. Wall
2. Island
3. Peninsula

Many combination of these are also possible. Peninsular benches at right angles to walls are preferable to island benches as the installation of services is easier and less costly.

- Island benches require large circulation spaces because of extra spaces required for access to the four sides of the benches.

Service Distribution Systems

Common service distribution in storey buildings are:-

1. Utility corridor system.
2. The multiple interior shaft system.
3. The multiple exterior shaft system.
4. The corridor ceiling.
5. The utility floor system.

Utility Corridor System

All service mains and ducts are brought to all the floor level by means of a vertical central core which helps to distribute the utility by vertical means in this system. The horizontal distribution of utilities from this core can either be at the ceiling level downward to individual work areas or directly along the floor through the pipe space in the base cabinets.

This system has a high degree of flexibility and high capability to meet the needs of environmental control and ventilation. It is mostly suitable for multi-storey buildings with a square rather than a rectangular building.

Multiple Interior Shaft System

Provision for concealed services in a series of regularly spaced shaft located either on both sides or on side of a circulation corridor is made in this system.

Distribution of utilities into the working areas is generally in the pipe space behind the bench work.

This system is most efficient in multi-storey buildings. Advantages include flexibility, moderate initial cost and net to gross area efficiency.

The disadvantages include high initial cost and service interference with traffic flow in corridors.

Multiple Exterior Shaft System

Services and ventilation ducts are brought to individual floors by a series of exterior wall vertical shafts located at each or alternate laboratory module or room.

Distribution of services into workrooms is by means of pipe space behind the base cabinets of the fixed equipment or at ceiling level.

This system is also suitable for multistorey laboratories since its high initial cost does not justify its use for low rise buildings.

Advantages however, include good flexibility, easy maintenance and good appearance.

The disadvantages are the difficulty in servicing or modification and increased expenses over exposed systems. It is also not as flexible as the exposed systems.

Corridor ceiling Distribution System

In this system of service distribution, utilities are located in the corridor ceiling and in some instances above the ceiling of the rooms on each side of the corridor and are supplied by vertical pipe shafts.

Distribution of services from the ceiling mains to work area may be downward to work areas below and or upward to the floor above.

Advantages include low first cost and excellent flexibility, modifcation of services does not interfere with work in adjacent modules.

The disadvantages include higher ceiling height for clearance, limitations in the installation of wall cabinets, increased maintenance cost and poor aesthetics.

Utility Floor Distribution System

This system provides maximum flexibility in laboratory services distributions.

Utility and the plumbing services are in separate space between the upper floor and the lower ceiling.

Distribution of services may be downward to work areas and/or upward through the upper floor.

This system is selected because:-

1. Excellent flexibility to any portions of the room.
2. low modification and replacement costs.
3. Modifications does not interfere with work in adjacent modules or rooms.

The disadvantages however include low net to gross area efficiency and high initial cost.

Lecture Theatre/Assembly Hall.

The design of a lecture theatre like the design of any place of assembly requires good visual and audible conditions.

Effective acoustical planning depends on the correct placement of reflective surfaces. For all sounds involved in the performance. Other requirements are:-

1. Viewing angle s to screen.
2. Distance to nearest and farthest eyes.
3. Width of gangway.
4. Shape and size of rooms.
5. Room Furnishings.
6. Position of source of sound.
7. Reverberation time.

Viewing angles

The angle of elevation from the eye to the upper part of an object on the screen or chalkboard should not exceed 30^{o} see figure . The viewing area should be within an angle of about 45^{o} on either side of the normal to the screen or chalkboard given a total angle of 90^{o}.

Distance of seats

The limitations of viewing distance and angle impose restrictions on the placement of seats for adequate viewing.

Seat dimensions and Spacing

The minimum back to back distance between rows of seats is 760mm, 800mm is however prefarable. Width is 570mm.

Shape of Room

Large curve surfaces produce focal points which is detrimental to good hearing. Parallel walls also reflect sound.

The provision of raked seating and breaking surfaces of walls and ceilings produce even sound distribution. See figures 7.1 and 7.2.

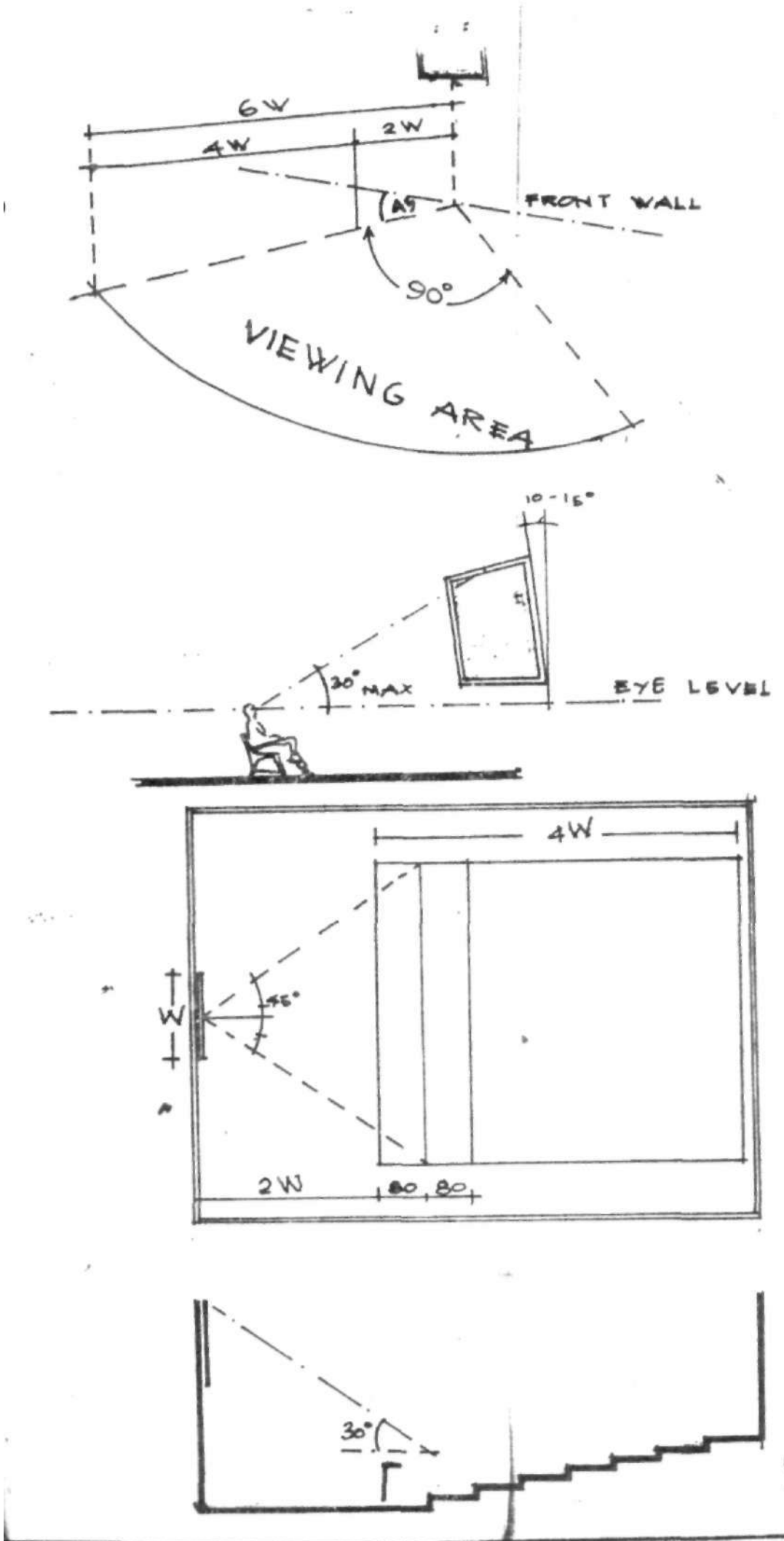


Fig. 2.1
Horizontal and vertical viewing angles

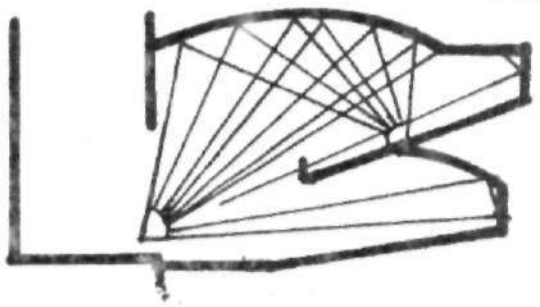


Fig. 8.2 Large curved surfaces produce focal points and large overhangs screen path of sound.

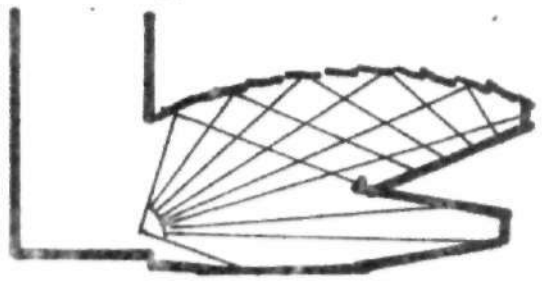
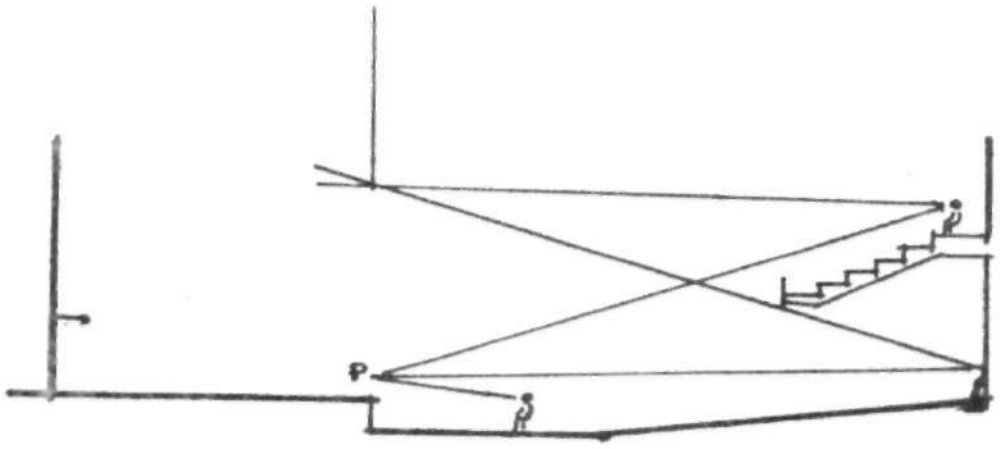
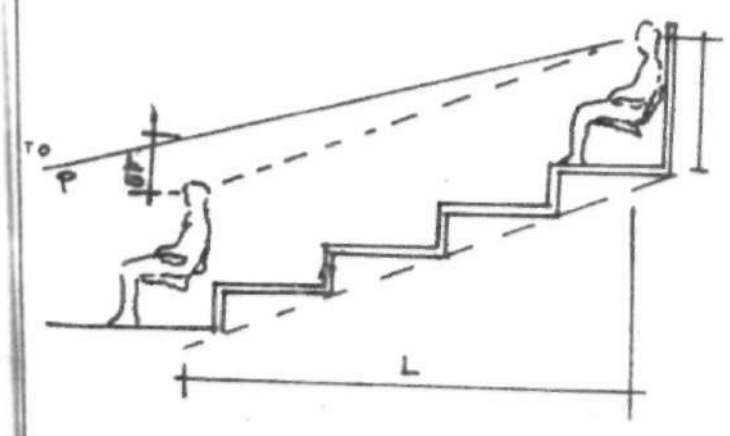


Fig. 8.3 Breaking walls and ceiling surfaces produce even distribution of sound.



8.4. Vertical sightlines in galleries.



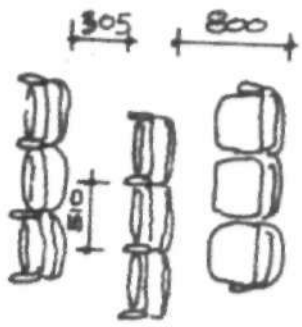


Fig. 8.6. Seating Dimensions

Room furnishings

Suspended ceilings and cladding with intervening voids, which resonate with the sound are usually preferred in places of assembly.

Position of Source of Sound

Source of sound should be in front of a hard reflecting surface.

Reverberation time

Sound reverberation is caused by the reflection of sound from surfaces. When a long time interval exist between the direct and reflected sound, the reflected sound is heard as an echo, which of cause is unpleasant.

Gymnasium

Sport halls are general purpose rooms intended for great varieties of activities. Some of which can take place simultaneously.

The area is usually a function of the range of activities and levels of performance.

Activities which can not be performed satisfactorily in the open air will be provided in the Gymnasium in this design.

Partition Wall

In the design of adaptable building to allow for alteration in the sizes of rooms, it is important to employ demountable partitions between rooms.

In the classroom block, demountable partitions are used to ensure flexibility in sizes and shapes of rooms.

The main requirements of a demountable partition wall are:-

- Good standard of sound insulation.
- Capable of supporting shelves, notices and chalkboard.

The ease of rearrangement in buildings depends not only on the methods of fixing the partitions but also on the layout of services. To allow for easy removal of partition wall, socket outlets and cable runs in any classroom are confined to the external walls only.

SCHEDULE OF ACCOMODATION

SPACE	OCCUPANCY	AREA (m^2)
A. TEACHING ACCOMODATION		
2 Lecture theatres of 240m^2 each	150	480
15 Classrooms of150 m^2 each	40	2250
2 Drawing Room of 150 each	40	300
Seminar Rooms		
B. ADMINISTRATION		
Entrance Hall		
Principals office	1	25
Vice Principal	1	20
Bursar	1	20
Registrar	1	20
General Office	3	30
Store	-	15
Enquiry	-	15
Boardroom	20	60
Seminar room	20	60
C. LIBRARY		
Stack/Study/Reading Room	150	200
Store	-	30
Librarian's Office	1	15

Schedule of Accomodation (Cont'd)

SPACE	OCCUPANCY	AREA (m^2)
D. ASSEMBLY HALL		
Auditorium	400	280
Stage	-	-
Back stage Rehearsal	-	-
Male Changing Room	-	40
Female Changing Room	-	40
E. BOOK SHOP		
Sales Hall	-	150
Office	1	15
Store	-	25
F. GYMNASIUM		
Games		
Stores		
Male Changing Rooms		
Female changing Rooms		
Gallery		
G. OFFICE ACCOMODATION		
Staff offices of $15m^2$ each	2	300
H. LABORATORIES		
8 Laboratories of 280 m^2 each	40	2240
8 Stores of $20m^2$ each	-	160
8 Preparation Rooms of $20m^2$ each	-	160
· Office		
I. HATCHERIES of $30m^2$ eacy	-	240
J. PONDS		
K. WORKSHOPS		

CHAPTER EIGHT

DESIGN CONCEPT

"Man has an innate to make meaningful order in his world. Without the presence of order in his life, man can not live. He therefore tends to create around him the kind of order he finds most congenial". Okorie J.O. (1978).

The form of the plan is based mainly on the functions accomodated within it. In order to achieve flexibility and adaptability in the design, shape of rooms are mainly rectangular. To ensure adequate cross ventilation in a warm humid climate of this nature, and also to ensure adequate lighting, buildings are grouped round courtyards and corridors are singly loaded.

Design:

Administrative Block

The administrative building is reached directly from the main access road. The museum is placed to the left hand side of the entrance hall, while on the right are the enquiry, registry, toilets facilities, offices and waiting area. The staircase is by the left hand side of the entrance hall. On the upper floor of this block are the offices for the principal and other administrative staff, and also the library.

In the library, the stack/reading and lending areas are left clear of internal support, so that flexibility in arrangement of furnitures within the library can be easilly achieved. The librarians office and a store room are provided within the library. There is a link between the library, laboratories and the classrooms so as to achieve proper functional flow.

Structure

Reinforced concrete frame structure is the structural concept adopted in this block. The infilling materials are hollow concrete block work. The floor is constructed of reinforced concrete, while the roof construction is carried out using long span aluminium sheets on purlins laid on steel trusses.

Finishes

The circulation route and the toilets are finished in granolithic concrete while the offices, library and the museum are finished with P.V.C. tiles.

Class room Blocks

The classroom blocks are to the left hand side of the entrance hall. There are two classroom blocks grouped around a courtyard. Each is made up of three levels. Vertical circulation is by staircases located at the end of each block. On the ground floor of one of the blocks

is the demonstration hatchery, while the other contains two of the laboratories. There is also a drawing room in one of the blocks.

Structure

The structural concept of the classroom blocks is the reinforced concrete frame. Wall claddings are hollow concrete blocks. Long span aluminium sheets are the roofing materials, which are laid on purlins laid on steel trusses.

Finishes

The floor construction is carried out in reinforced concrete and finished with P.V.C. tiles laid on sand/cement screed. The walls are rendered smooth and painted in emulsion.

Lecture Theatres

The lecture theatres are to the right hand side of the administrative block. There are two lecture theatres of capacity of 200 and 150 people respectively. The basic shape of the theatres are rectangles, but with two opposite corners sliced to give an irregular hexagon. The two main entrances to each of the theatres are located by the sides in the front. There are two other entrances at the back of the theatres. A projection room is also provided at the back.

The theatres are raked for visual and acoustics reasons. Stairs are provided at the external back of the theatres. Parallelism of walls is being eliminated to improve acoustic conditions.

Structure/Finishes

The walls of the theatres are load bearing reinforced concrete walls. The roof structure is space frame, cladded with long span aluminium sheets on plywood boards. The floor finishes are cement/sand screed laid on concrete.

Assembly Hall

The assembly hall is roughly in the centre of the whole complex. It is designed to provide seating for about 400 people. The entrance to the hall on the ground floor level is by the sides. The stage is 30cm above the floor level.

Due to the multi-purpose nature of the assembly hall, a level floor of about 120 m^2 is left unraked in front of the hall to serve the purpose of exhibitions, dances, dinners and other social gatherings. To the rear of the hall, the seats are raked. A gallery is provided in the hall to increase the seating capacity of the hall.

The hall isrectangular but with two opposite corners sliced to give an irregular hexagon. Parallelism is also avoided here to improve the acoustic conditions. Reflective ceiling is also provided to provide short-delayed reflected sound energy.

The surfaces are given orientations to secure even distribution of sound in the hall.

The access to the gallery is provided by two external staircases. The backstage male and female changing rooms are directly attached to the hall and at the same level with the stage.

Structure/Finishes

The walls of the hall are constructed of reinforced concrete. They are load bearing. The roof structure is space deck while the roof covering is long span alluminium on plywood boards.

The floor of the hall, foyer, and the staircases are finished with cast insitu terrazo, while the stage is finished with cork tiles.

Gymnasium

The Gymnasium is to the left side of entrance hall. It is located very close to the sports field. There is a gallery above the changing rooms for spectators, which is approached through a stair case just outside the Gymnasium.

Structure/Finishes

The structural elements are the reinforced concrete frames, Elimination of air borne and structure borne noise is essential. Floating wooden floors supported by resiliently

mounted sleepers on concrete oversite is used. Suspended ceilings are also used to absorb the noise.

The in-filling wall panels is hollow concrete blocks. The roof structure is space deck which is cladded with long span alluminium on plywood boards.

Office Block

The office block, three storey in height, is located very close to the classrooms and the theatres, it is also at a close proximity to the main entrance. This location allows for easy accessibility to the teaching as well as administrative areas.

Structure/Finishes

Cross wall construction is the structural principle of the block. The structural floor is constructed of reinforced concrete. The floors are finished with PVC laid on cement screed. Circulation routesand the toilets are however finished in cast in-situ terrazo. The walls are smoothly rendered and painted in emulsion.

Alluminium roofing sheets are laid on purlins which are laid on load bearing partition walls.

Laboratory Block

The laboratory block is grouped together with classroom blocks around a courtyard. It is located also on the left hand side of the entrance hall. On the ground floor are the basic sciences (Chemistry, Biology and Physics) laboratories. Directly above are the research laboratories. The design of the laboratories is largely the planning of service routes and the lay-out of work benches.

Services

Services in storey buildings are usually provided by a horizontal or vertical distribution system or a combination of both. The type of system of service distribution used in the buildings is the utility corridor system, in which all the service mains and ducts are brought to the various floor levels by means of a vertical core which distributes the utilities by vertical mains. The horizontal distribution of utilities is from the main core at the ceiling level of the room below upward to individual work areas. This system provides access for maintenance and service personnel to the utility piping and duct work throughout the life of the building.

Fire protection

Fire protection is afforded in the laboratories by the use of portable fire extinguishers and sand, which is contained in sand buckets. An escape staircase is provided for use during emergency.

Ventilation

Fume cupboards are provided in all the laboratories to provide exhaust for poisonous fumes. Extract fans are located within the laboratories to effect a more rapid change of air within the rooms to compliment the natural ventilation through windows.

Planning

Each laboratory basically has a storage, preparation and work area.

In the physics laboratory, a dark room is further provided for experimental purposes, e.g. photometry. Balance rooms are provided in the Chemistry laboratories. In the Zoology and botany laboratories, additional storage spaces are provided for aquarium.

Construction

The structural system of construction is the reinforced concrete frames while grid deck flooring is the system of floor construction.

Horizontal service spacesare left between the floors and the ceiling to accomodate service pipes and duct work. The roof structure is steel trusses on which purlins carrying the long span alluminium roofing sheets are laid.

Material and Finishes

The materials and finishes used in the laboratories are acid resistant. The pipe work in all drainage channels and the furnitures are acid resistant and easy to wash and clean.

Workshop Blocks .

The work shop area is located at about 80m away from the classroom blocks. It is accessible by pedestrian routes from the classrooms, theatres and laboratories. It can also be reached directly by an access road.

Maintenance Workshop

This is a place where repairs and servicing of boats and other fishing tools are carried out.

Tools store, two office spaces and spare parts store are directly attached to this workshop.

Iron gates are provided to the otherwise open fronted workshop for security reasons.

Construction

The structural system of the workshop buildings is the reinforced concerete frame. Long span alluminium is used as roof cladding material.

Machines in the workshops are mounted on pads to reduce structure borne noise. The infilling wall panel is the hollow concrete blocks. High level windows are used on either side of the workshop buildings to allow for deep penetration of light into the interior.

Floors of a workshop building should usually be resistant to chemical attacks, easy to clean and maintain, and should also have high resistance to abrasion. To meet this requirements, in-situ terrazo finishes is thus used.

CHAPTER NINE

PHASING AND CONCLUSIONS

9.1 Phasing

The design of the school is such that it can be built in stages as student population increases and more fund is made available.

The criteria determining the direction of development are:

1. In each phase, concentrated rather than dispersed developments are required in order to make efficient use of services and to economise on provision of infrasturctures.

2. Phasing is also dictated by the degree of need of a certain facilities.

Basically, three phases are suggested in the construction of this school, each occupying a period of about 3 years. See figure 9.1.

Phase One

- 1 classrom block of 6 classrooms.
- 1 lecture theatre
- Basic research laboratories
- library
- Maintenance workshop
- A block of staff offices
- Administrative block
- Some ponds.

Phase Two

- Basic sciences laboratory block
- Second block of classrooms
- Second block of offices

Phase Three

- Second lecture theatre
- Assembly hall
- Gymnasium
- More ponds

9.2 Conclusions

Development in fisheries agriculture depend on a network of factors such as:

- the provision of infrasturctural facilities.
- provision of supply, marketing and credit facilities.
- provision of social and health facilities to fish farming population through extension services, and assisting the fishermen in various ways on the practical aspect of fish farming.

This Thesis, however, is concerned with the training of middle level man power to assist the fish farmers in various ways, and to mobilise them for more effective fish farming practices.

We happen to be in an 'austere' era, the austerity, however, should not mar the establishment of this institution, as on the long run it would have tremendous economic and social benefits. The eradication of illiteracy from any society is important to the development of any country. The Federal Government in realisation of this, launched the mass literacy campaign.

The realisation of this project will go a long way in reinforcing the Governments efforts in eradicating illiteracy, because as the fishermen become enlightened and are assisted in the fishing practices, their social and economic outlook will improve, as they can now produce much more fish easilly.

The designer is very optimistic that this project will boast fishery Industries and fish production for the populace, as well as satisfying the yearnings of many for higher education.

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