A SURVEY AND ANALYSIS OF PROBLEMS ASSOCIATED WITH ESTABLISHING AND MAINTAINING BOTANICAL GARDENS IN SOME PARTS OF NIGERIA

BY

JEREMIAH JINKUTA DANBEKI

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ABSTRACT

Data for the survey were gathared from fifteen (15) states- of Nigeria, using questionlaresa. The questioniares were designed to provide information about preparation, maintenance, and problems of botanical gardens and why such gardens were lacking in many parts of Nigeria.

From the data gathered, it has been observed that botanical gardens tend to be lacking in many parts of Nigeria. The few botanical gardens that exist tend to be associated with institutions of higher education, not necessarily Universities,

In most cases, establishment of botanical gardens in Nigeria came into being as a result of growing interest in the study of botany, which called for the need for collections and maintenance of living plants to serve as aids for studying botany. Botanical gardens for recreation,supply of medicines, or for ornamental, or conservation purposes tend to be lacking

Most of the botanical gardens obtained their plants within Nigeria, Some gardens, however, contained plants both from within Nigeria and from overseas countries. The plants obtained locally were either from the local environment, other existing botanical gardens within the country, or both.

Most of the botanical gardens prepared their ground and added manure before the plants were brought for planting out. Sources of water supply for the gardens were mainly taps and wells. In some cases reservoirs were provided for storing water, to be used during scarcity.

Attempts were made to isolate some of the problems which limit the growth of botanical gardens in Nigeria. Nore of the problems is universal to all the botanical gardens. Most of the botanical gardens have lack of trained manpower and shortage of funds as the greatest problems limiting their growth. Most of the garden staff are illiterates or semi-illiterates. This contributes to difficulties in management and may be partly the reason why seme of the botanical gardens. seem to be poorly manage. Other problems limiting the growth of the botanical gardens include shortage of land, shortage of water, soil factor, and presence of pests and diseases.

Most of the areas sampled did not have botanical gardens. The frequent reasons for lack of botanical gardens were stated to be (i) shortage of funds; (ii) most of the institutions were still at their temporary sites, and (iii) lack of knowledge of how to go about establishing botanical gardens. Other reasons included lack of public awareness of what botanical gardens were all about and what could be

achieved through them; shortage of land and water, and lack of encouragement from appropriate authorities.

Green houses and shade houses, which are additional facilities, tended to be lacking in most of the Nigerian botanical gardens. This means plants which grow well only in controlled environemt (like that of green house)and partial shade (like that of the shade house) can net be cultivated in most of the Nigerian botanical gardens.

Generally, botanical gardens as a research institution and for public enlightenment are lacking in Nigeria.

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INTRODUCTION

Nigeria, like other underdeveloped countries, wants to achieve rapid economic development and growth. Evidence for this can be seen in the efforts of Nigerian Governments since independence in 1960. Investments were made into many areas that were thought to have a potential for fast economic growth and development.

Economic development cannot be achieved without the proper kind of education. Hence the emphasis on education by Nigerian Governments is well made. In all the four Development Plans embarked upon by Nigeria, education has been emphasised. This can be seen in the increase in number of institutions from primary to the pre-university level. An aspectsof the emphasis on education was the launching of the Universal Primary Scheme in 1976. The trend in education in Nigeria is changing. Formerly it was the so called "liberal education", but today it is technological. Up to 1976 no mention was made of universities of technology but today, the Federal Government has designated seven universities of technology. Many science secondary schools are being established. The number of arts students taken into various universities and many advanced level institutions has been reduced, but increased for the sciences. Science education is being emphasised. Many State Governments grant automatic scholarships to students to study science,

especially medical and agricultural sciences, but this is not so for arts courses. Our mass communication systems (radio and television) occasionally carry science programmes to educate children and adults.

Why should Nigerian Governments attach so much importance to agriculture? From the beginning of the colonial era (1900) up to 1960, agriculture has been the mainstay of the country (Madujibeya, 1976). It was from the profits on agricultural products such as cocoa, cotton, groundnut, rubber and oil palm that colonial administration ran the government. These agricultural products earned a lot of revenue and foreign exchange for the coffers of the colonial administration. What brought about the fall in agricultural production was the extraction of petroleum which started in 1958. By the late 1970s, petroleum became the main revenue and foreign exchange earner for the Federal Government. Then came the so called "oil glut" on the world market. There was need to go back to the farm. "Operation Feed the Nation" was launched in 1976 by the then Military regime, which has been superceded by the so called "Green Revolution". A great deal of money has been invested in agriculture. This will be a waste, unless there is improvement in quality and quantity of agricultural products. About 60 per cent of Nigerians are farmers and yet Nigeria

cannot produce enough to feed herself.

There is a need for Nigeria to be self-reliant in agriculture, especially in producing enough food materials to feed her citizens rather than continually importing such commodities. To improve agriculture, research is important. Botanical gardens are one of the venues for botanical research, especially in the field of plant propagation and breeding. Therefore it is important to carry out a survey of botanical gardens to find out whether or not such gardens are being emphasized in Nigeria, and if not, what are the reasons? How can they be used for improving education and agriculture in the country?

It is hoped that this survey will help to evaluate the potential role of Botanical Gardens in Nigeria, and identify problems concerned with such establishments and their maintenance, so that they can be more fully utilised for supporting and expanding agricultural research. Hopefully, this will stimulate agricultural production, and eventually agricultural exports.

Definitions

A botanical garden may have several components including: arboretum, shrubbery, fernery, order beds, lawn, herbarium, rock garden, wall garden, orchid garden,

shade house, herbaceous border, flower garden and hedges.

A botanical garden can be defined as a "garden in which many different kinds of plants are cultivated for scientific purposes" (Everett, 1981). The plants so cultivated are labelled with their names and other pertinent information. A botanical garden may have different sections for different kinds of plants and other uses such as a section for plant breeding, etc.

An arboretum refers to a display garden that concentrates on shrubs and trees, i.e. woody plants. An arboretum could be within a larger and more diversified botanical garden, or a garden of itself. A shrubbery and fernery signify places where many shrubs and ferns are grown respectively. A lawn is defined as a piece of ground covered with grass, kept closely mown. A herbarium is a collection of dried and pressed plants preserved to illustrate as far as possible their character.

An order bed could be regarded as synonymous with a bed of plants from the same botanical family. Rock gardens are gardens designed to look as if they are a natural part of a rocky hillside or slope. A hedge is similar in function to a fence; it is a dense (or closely planted) line of shrubs (which may be thorny) planted as a boundary (to a plot or field) in such a way as to prevent the passage of animals. A fence is

a barrier for enclosing or demarcating an area, normally made of non-living material, for example, wire attached to poles. One of the functions of a fence is to exclude or enclose animals.

Herbaceous border refers to a border made of herbaceous plants. A flower bed is a bed (or small plot) which contains herbs grown mainly for their flowers. A water garden is a collection of water plants cultivated in a pond, or ponds, sometimes associated with a stream. A green house (or glass house) is a house with the roof, sides and ends made largely of glass. It is used for propagation and cultivation of plants under partly controlled environmental condition (free from rain, wind, etc); temperature may be partly controlled by ventilation with or without heating. A shade house is a house, usually with bamboo roof to provide partial shade for cultivation of plants that grow better under shady conditions. The sides may either be open or else partially closed with bamboo; often the relative humidity inside a shade house is kept higher than in the garden outside. An orchid garden refers to a collection of orchid plants, sometimes they may be grown in a specially designated orchid house.

History of Botanical Gardens

The establishment of Botanical Gardens is not an invention of recent origin. The idea of Botanical Gardens is derived from gardening. Gardening deals with growing plants in harmonious or pleasing arrangements in the landscape, and the techniques of cultivating and maintaining plants and producing satisfactory growth (Herklots, 1975). Botanical gardens are gardens specifically maintained for the scientific study of plants.

Among the earliest gardens, there is the record of the hanging gardens of Babylon which could have been terraces around a steep hill. Cyrus II the Great has been reported to have established a garden or orchard of trees mainly to provide shade. The records of Classical Rome show that the Romans had gardens which were mainly enclosed courts with some emphasis on herbal plants, with roses as one of the favourites (ibid).

The Chinese have been reported to be the founders of Botanical Gardens. In 2800 B.C, the semi-mythical emperor of China, Shen Nung, was said to have sent collectors to distant parts and they brought back plants

which were grown for their medicinal or economic value. Many rare herbaceous plants and trees including Canna indica, Cinnamomum sp. were reported to have been planted by the Han emperor Wu Ti between 140 and 86 B.C (Lewis, 1973).

Generally, botanical gardens, as an institution, have their roots in ancient China and many of the countries bordering the Mediterranean. Gardens were established for raising fruit-trees, vegetables, and herbs used in making crude medicine of that time. Herbalists published descriptive works called herbals, and it was the herbalists and their herbals that stimulated the founding of botanical gardens (Avery, 1975). At first, such gardens were associated with the medical schools of Universities, with the professors of medicine as the botanists, and their "physic gardens" for training students and for growing plants to make medicines.

During the middle ages or in medieval times (1100 to 1500 A.D.), gardening centred around the monasteries, where herbal plants were grown mainly for medicinal purposes, as well as vegetables for food, vines and other fruits. During the Renaissance (1300s to 1500s), gardens were established all over Europe, with most activity around Italy. "The

garden remained an enclosed area, the proverbial haven of quiet and peace in a troubled world" (Herklots, 1975).

By the early 1800s, a Swiss physician and botanist, Jean Gesner, put the number of botanical gardens in Europe by the end of the eighteenth century as 1,600 (Avery, 1975). The science of botany took form during the eighteenth and nineteenth centuries, and many of the prominent botanists of the period became the directors of the botanical gardens of their day.

The earliest botanical garden established for teaching purposes was that of Pisa, Italy, in 1543, followed closely by that of Padua in 1545. The first recorded botanical garden in England is that of Oxford (1621) followed by the one at Edinburgh (Scotland) in 1667. A century later Kew was founded (1759) (Herklots, 1975).

In the United States of America, the first botanical garden is thought to have been established near Philadelphia in 1728, by John Bartram, a leading botanist of his time. Other important botanical gardens in the U.S.A. include the Missouri Botanical Garden (1859) at St. Louis; the Arnold Arboretum (1872) in Jamaica Plain, Mass; the New York Botanical Garden (1895) at New York City; the Brooklyn Botanical Garden (1910) at New York City, the Fairchild Tropical

Garden (1938) in Florida; and Los Angeles State and County Arboretum, California (1947). In Canada both Montreal and Hamilton, Ontario, have noted botanical gardens.

In the tropics, botanical gardens were established in the eighteenth and nineteenth centuries, the purpose of which was to exploit economically important plants, such as those yielding fruits, spices, dyes and varnishes. The tropical botanical garden at Pamplemousses (Mauritius), founded by the French in 1735, is the oldest tropical botanical garden. This botanical garden is said to have played a prominent part in establishing the Mauritius sugar industry (Girling, 1978). A number of botanical gardens in some colonial territories were founded by the British These include the Hope Botanic Garden in Jamaica (1774), the Indian Botanical Garden, Calcutta (1786), and other such gardens in Trinidad (1819) and Singapore (1822). When these countries became independent, most of these botanical gardens were absorbed by agricultural and forestry departments. (ibid).

The botanical gardens at Bogor in Indonesia (formerly Buitenzorg, Java) founded in 1817 are probably the most extensive in the world (Lewis, 1973).

At Peradenaya, Ceylon (Sri Lanka), there is a botanical garden which is said to have played an important part in cultivation of economic plants. In South Africa, the National Botanical Garden at Kristenbosch on the slope of Table Mountain, contains a fine collection of tropical and South African plants.

The Aburi Botanical Garden in Ghana (formerly Gold Coast) was established in 1890. The move for the establishment of the botanical garden was made in 1842 by the Select Committee of the House of Commons in London; but it did not take off until 1890. The botanical garden was established with the view of finding economic plants for European markets, to experiment upon both economic and decorative plants from other tropical and subtropical countries, and to teach scientific agricultural methods. By 1908 the area of the Aburi Botanical Garden was 64.8 hectares (Anon. The Aburi Botanic Garden, 1962).

Functions and Purpose

Many Botanical Gardens are associated with institutions of higher education. Botanical Gardens are multi-functional. The number of functions may be dependent on the extent of any particular garden. A large garden with more varieties of plant may perform or serve more functions than a small garden with less

diversified plant types. The functions of any garden may be influenced by the purpose of its establishment. For instance, if a garden is established mainly for production of herbs for medicinal purpose, then it will be less diversified than a garden that is established for general purposes.

The most important function of Botanical Gardens, probably, is educational. Such collections of living plants constitute a formidable resource for professional scholars. Botanical Gardens, especially if associated with herbaria, are important for identification of new plant species. The gardens provide information and facilities for botanical research. They provide a rich opportunity for educating the general public about plants and how to grow them. Some gardens offer short courses for amateur gardeners in horticulture, and offer training for National Diploma in horticulture, etc. Botanical Gardens can be used to educate both children and adults. They can serve as a source for providing botanical teaching materials for educational institutions.

Another function of Botanical Gardens is that they constitute reservoirs of valuable characters potentially important in the breeding of new varieties of plants. In recent years, Longwood Gardens (Pennsylvania) in collaboration with the United States Department of

Agriculture has sent out agents to collect species that have promise as breeding stock or are already attractive ornamental plants, so as to be used for breeding purposes (Avery, 1975). The Royal Botanic Gardens, Kew, England, are famous for their collecting expeditions and the distribution of economic plants of the world to places where they could most successfully be grown.

Botanical Gardens are also ornamental in function. They appeal to the eyes. In such gardens emphasis is usually laid on flower beds. All efforts are made to make such gardens beautiful so as to appeal to all visiting them. Construction of lawns, paths, and general design should be such that they make a visual appeal.

Botanical Gadens could act as a sort of recreational ground. As the world populations become more urbanised, people increasingly recognise botanical gardens as among the important cultural resources of civilised nations. The gardens offer some aspects of the natural environment which a city dweller no longer has access to. Some people love to relax in such gardens as the gardens can offer a mental escape from population pressure - the gardens are normally quiet places.

In the case of early botanical gardens, herbs were cultivated for medicinal purposes. An example

of such a garden is the Kew Garden which cultivated and distributed Cinchona trees, the bark is a source of quinine. Some botanical gardens today may still maintain the cultivation of plants for medicinal purposes.

Also practiced in botanical gardens is vegetative propagation of plants. Such propagation may be by cuttings, grafting, budding, layering, etc. This can be very useful in agriculture.

Endangered plants species can be cultivated in botanical gardens to preserve them. They may later be distributed either to restock other gardens so that the species do not become extinct, or if numbers are adequate the endangered species may be re-introduced to natural habitats.

Botanical Gardens are also associated with plant introduction. For instance, early introduction of cocoa were propagated at Aburi Botanic Garden from where they were later distributed to other parts of Ghana.

Preparation of a Botanical Garden

To prepare a botanical garden requires several steps. However, in laying out a garden there are no fixed rules. Much about the laying-out depends upon individual taste, local circumstances, climate, lay of land, water supply, availability of labour and funds (MacMillan, 1954).

Design

The first consideration in laying out a botanical garden is to get a sketch or diagram on paper to help in the visualisation of the proposal. The sketch or diagram will serve as a guideline within which one will operate. The main features should first be sketched out.

The first principle is perspective, that is, maintaining a sense of proportion in the relation of the garden to its surroundings. It should be such that it can fit naturally into its setting, though innovations should not be overlooked (Schubert, 1977). There is no universally agreed plan that can be taken as a model. The plan for any garden may depend on individual taste, and there may be limiting factors, such as space (land), water, funds, etc. Sometimes landscape architects are employed to design plans for botanical gardens. Despite similarities, one garden differs from another. In botanical gardens, the laying out of parts of the garden is usually according to the scientific relationships of their collections. Botanical gardens range in size from a few square metres to about 810 hectares (Avery, 1975). The laying out of a garden may proceed over some years, with varying opportunities for effecting changes and carrying out new schemes and ideas.

It is important to distinguish between the front and the back of the garden. Main features of the garden should then be sketched out. These include the avenue(s), paths, borders, lawns, order beds, etc. If the area stands the chance of soil erosion or being water-logged, appropriate remedial measures, such as drainage pattern, should be incorporated. It is important to know the aspect of the garden regarding sun and shade, its exposure to wind, means of artificial watering available, and to plan accordingly.

Hedges and Fences

After the sketch on paper, the next step is the actual laying out of the garden. To avoid intruders, such as unauthorised persons and unwanted animals, a boundary fence should first be considered. This could form a barrier and maintain exclusion or privacy.

Immediately after the fence, hedges follow. Apart from forming a barrier, hedges provide a shelter from the wind, form a screen, and can act as an ornament as well as being of botanical interest. The type of shrubs to be chosen for a hedge depends largely on the function of the hedge and its locality. If it is for protection or shelter from winds, quick-growing deciduous shrubs are excellent, while flowering shrubs

make good ornamental hedges.

Not all plants will survive in climates that are adverse to them. So in forming any hedge it is necessary to consider the aspect and the quality of the soil before deciding what to plant.

The shrubs for hedges are usually planted when they are about 50 to 90 cm in height; they ... more easily establish themselves, and are easier to train. Such shrubs are mostly planted out some twenty-five (25) to forty (40) centimeters apart.

Paths and Walks

When the area of the garden has been fenced, then real work within the garden should commence. The major paths or avenues should be constructed, to be followed by the smaller paths. Paths and walks have often been described as a "necessary evil" in a garden (MacMillan, 1954). A good path should essentially harmonise with the rest of the garden; and afford a flat dry walking surface during wet weather. The paths may be paved. The smaller paths are sometimes constructed such that they separate one taxonomic grouping from another; so as to facilitate effective access to each group of plants.

The real dimension of a path has never been universally determined, but an approximate width of not less than 0.62 metre and average of 1.24 metres has

been suggested; and if motor traffic should be allowed into the botanical garden then the entrance drives and tracks should not be less than 2.48 metres wide. Some botanical gardens have grass walks, running between beds. It has been suggested that such walks should not be less than 0.62 metre wide so as not to pose any difficulty during mowing. The idea of grass walks is to add to the beauty of the garden concerned. Such grass walks are usually kept closely cut for occasional use only. Grass walks are not important in gardens without mowers.

Preparation of the Ground

Whether or not the botanical garden is started on virgin land, there may be some plants existing within the area. Such material should not be destroyed without careful thought, it may sometimes be retained as ornamental a feature of the proposed botanical garden. It is often easier to transform such features than to remove them. Existing vegetation can often provide shade or shelter for plants that are introduced. A portion of such existing vegetation could be selected and isolated into clumps, or the best trees could be separated to form solitary specimens. A variety of introduced plants may gradually replace the less desirable ones.

Some objects other than plants may be existing in the area of the planned botanical garden. They may not

be easily movable, and sometimes they can be turned into ornaments or supports for climbing plants.

The order beds have to be prepared by digging and levelling. Manure (chemical or organic) may be added. The ground has to be thoroughly prepared before the introduction of the plants. The composition of soil is important, so also the texture. It has been recommended that soil for general use should be composed of lime, humus, clay and sand, in various proportions (Coutts, 1973). Such soils are not easy to select or acquire, but soils can be improved by use of compost, lime, fertilisers, as appropriate. The soil should be such that it can retain an appreciable amount of water for plant growth. Clay soils may be seasonal so that adequate drainage has to be provided. Their texture may be improved by adding sand, leaf-mould, and organic manures. Similarly, light sandy soils may be improved by addition of clay, loam, organic manure and leaf-mould.

Sometimes the land is dressed with fumigants such as napthalene if there is suspicion of pest infestation. Soil sterilisation may be done for potting plants, especially those that are to be introduced into the green house.

The Green House and the Shade house

The greenhouse or glass house is essential, especially in botanical gardens where research work on plant propagation is to be carried out. It is used to propagate and cultivate plants under controlled environmental conditions. In the temperate regions heating may be done to raise the temperature of the greenhouses. In the tropics green houses have the disadvantage of becoming overheated, therefore they have to be well ventilated.

The choice of site for the location of the green house in a tropical botanical garden should be such that it is located away from big trees in order to avoid d mage due to branches falling or its being littered with leaves and there may be shade cast from such trees. The green house should not be located in a position too exposed to wind so as to avoid damage. The position should be such that there is easy access to the green house.

The greenhouse is sometimes sterilised using correct concentration of a sterilising chemical. The green house so treated has to be void of plants for six to eight weeks.

Greenhouses are sometimes provided with light, usually from electricity. This is to enable work being carried out even at night and to provide

artificial light for plants that are long day, that is plants that need more hours of day light than darkness for flowering.

There are plants that need shady conditions in order to grow well. Such plants are better cultivated in shadehouses. It is easier to choose a location for a shadehouse than that of a greenhouse. The only consideration, perhaps, in locating a shadehouse is easy access to it.

Storage Facilities

There is a need for some storage facilities within the botanical garden. Usually a house, with at least one room is built in the garden which may be used to store the garden tools and appliances, records, produce from the garden and as office for the curator.

Light may be supplied to the house, especially if work is to be done there during the night. The electricity supply for the greenhouse may be connected to that of the house.

The house should be located near the entrance. This is because every visitor to the garden passes through the entrance and an unauthorised persons may easily be checked by the curator. It is also easier for visitors to contact the curator as they come into the garden.

Water Supply

The supply of water is essential to every botanical garden. Water supply controls the whole scheme of garden layout. In low-countries or plains, the garden may be supplied from a well, while in some hilly regions, botanical gardens are supplied from a diverted stream. The position of the source of water supply to the garden is important. It should be positioned such that access to it is easy and convenient for all parts of the garden.

Other sources of garden water include ponds, reservoirs and a piped supply. These sources may not be within the garden, but pipes could be laid from reservoir or nearby river. Artificial ponds may be constructed within the garden. Reservoirs or storage tanks may have to be provided to serve during a time of water scarcity or if the supply is irregular.

The amount of water available may determine the size of the plant collection the garden may have. If a large amount of water is available, it may reduce the cost of labour.

Planting Out

When all the preparations of the ground have been completed, then the plants could be planted, and the seeds sown. Sometimes the time of planting may be

timed such that it corresponds to rainy season, so that there is adequate water supply at least in the earlier stages of growth. If the planting is done during the dry season, more labour is needed - the plants have to be watered constantly for them to grow well.

For larger plants, holes are made, and the plants may be staked, and temporary shade provided. In the case of the botanical garden that is being started on virgin land with some trees which were left during the preparation and design stage, such trees may provide some temporary shade.

The planting is done in such a way that plants are arranged according to their taxonomic relationships. Plants that may not survive seasonal changes are grown in the greenhouse. Such plants grown in the greenhouse are set outdoors as soon as the wether improves. Plants that can only do well in the shade are grown in the shade house. An area for research work should be reserved, and the right types of plants required for such work planted. Beds for experimental or research work have to be separated from other beds, even if they belong to the same taxonomic group. Materials for teaching may also be supplied from this area.

Pots could be provided for very small plants which cannot be grown on beds, and for flowers or plants for experimental work, especially those that

are meant to be grown in the greenhouse. There are various types of pots, some are biodegradable while others are not so. Those pots that are biodegradable are usually made from cardboard and when the plants grown in them are to be transplanted, such pots are buried in the soil where they later breakdown. Other types of pots are made of plastic, baked clay, or concrete (for the largest pots). The pots are made such that there is a hole at the bottom to allow for drainage. Some ornamental plants that are meant for corridors, or to be sold, are also grown in pots.

Plant Labels

The plants have to be labelled with Latin binomial, family name, origin and with other pertinent information. In labelling a sense of proportionality should be maintained. Small plants may have small labels in proportion to their size but large plants do not require very large labels. The labels should not be too conspicuous or obstructive.

The labels are usually made of wood, bamboo, zinc, sheet-iron or plastic. The labels may be hand-written, stencilled, printed, or engraved. They are then tagged onto the plants or put near them. It is not advisable to nail a label onto a plant. In the

tropics, labels made of wood or bamboo have to be treated otherwise they will be destroyed by termites. Sometimes it is necessary to paint metallic labels to avoid their being corroded.

Seats

In the tropical regions, seats are important parts of garden equipment. The seats have to be placed in positions which are commanding views, over looking terraces, spots of special interests or under shady trees. If the garden has got a pool then seats should also be located around it. It has been suggested that the ground underneath the seats be paved or gravelled.

The form of seats used varies. Some are plain wooden benches, while some elaborate cast-iron designs. Whatever their make, all seats should be painted at least once a year. The paint not only makes the seats attractive but also protects them, especially as they are perpetually outside, beaten by the rains, sun, etc.

Sources and Types of Plants

Some botanical gardens emphasise the flora of one geographical area and their researches are geared towards a specific field of botanical study, but many botanical gardens have broader objectives, and their

plantings include representatives from many parts of the world and a wide variety of habitat(Everrett, 1981). This partly depends on funds availability.

There are various ways of obtaining plants for a botanical garden. Plants and seeds can be obtained from other existing botanical gardens. Many botanical gardens have seed lists which list the types of seeds available. Requests can be made for some of such seeds and they are usually supplied. Such plants and seeds may be obtained from existing botanical gardens in one's country or from abroad. Another source of plants for a botanical garden are indigenous plants. These plants may be collected and incorporated. Agents are sometimes sent out on collection expeditions and the plants and seeds brought back are incorporated into the botanical garden. Many botanical gardens had sponsored expeditions which brought back seeds and plants specimens from all over the world, leading to the introduction of suitable, but previously unknown species in many countries. Example of such a garden is the Royal Botanic Garden at Kew.

Importation of plants is subject to quarantine regulations. The seeds when requested, are usually prepared in packets and are free of charge.

Different types of botanical gardens may emphasise one or more types of plants, depending on the purpose of a particular garden. There are, however, gardens

that are general in outlook, and the types of plants to be found are limited only by their availability and space within the gardens.

There is no rule regarding the number of plants to incorporate within any botanical garden. The number of species to be found may depend on the size of the garden, access to the plants, number and effectiveness of staff, and availability of funds. The largest botanical garden in the world in terms of size is the Holden Arboretum at Mentor, U.S. with an area of about 891 hectares. In terms of number of collections, the largest botanical gardens are the Royal Botanic Garden, Kew and the National Botanic Garden, Dublin (Ireland), each with 25,000 species and varieties (Avery, 1975).

Maintenance

It is not enough to establish a botanical garden. Maintenance is of prime importance. Some plants easily overgrow their boundary. Soil fertility may dwindle, unless maintained artificially. Pests and diseases may increase and infest the garden. Some plants may need to be harvested. The people entering the garden may need to be controlled, at least to some extent. Records about the garden need to be kept. New plants and seeds can be grown. If there are lawns,

they need to be maintained which may entail a lot of work.

But how are these tasks going to be carried out, and who are to do them?

Staff Needs

The most important and critical factor in any botanical garden is the human factor. The number and quality of staff needed depend upon the objective of the botanical garden, availability of resources, climate and the area to be cared for (Avery, 1975). The head gardener must be one with advanced horticultural training and experience. At least one of the gardeners should be a skilled propagator or nursery man.

Depending upon the objectives and resources of an institution, a general botanist, a taxonomist and a librarian may be employed. If the plant collections are large, a plant pathologist is essential. In a botanical garden with a teaching programme, teachers who could be full time or part time are necessary.

On the whole, a coordinator called the director or curator is essential for coordinating all the programmes of the botanical garden. If the garden is a private corporation, the director may be responsible to a board of trustees. In the case of a botanical garden affiliated with a university, the professor of botany or horticulture is often primarily

responsible; the garden is under his departmental control. Gardens that are supported by government usually operate under a director and advisory group.

However, small gardens may not need all the types of staff mentioned above. A director is essential for effective administration. Uneducated or partly educated personnel may be employed to do less specialised work, such as watering, pruning, , digging, etc. under supervision.

Garden Tools, Appliances and Supplies

In maintaining a garden, tools and appliances have to be supplied to be used by the garden staff. The garden tools and appliances commonly used include spades, forks, trowel, hoes, wheel barrows, secateurs, rakes, branch cutters, saws, watering cans, water. sprinkler, hedge trimmer, lawn mower, baskets, axes, hose pipes, water storage tanks, and budding knives.

In addition to the above, there is need for manure and fertilisers to be used to replenish the soil. Chemicals such as pesticides, herbicides and insecticides are needed for control of pests, weeds and insect pests. It is essential to guard against diseases and pests which could invade the garden at anytime. If the right chemicals are in stock, the spread of such diseases and pests may be checked at once; rather than waiting until later when control

may be more difficult.

Some plants in the botanical garden need more attention than others. Plants that are grown for ornamental reason may need careful pruning, lawns may also need seasonal mowing, On the other hand, a fernery, when well established needs little attention, provided that shade, a constantly moist atmosphere and shelter from strong winds are provided. If the climate is suitable, lawns may be a prominent feature of some botanical gardens and if properly maintained they may enhance the beauty of the gardens concerned, depending on the attention given to the lawns. The attention needed by lawns is not only in terms of mowing but also involves the control of destructive insects like termites, and regular control of weeds, either by hand weeding or herbicide treatment. Shrubs need pruning, especially those that are used for hedges, since they can easily overgrow. Shrubs and trees usually require systematic pruning, at not longer than two years intervals (Avery, 1975).

Records

Documentation in botanical gardens is important. One may like to know the orgin of the plants in a garden or where some of them go to. Information may be needed regarding the species being grown or the

number of species within the garden. The general public may want to know details of the history of the botanical garden and its plants.

Most of the well-organised botanical gardens have brochures to educate the public about the gardens. Such brochures may be free of charge or sold for appropriate fee. Such botanical gardens also have an Index Seminum which is helpful, especiallywwhen a request is received for seeds of a particular plant. The list is quickly checked to find out whether or not the seeds are available. The Index Seminum is normally despatched to other gardens to acquaint them with the type of seeds available, either annually or in alternate years. Record cards and card index are maintained, which are a catalogue of the type of plants in the garden. Some botanical gardens have maps of their gardens to serve as guides for visitors. An example of such a garden is the Uppsala Botanic Garden (Simons, et. al., 1975).

The index card for every collection planted in the garden are usually kept in boxes in alphabetical order, according to the name of the genera . Guide cards, which indicate the genera and are marked with their names and code number, are maintaned. The index cards are typed according to a model. If the plant dies or is rejected the card is excluded from the main index but held in archives for future information on plants

that were tried but difficult to cultivate. On the card, both the reason for and year of exclusion are noted. The text on the front of the card has to agree with the label, while on the back of the card the scienfic name with author is given, so also the origin of the collection, its locality and collector or the original donor garden and the year of acquisition. Whereever a later generation raised in the garden replaces the original collection such is noted as well as which generation it is. The existing generations are usually never mixed with newly accessioned material which is grown separately and recorded on its own individual index card.

Sometimes the preparation of the index seminum is done in conjunction with the institutions with which the botanical gardens are affiliated. The seeds collected from the gardens are prepared and stored and when requests for some of them are made they are despartched.

Funds

To run a botanical garden money is needed. The money is used to purchase garden tools, appliances, chemicals, pay salaries of garden staff and to pay per capital development and improvements, etc. A botanical garden may be supported by public funds, private endowments, or both. Public funds can be

direct, such as the direct government grants, or indirect such as institutional support which is indirect government grant. Private funds are nongovernmental. They may be accrued through private endowments, company endowments or foundation funds endowments.

Any botanical garden established by a government will be supported by public funds. Those botanical gardens that are independently established by private individuals are supported through endowments set up by wealthy individuals. Private colleges and universities that establish botanical gardens are privately supported and may receive financial assistance by organised, due-paying-membership groups or through endowment funds established on their behalf (Avery, 1975). Some botanical gardens have "friends" who subscribed to the gardens annually for which they may be entitled to some privileges such as free entry. An example of such a garden is the Ness Garden, Liverpool, which has some friends called "The Friends of Ness Garden" (Anon, The Friends of Ness Gardens, 1983).

Money can also be generated from the botanical gardens themselves through entry fees, sales of plants and produce from the gardens, running refreshment canteens Large botanical gardens publish technical journals and other books of general appeal and produce some films. All these can provide additional income for a garden. There may be a bookshop with books on gardening, pictures, post cards, etc.

which may yield some profits to be used for the betterment of the garden.

Rules and Regulations

Rules and regulations are usually publicly displayed. They may restrict or control the number of those who enter the garden without any valid reason, especially when entry fees are not charged. Those that enter the garden have to abide by the rules and regulations of the garden. For instance, there may be a rule that nobody should pluck any flower without being authorised; or people should not kneel or sit or lie on the lawns. The rules and regulations also help in keeping the garden in good condition. Some botanical gardens have warders, and caretakers who patrol the garden, check the behaviour of visitors, control pests and help people in difficulty, etc. Examples of such a garden are those of Kew, and Edinburgh.

Due to the different categories of people entering the garden, some rules may affect some categories more than others. For instance, if there is a rule that certain plants may not be touched or certain areas are not open to the visits by the public, but researchers may not be restricted in this way. Rare and endangered species may not be given out to other persons, but special access may be given to researchers or visiting scientists.

Botanical gardens often have certain periods or times during which they are open to the public. Such times are important, since other times may be used for research or other work within the gardens. Some botanical gardens are only opened to the public with the permission of the directors, for example, Chelsea Physic Garden, England, Such gardens do not have specified period of opening. Some other botanical gardens have opening periods which vary with the season; especially those gardens in temperate regions, for example, Kew Gardens are opened to the public 10 a.m. to 4 p.m. in Winter and 10 a.m. to 8 p.m. in Summer, every day. Some gardens remain open for the public from sunrise to sunset daily, for example, Indian Botanic Garden Calcutta. Other gardens, like the East African Agricultural and Forestry Research Organisation garden Kikuyu, Kenya, are opened to the public during all working days (Howard, et. al., 1963).

Miscellaneous

One botanical garden differs from another in details, size, etc. Some large botanical gardens have some bungalows or houses for the directors and possibly some of the other garden staff. Any botanical garden that incorporates a bungalow should have that incorporated in the design. Such a bungalow in some gardens serves a cardinal point so that other

features in the garden are fixed in relation to it. Special features and views should be commanded from the front verandah and windows of the bungalow.

Large botanical gardens that are associated with universities have herbaria, laboratories, libraries and sometimes schools attached. With a large number of books, a Librarian is required. Such botanical gardens involve larger numbers of staff in running the activities of the gardens. Some botanical gardens have museums, which are exhibition centres. An example of such a garden is the Royal Botanic Garden, Kew.

Problems Associated with Botanical Gardens

Due to differences in climate, soil conditions and location, the problems of one botanical garden may differ from those of others. The problems faced by botanical gardens in the temperate regions may not be the same as those of the tropical regions.

Generally, most botanical gardens have some pest problems. The soil may be inhabited by pests which have an adverse effect on the plants. Seeds that are not treated can easily be damaged by pests. Plant diseases are common in some gardens and need serious attention. This effect is more often felt in the tropics. Termites are common in the tropics; they can attack plants especially lawns, destroy wooden

fences and labels. Botanical gardens that are not properly fenced may have the problem of animals such as donkeys, goats, etc. There may be problems from rodents.

In some cases land shortage is a great problem. A garden may wish to expand but the space may be lacking.

Inadequate water supply limits the growth of some botanical gardens. This effect is more felt in a botanical garden that is situated too far away from the source of water and water has to be brought to the garden by tankers. This can be costly and is liable to interruption, giving irregular supply.

Shortage of funds affects the growth of many botanical gardens, especially privately owned gardens Some government owned gardens are sometimes hit by shortage of funds, depending on the economic condition of the government at any given time.

Not all kinds of soil are good for the growth of all plants. This may be a limiting factor since some botanical gardens will not be able to grow some plants which they may want to due to unfavourable soil. A ground that is water-logged may not support the growth of many species. The drainage pattern may not be effective and this may add to the problem. Treatment of the soil to meet the growth requirements of some plants may be costly.

Lack of trained manpower can limit the growth of some botanical gardens. The gardens may have all the

facilities needed to be effective, but without the technical know-how, there may be difficulties of establishment and maintenance. For a garden to be properly maintained, experienced, skilled workers in adequate numbers are essential.

MATERIALS AND METHODS

Materials

The materials used for the investigation were questionnaires. The reason for choosing questionnaires was that it was considered easier for questionnaires to produce the necessary information than for one to move from one state to the other, especially as the area being investigated was extensive. It was also considered that questionnaires would help reduce the amount of travelling one would do, as some of the questionnaires might be mailed to respondents. Also, it was thought that it would be easier for respondents to complete the questionnaires since they could do so at their own convenience, and would give enough time to provide objective and accurate responses by visiting their botanical gardens for information.

Methods

Two types of questionnaires were designed. One type was to be distributed to areas and places with Botanical Gardens, and this type of questionnaires was labelled QA. The other was intended for areas and places without Botanical Gardens and was labelled QB. One of the reasons for designing these two types of

questionnaires was that QA was expected to account for the problems or factors limiting the growth of Botanical Gardens in Nigeria, while QB was expected to reveal the reasons why there was a lack of Botanical Gardens in many parts of the country.

Sufficient questionnaires were produced to cover the areas that were chosen for the investigation. There were two methods used for distributing the questionnaires. One method was through personal visits to some of the areas. The other method was through correspondence. In the case of personal visits, the institutions or areas visited were given either questionnaire QA or QB as apropriate. In the case of correspondence, the two types of questionnaires were both despatched in envelopes, together with self-addressed, stamped envelopes. They were mailed to the institutions concerned. The self-addressed, stamped envelopes were to be used to return the completed questionnaires. The reason for enclosing the two types of questionnaire was uncertainty whether the institutions or areas had Botanical Gardens available. In such cases the correspondents were at liberty to fill and return either QA or QB.

The Sample

Biology or botany teachers of post secondary institutions were eligible to complete the questionnaires In the case of Botanical Gardens not attached to educational institutions, such as those established by the government or private individuals, the directors were eligible to complete the questionnaires. In the case of institutions with large Botanical Gardens under the charge of directors, the directors were eligible to be respondents.

The Questionnires.

The questionnires were designed to provide some particular information pertinent to Botanical Gardens in Nigeria. Some questions were provided with some options from which the respondents were expected to choose to answer the questions. Some questions, however, required direct answers from the respondents.

The questionaire, QA (see appendix I), required the participants or respondents to provide information about the following:

1. Number and qualification of particular garden staff.
2. Dimensions of the botanical garden
3. Purpose for the establishment of the botanical garden.

4. Types of garden tools available
5. How the garden was prepared
6. Factors limiting the growth of Botanical Gardens in Nigeria.
7. Maintenance of the garden
8. Sources of plants for the garden.
9. Sources of funds for the garden.

The other questionaire, QB (see appendix J), required the respondents to furnish the investigator with the following information:

1. Factors responsible for lack of Botanical Gardens in many parts of Nigeria.
2. Whether the particular institution was making effort or had in mind to establish a botanical garden in the near future.
3. The sources of funds for such a garden

The Data

The information provided by the biology teachers of post secondary institutions and directors of Botanical Gardens (respondents) through answering the questions in the questionaires, provided the data for the investigation. The responses were sorted out and the data tabulated accordingly.

Areas Selected for the Investigation

The choice of areas for the investigation was rather random, though in some cases it was influenced by nearness to the investigator. The states involved were Bendel, Bauchi, Lagos, Borno, Cross Rivers, Anambra, Ondo, Kwara, Kaduna, Gongola, Niger, Plateau, Benue, Kano , Sokoto, Oyo, Ogun and Rivers

Most of the states involved which are in the Northern part of the country were visited by the investigator as he distributed the questionaires, whereas communication with the states involved which are in the southern part of the country was by correspondence. The questionaires were sent to almost all the post secondary institutions and botanical gardens found in the chosen states, either through personal visits or by post.

RESULTS

The results of the investigation drawn from the questionaires are summarised below.

The results shown in tables I to Iv are drawn from questionaire QA, while that in table V from questionaire QB. Where it is not possible to tabulate the results, they are summarised against the number of the questions.

A total of thirty five (35) questionaires were returned to the investigator. Out of the thirty five (35), ten (10) were questionaire QA while twenty five (25) questionaire QB. The list of respondents to these thirty five questionaires are as follows:

QA

1. Advanced Teachers' College, Kano, Kano State
2. College of Education, Ekere-Ekiti, Ondo State
3. Advanced Teachers' College, Zaria, Kaduna State
4. C.A.S.T., Zaria, Kaduna State
5. University of Calabar, Calabar, Cross River State.
6. Ahmadu Bello University, Zaria, Kaduna State
7. Naraguta Parks and Garden, Jos, Plateau State
8. College of Education Jalingo, Gongola State
9. University of Lagos, Lagos State
10. Garden and Parks, F.A.T.C., Okene, Kwara State.

QB

1. Federal Polytechnic, Bida, Niger State
2. Federal Advanced Teachers' College, Bida, Niger State
3. Plateau Polytechnic, Barkin Ladi, Plateau State
4. Federal Advanced Teachers' College, Pankshin Plateau State.
5. Advanced Teachers' College, Azare, Bauchi State
6. School of Basic Studies, Makurdi, Benue State
7. Federal Polytechnic, Mubi, Gongola State
8. College of Preliminary Studies, Yola, Gongola State
9. College of Agriculture, A.B.U., Kabba, Kwara State
10. Sokoto University, Sokoto, Sokoto State
11. College of Education, Abraka, Bendel State.
12. University of Maiduguri, Maiduguri, Borno State
13. College of Education, Warri, Bendel State
14. Advanced Teachers' College, Katsina-Ala, Benue State
15. College of Education, Awka, Anambra State
16. University of Technology, Yola, Gongola State
17. Omu Aran High School, Omu-Aran, Kwara State
18. University of Technology, Bauchi, Bauchi State.
19. College of Agriculture, Jalingo, Gongola State
20. Federal Advanced Teachers' College, Yola, Gongola State

21. Kwara College of Education, Ilorin, Kwara State
22. College of Education, Oro, Kwara State
23. Institute of Agricultural Research and Training, Akure, Ondo State.
24. Advanced Teachers' College, Maiduguri, Borno State
25. University of Jos, Jos, Plateau State.

Table I: Analysis of Responses to Questionnaire QA: General Information

Question	Summary of Responses		
4	a) 30% of the botanical gardens were associated with universities. b) 60% were associated with institutions of higher education other than universities c) 10% were not associated with any institutions but with state government		
		No. of Staff	Percentage %
5	Total Staff	1 - 15	100
	Uneducated staff	0 - 9	45
	Primary school leavers	0 - 7	28
	Secondary School leavers	0	0
	University graduate staff	0 - 6	21
	Technical Staff	0 - 2	7

Question	Summary of Responses	
	Size	
6	Length	10 - 100m
	Breadth	10 - 84m
	Area	0.6- 7.6 hectares
7	a) 30% of the gardens had herbaria associated with them. b) 70% had no herbaria	
8	None of the gardens had ever produced a brochure	
9	None of the gardens was a private corporation	
10	None of the gardens had a board of trustees	
11	Total number of species collection ranged from 12 to 200	
12	Reasons for Establishment	Percentage(%)
	Ornamental	50
	Educational	70
	Recreational	20
	Conservational	20
	Medicinal	10
	Total	170

Question	Summary of Responses	
	Garden	Date of Establishment
13	Garden and Park, F.A.T.C. Okene	1977
	Lagos University, Lagos	1964
	College of Education, Jalingo	1979
	Naraguta Parks and Garden, Jos.	1970
	A,B.U., Zaria	-
	University of Calabar	-
	C.A.S.T., Zaria	1973
	A.T.C., Zaria	1979
	College of Education, Ikere-Ekiti	1977
	A.T.C., Kano	1969
14	The overall types of garden tools and appliances available were Rakes, shovels, spades, Hoes, Hand and Foot forks, water cans, sawing machines, wheel barrows, knives, pruning shears, baskets, ropes, tapes, pegs, pots, hose pipes, lawn mowers, sprinklers, cutlasses, Trowel, secateur, Hammers, Diggers, Trimmers, Chains, pans, and bowls.	

Question	Summary of Responses
15	a) 60% of the respondents traced the historical background of how their botanical gardens had come to being to the increasing interest in botanical studies; hence the botanical gardens were established to provide teaching materials. b) 20% of the gardens were established because of the needs for ornamental flowers. c) 10% of the gardens were established largely for tourist attraction. d) 10% of the respondents did not indicate the historical background of their gardens.

Table II: Analysis of Responses to Questionaire GA:
I- Preparation of Botanical Gardens

Questions	Summary of Responses
16	c) 90% of the botanical gardens chose their positions because of their proximity to the department of biology. b) 10% chose their positions because such positions were at the outskirt of the town and also had beautiful landscape.
17 and 18	a) 50% of the botanical gardens were started on virgin land and the plants existing there were destroyed or partially cleared. b) 40% of the gardens were not started on virgin land. c) 10% of the respondents did not give any response
19	a) 30% of the botanical gardens were started by getting a proper plan. b) 50% did not get any proper plan before starting. c) 20% did not give any response.
20	a) 60% of the botanical gardens had paths and walks. b) 20% had no paths and walks c) 20% gave no response

Questions	Summary of Responses
21	a) In 20% of the gardens lawns predominated b) In 80% lawns did not predominate
22	a) Wells were sources of water for 20% of the botanical gardens. b) 10% of the gardens had dams as sources of water c) 70% had taps as sources of water d) None of the gardens got water from an irrigation channel.
24	a) 70% of the botanical gardens initially added manure to the soil before planting b) 30% did not.
25	a) In 40% of the gardens temporary shade/ shelter from strong wind was initially provided. b) 30% did not provide shade/shelter initially. c) 30% did not give any response.
26	a) 30% of the gardens got their plants both within Nigeria and abroad b) 70% of the gardens had plants which were largely obtained within Nigeria.

Questions	Summary of Responses
27	The indigenous plants included in these botanical gardens varied from one garden to the other, both in number and kind. On the whole, those that were identified included: Elaeis guineensis, Adansonia digitata, Parkia clappertoniana, Ceiba Pentandra, Acacia seiberiana, A. nilotica, Borrassus aethiopum, Hyphaene theibaica, Albizzia lebbk, Mimosa species, banana, pepper, Bougainvillea, Vernonia amygdalina, Carica papaya Ocimum gratissimum, Talinum triangulare, Arachis hypogaea, Ficus sp. and Newbouldia, sp.
28	a) In 90% of the botanical gardens the plants were brought after the preparation of the ground. b) In 10% the plants were brought both before and after the ground preparation.
29	a) In 30% of the gardens there were drainage patterns which were natural for 10% and artificial for 20% b) 70% of the garden had no drainage pattern.

Questions:	Summary of Responses
30	a) 90% of the gardens had fence/hedge, 10% had hedges made of ornamental plants while 80% had fences made of wire, either barbed or mesh. b) 10% of the gardens had no fence/hedge.
31	Only 10% of the gardens had latrines for visitors while 90% had none.
32	a) 40% of the respondents indicated that there were seats (made of wood and metal) for visitors in their gardens and these were located either at the base of shady trees or in picnic areas. b) 60% of the gardens had no seats for visitors.
33	a) 70% of the gardens had pot-plants. The pots, made of clay or plastic, were purchased within their localities. b) 30% had no pot-plants.
34	a) 40% of the botanical gardens sold potted plants and/or cuttings with annual income varying from ₦20 to ₦200, though some did not indicate their annual income. b) 60% of the garden did not sell any potted plants or cuttings

Questions	Summary of Responses
35. and 36	a) 6 of the gardens pruned their shrubs and trees ranging from once a year to monthly. None, however, indicated mowing lawns. b) 4 did not prune their shrubs, trees nor mow lawns.
37	a) 2 of the gardens had houses for the garden staff outside the garden. b) 8 had no houses for garden staff.
38	None of the gardens had a library.
39 and 40	a) 4 of the gardens had green houses with the number ranging from one to three. 3 had shade houses. b) 6 had no greenhouses but out of this 6 , 1 had shade houses.
41	a) Only 1 of the gardens provided teaching programme for adults and children, and had a full time teacher for that. b) 9 did not provide any teaching programme.
42	a) Only 1 of the botanical gardens had ponds for cultivation. b) 9 had no ponds.

Table III: Analysis of Responses to Questionaire QA. II-Limiting Factors and Reasons for Lack of Botanical Gardens.

Options	% Frequency of Choice (Questions 43 - 44)		
	43	44	
A	40	40	Inadequate trained manpower
B	20	10	Shortage of land
C	40	30	Inadequate water supply.
D	30	10	Difficulty in importing plants.
E	10	0	Because only local plants varieties are available.
F	70	40	Lack of funds
G	0	20	Botanical gardens do not yield any profit in terms of money.
H	0	10	Because fencing is a great difficulty.
I	10	0	Our soil does not support foreign plants.
J	20	0	Too many pests
K	10	50	Members of our society do not value botanical gardens in any way.
L	10	50	There is no public awareness of what a botanical garden is or can do.
M	0	10	There are more problems than botanical gardens but require money.
N	10	0	The climate does not favour the growth of some plants that are a necessity to botanical gardens.

OPTIONS	% Frequency of Choice (Question 43 - 44) 43	44	
P	10	10	Soil erosion
Q	0	10	Plants dying off due to heavy rains which cause the ground to become water-logged.
R	30	0	Lack of garden tools
S	0	0	It is difficult to label plants.
T	0	0	Earthen pots easily get broken, and the plastic types are difficult to get.
U	10	0	Constant presence of termites, destroying fences.
V	0	0	Too many requests for our quality plants.
W	10	0	Lack of ideal garden plan.
X	0	0	[illegible] of [illegible] learning specially university
Y	10	0	Lack of greenhouse
Z	10	0	Lack of shade-house.

45. The presence of animals like goats and sheep was mentioned in one case as a limiting factor to the growth of the botanical garden.

Table IV: Analysis of Responses to Questionaire 'A: III-Management and Maintenance.

Questions	Summary of Answers
46	a) Along lines of classification b) In terms of genus and species c) In terms of families or on family basis.
47	a) Use of insecticides, pesticides - chemical. b) Destruction of affected plants
48	a) 3 of the gardens had all their plants labelled b) 5 had only a few plants labelled c) 2 gave no response.
49	a) Family, generic and specific names, when and where they were collected. b) Family, class and local names. c) Generic, specific names, locality, habitat, e.g. paw-paw (Carica papaya, Zaria, Savanna) d) Date, name of plant and family e) Generic and specific names only f) Name of plant only g) Generic, specific and common names.

Questions	Summary of Answers
50	a) 4 of the garden had labels made of wood. b) 2 had labels made of metal. c) 1 had labels made of plastic d) 1 had labels made of metal and plastic e) 2 gave no response.
51	a) 4 of the gardens designated their plants by families. The families represented varied from one garden to another. Examples of families represented included Malvaceae, Rubiaceae, Meliaceae, Apocynaceae, Palmae, Sapindaceae, Papilionaceae, Mimosaceae, Caesalpiniaceae, Acanthaceae, Gramineae, Dioscoreaceae, compositatae, Amarantaceae, Moraceae, Convovulaceae, Basellaceae. b) 4 didnot designate their plants by families. c) 2 gave no response.
52	a) 5 of the gardens had plants which were both imported and local. b) 4 had plants which were largely local c) None of the gardens had plants that were mainly imported.

Questions	Summary of Answers
53	a) 6 of the respondents indicated that they gave out some of their plants/ seeds on request. In the case of plants they were given out mostly with the pots in which they were planted, while seeds were dried and dressed or treated before being sent out. b) 3 indicated that they did not give out some of their plants/seeds on request. c) 1 gave no response.
54	None of the gardens had ever produced an Index Seminum.
55	a) 2 of the respondents indicated that there were rare and endangered or threatened plants within their gardens and that these were brought into cultivation by seeds or grafting. b) 8 had no such plants.

Questions	Summary of Answers
56	a) 6 of the botanical gardens were financed by the institutions with which they were associated. b) 1 was financed by state government and sales from the produce of the gardens c) 2 indicated that they had no financial support (It is assumed that the gardens were paid for by the associated institutions.)
57	None of the gardens charged any fee when the public visited it.
58	á) 7 of the gardens had no set of rules governing them b) 2 of the gardens had some set of rules but such were not displayed for public. Example of such rules were: Don't remove flowers without authority; Don't litter. No shooting; No entry without permision.

Table V: Replies from Institutions without Botanical Gardens.

Options	% Frequency of Choice 1	
A	0	Botanical gardens are not so important.
B	40	We have problems of greater significante that need our money than botanical gardens.
C	8	We do not know what botanical garden is or what functions it performs.
D	12	Shortage of land
E	20	We are sure that we shall not be able to manage a botanical garden, therefore, we forget about it.
F	0	We do not derive any benefits from botanical gardens.
G	4	We do not want to get into the trouble of importing plants.
H	8	We cannot start a botanical garden since water is in short supply.
I	8	We don't have a university, therefore there is no need for a botanical garden.
J	28	Our university has just taken off, therefore we shall think of establishing a botanical garden soon.
K	40	We do not have trained manpower to man a botanical garden.
L	8	Our soil condition is too poor for foreign plants.

Options	% Frequency of Choice 1	
M	0	It is nonsense to have a collection of plants.
N	16	The idea of botanical garden is good, but we do not have time for that now.
P	8	The climate here is quite unfavourable for botanical gardens
Q	0	Botany is not one of the criteria for establishing this institution
R	32	We should have established one, were it not for the present austerity measures.

2. Other factors contributing to lack of botanical gardens that were indicated included:
   a) Lack of interest and public awareness;
   b) Lack of knowledge of how to go about establishing a botanical garden;
   c) Young age of some institutions;
   d) Lack of funds;
   e) Lack of encouragement from the authorities concerned; and
   f) Institutions still at temporary sites.

II:

1. All 25 respondents gave affirmative indications to establish botanical gardens in the near future.

2. Regarding the sources of funds, some indicated that they would rely on their institutions, while others on Federal, State or Local Governments. However, out of the respondents, two had indicated that they would like to establish private botanical gardens as soon as money was available.

3. As regards when to start the botanical gardens, the replies were variable. One institution had started but had not yet completed the garden. Some were positive that they would start within the 1982/83 session, while some would like to start in two-three years' time, and some were not certain. In one case, the botanical garden would be started as soon as land was available. The most prevailing problem was that most of the institutions concerned were still at their temporary sites, and they would like to establish their botanical gardens as soon as they moved to their permanent sites.

DISCUSSION

Areas With Botanical Gardens

Historically, the establishment of botanical gardens in Nigeria is of recent origin. From the data gathered, it has been shown that botanical gardens were established in Nigeria within the twentieth century. The earliest botanical garden in Nigeria, according to the data (see table I) was that of Lagos University, Lagos, established in 1964, compared to that of Pisa (the oldest in Europe) which was established in 1543.

Most of the botanical gardens within the area investigated, traced their historical background to the increasing interest in botanical studies which gave rise to the need for botany teaching materials, and consequently the need for collection of living plants (botanical gardens). This development was possible because prior to this period (1964-83) there existed a sufficiency of knowledge about plants and their maintenance for scientific studies. This case is contrary to the origin of botanical gardens in other parts of the world, where the rise to botanical gardens was not related, on the whole, to the supply of educational materials to support teaching programmes.

The development of botanical gardens in Nigeria, in terms of functions, was similar to that of any other part of the world. The functions of the

botanical gardens depended upon the purpose for their establishment. In Nigeria, the botanical gardens that were established largely for educational purposes, emphasised, mostly, provision of teaching materials. Botanical gardens as a research institution and for public enlightenment were not emphasised in Nigeria.

There were other reasons for establishing botanical gardens in Nigeria. These included provision of ornamental plants (e.g. Naraguta Parks and Gardens, Jos), the provision of recreational ground (e.g. Naraguta Parks and Gardens, Jos), the conservation of some plant species (e.g. A.B.U., University of Calabar, and C.A.S.T., Zaria. Botanical Gardens) and in some cases display of medicinal plants (e.g. A.B.U. Botanical Garden). These reasons are also common with those of other botanical gardens of the world.

Some of the botanical gardens in Nigeria were associated with universities (e.g. A.B.U., University of Calabar and A.T.C. Zaria, Botanical Gardens), while a greater percentage were associated with institutions of higher education, other than universities; for instance, the botanical garden in Jalingo College of Education is associated with that institution, so also other colleges of education, some Advanced Teachers' Colleges, schools of Basic studies/

Colleges of Preliminary Studies, and Polytechnics. Some of the botanical gardens linked with universities had associated herbaria, namely, A.B.U. and A.T.C., Zaria Botanical Gardens. Those botanical gardens linked with institution of higher education other than universities, and the few that were owned by State Governments, did not have herbaria. Botanical gardens established through private endowment funds tended to be lacking in Nigeria. The reason for most botanical gardens being associated with other institutions of higher education rather than universities, may be due to the smaller number of universities in the country, compared to that of other institutions. The Nigerian governments did not seem to contribute directly to the development of botanical gardens in the country. This may be due to lack of knowledge on the part of those in government, of what botanical gardens are and what can be achieved through them.

The botanical gardens in Nigeria tended not to be very extensive both in size and in number of collections. The highest number of collections of species and varieties in the gardens investigated was 200 (Lagos University), compared to 25,000 found in Royal Botanic Gardens, Kew. In terms of area, the largest botanical garden in Nigeria (that of Lagos

University, Lagos) had an area of 1.6 hectares, compared with 891 hectares of Holden Arboretum, Mentor, U.S.A. None of the botanical gardens investigated had any board of trustees. They had never produced a brochure or index seminum. Brochures and index seminum sometimes enlighten the public about existence and some activities of botanical gardens. For instance, one may not be aware of the existence of a botanical garden or its functions, purposes and needs; but if he finds a brochure about such a garden, he may be enlightened.

Staff Needs

The categories of staff found in the Nigerian botanical gardens were:

i) Illiterates

ii) Primary school leavers

iii) University graduates, and

iv) Others, such as technical staff.

The overall number of staff, according to categories, has shown the illiterates or uneducated to predominate (see Table I, question 5). In the gardens where university graduates were found, most of them were lecturers in the associated departments of biological sciences. There were quite a number of primary school leavers, but very few technical staff (only in two gardens).

For the botanical gardens to be worthy of their names, management must be effective. To manage effectively training is essential, but most of the botanical garden staff in Nigeria were found to be illiterates or semi-illiterates. The lack of manpower with the right type of skills is probably the major limiting factor to the growth of botanical gardens in Nigeria. This calls for the need for training. It has been indicated in most of the Nigerian botanical gardens sampled that some or most of their plants were not labelled because of lack of identification. This may partly be attributed to the high illeteracy rate among the majority of the garden staff. There is need for manpower planning so that in the fuiure there may be required trained personnel to man the Nigerian botanical gardens.

In many botanical gardens in the world, research work is being carried out, and this has led to improvement in the botanical gardens concerned and sometimes to improvement in agricultural output. In Nigeria, there is a need for the botanical gardens to have research workers to contribute to the improvement of the botanical gardens as well as agricultural output in the country.

Preparation

Most of the botanical gardens that reponded were established at locations considered suitable. The suitability was in terms of functions or purpose. Those botanical gardens that were associated with institutions of higher education, and had education as the main purpose, chose their sites of location on the basis of proximity to the departments of biological sciences. Those gardens that were largely established by the state governments and were ornament-oriented chose sites that were at the outskirt of the towns and had beautiful landscapes. This may have been with a view to later expansion, since there may be more land at the outskirts of towns.

Most of the gardens were started on virgin land, and in some cases the vegetation existing in such land was completely destroyed, while in others some of the vegetation, especially trees, was left to provide temporary shade or shelter from strong wind, prior to planting. The practice of leaving some trees to provide shade or shelter from strong wind has been the usual practice in other parts of the world also, where botanical gardens have been started on virgin lands.

The majority of the botanical gardens in Nigeria were started without getting a proper design or plan.

In the ... botanical gardens part of the laying out is usually according to the scientific relationship of their plant collection. It is important to get a sketch or diagram on paper and to work according to a pre-determined plan so that the correct arrangement may be maintained. Without having a design at the beginning, proper organisation and development may be difficult. The lack of a proper plan initially, perhaps, has contributed to the seemingly poor organisation and poor arrangement of many Nigerian botanical gardens. For instance, if plants were not planted according to their scientific relationships but haphazardly, it would be difficult to have an organised garden with the required labels, etc.

Paths or walks were not common in most of the botanical gardens investigated. The major or prevailing reason given by most of the respondents was that their gardens were so small that paths and walks could not be introduced. In some of the botanical gardens (e.g. Naraguta Parks and Garden, Jos, Lagos University and Ahmadu Bello University Botanical Gardens), avenues and paths were provided. Gardens that are small may still have paths proportional to their size. The lack of paths in most of the botanical gardens may likely be attributed to lack of proper

plan availability. It was observed that most of the botanical gardens without paths and walks, (e.g. A.T.C Kano and College of Education, Ikere-Ekiti, Botanical Gardens) were those that did not get any landscape architectural plan.

After digging and levelling of the ground or order beds, most of the botanical gardens investigated indicated that manure was initially added to the soil before planting out. This practice is important in soils that have declined in fertility due to usage or erosion.

Very few of the botanical gardens investigated took into consideration drainage patterns. They artificially provided such, or the drainage patterns were there naturally. The location of a particular garden may or may not require a drainage pattern. Botanical gardens located in water-logged or slopy areas or where there is erosion may require drainage patterns.

All the botanical gardens investigated had some sources of water for their plants. In most cases the source of water was pipe borne. Some of the botanical gardens had reservoirs for storing water to be used during scarcity. Other sources of water included sunk wells. Whatever the source of water

may be, it is necessary to have some form of water storage facilities, for example, in the form of overhead tanks or artificial ponds, to be used during scarcity or irregular supplies.

Almost all the botanical gardens investigated had fences. Very few of them, however, had hedges made of ornamental plants. For example, those of Lagos University and University of Calabar. Most of the fences are made of barbed wire, or wire mesh to which poles were attached to give support. Attention must be given to fencing, otherwise damage or destruction may be done to botanical gardens as rodents and other animals, including unauthorised human beings, may have access to the garden. Fencing may be a limiting factor to the growth of botanical gardens.

The plants for the botanical gardens were obtained through many sources. Most of the gardens obtained their plants largely within Nigeria. Such plants were obtained from other existing botanical gardens within the country, or through collection expeditions within the country. These methods were used by University of Calabar and College of Education, Ikere-Ekiti Botanical Gardens. University of Calabar indicated that it obtained some of its plants from:

a) University of Ife, Botanical Garden.

b) University of Ibadan Botanical Garden; and

c) Locally from the bush around Calabar.

College of Education, Ikere-Ekiti, indicated as sources of its plants:

a) University of Ife Botanical Garden, and
b) Idanre Hills.

However, some of the botanical gardens, like those of Lagos University, Naraguta Parks and Garden, Jos, and A,B.U. indicated that their plants were obtained both locally in Nigeria and from abroad. The plants that were imported were mainly in form of seeds. Requests were made to the botanical gardens concerned (abroad) and seeds were prepared in pockets and were sent to them, or agents were sent from Nigeria to the overseass country concerned to make requests and to bring back seeds. In few cases, such as those of A.T.C. Kano, students often brought back plants/seeds, whenever they went on excursion, which were also grown in the botenical garden.

In most of the botanical gardens investigated, the plants were brought after the preparation of the ground. It is usual to bring plants after the preparation of the ground. This will reduce losses of plants through drying out, as opposed to when plants are brought before the ground is prepared. Seeds may be brought before or after, since they are in dormant stage they can survive longer, but this is not true with seedlings.

The next stage is the planting out of the plants so brought. Botanical gardens, such as those of A.B.U., University of Calabar, Naraguta Parks and Gardens, etc, arranged their plants along the lines of classification, that is, according to families, in beds. Arranging plants this way may give some sense of order to the botanical gardens; labelling of plants may be easier, and it will be easier for visitors to the gardens to locate specific beds of interest to them.

The plants that have been planted have to be labelled for identification. Most of the botanical gardens investigated had only a few of their plants labelled. Some of such gardens included those of Naraguta Parks and Garden, University of Calabar, A.T.C., Kano, A.T.C., Zaria, and College of Education, Jalingo. In some cases, the details given on the labels did not follow the scientific principle of labelling plants. An example of such poor labelling was found in Collged of Education Jalingo, Botanical Gardens where the plants were labelled only with their names. A properly labelled plant should have Latin binomial, family name, origin and other pertinent information. Most of the gardens (40%) had labels made of wood, while a few (20%) had labels made of metal. It seems local materials were emphasised. This is encouraging. It is not necessary to depend all the time on imported

materials. So in these botanical gardens, labels are not a limiting factor but labelling is. The problem of labelling may be related to lack of trained manpower.

The majority of the botanical gardens did not provide any seats for visitors. The reason for this may not be unconnected with the functions of the gardens concerned, and probably their smallness. Since most of the botanical gardens were concerned largely with provision of materials for educational purposes, they considered seats of less importance. Some botanical gardens (eg. Naraguta Parks and Garden) had seats for visitors. Such gardens were mostly recreation and/or ornament-oriented in their purposes of establishment. Some people like to relax in botanical gardens, since they are usually quiet places. If seats are provided they add to the enjoyment of the botanical gardens. The seats were largely made of wood and metal. These seats in some of these botanical gardens were located under shady trees and picnic areas (as in Naraguta Parks and Garden, Jos).

Green houses were lacking in most (60%) of the botanical gardens. Certain plants need to be grown in controlled environment, such as that of the greenhouse. In the majority of the botanical gardens (70%)shadehouses were lacking. Their absence means

that plants that grow only under partial shade cannot be cultivated in such botanical gardens. Green houses and shades houses are additional facilities which, if developed by botanical gardens, may increase the range of plants that can be grown.

Common also in botanical gardens are potted plants. In most of the Nigerian botanical gardens i potted plants were found. Most of the plants that were grown in pots were ornamental flowering plants. Most of the plants that were introduced into the green houses were planted in pots. The pots were purchased from local markets or local potters. They were made of clay or plastic, and in A.B.U. Botanical Garden half-drums were used as well. In case where potted plants were sold, they were sold together with the pots.

All the botanical gardens investigated contained some indigenous plants. Those botanical gardens that did not import plants from abroad (e.g. University of Calabar, and College of Education, Ikere-Ekiti), had collections which were mainly indigenous.

Conservation is an important aspect of many botanical gardens. Plants that are endangered or threatened are prevented from becoming extinct by cultivating them in botanical gardens, from where they may be distributed to other gardens, and if in great

number, the wild may be restocked. In Nigeria, only a few botanical gardens (e.g. University of Calabar, and C.A.S.T., Zaria) served this purpose. These gardens indicated that they brought the endangered or threatened species into cultivation by means of seeds.

Lawns are usually most conspicuous in most of the botanical gardens of the world, especially in the gardens that are meant for tourist attraction. Lawns enhance the beauty of botanical gardens. In Nigeria, generally, lawns tended to be lacking. The lack of lawns may be related to the functions of the gardens. In Nigeria, botanical gardens established for tourist attraction tended to be lacking, therefore, beauty was not of prime importance to the Nigerian Botanical gardens, hence the lack of lawns. The few gardens that had tourist attraction as one of their purposes (e.g. Naraguta Parks and Garden), probably did not have lawns predominating because of the difficulty involved in maintaining lawns. Nigeria is a tropical country, and the presence of termites may be a problem to lawns.

Maintenance

To maintain a botanical garden, tools and appliances are needed. Trees and shrubs need to be pruned, lawns have to be mowed, the plants have to be watered, ripe fruits picked, the soil needs to be

maintained, and so on. Most of the botanical gardens in Nigeria had some basic tools and appliances. Since tools and appliances were not in short supply they did not pose any problem. The problem was whether or not the garden staff used the tools and appliances to achieve the goals for which they were supplied. Most of the respondents indicated that they pruned their shrubs and trees, ranging from monthly to annually. Among the areas that indicated that they had lawns, only Lagos University indicated that it mowed them. There were some botanical gardens (eg, C.A.S.T., Naraguta Parks and Garden) that indicated that they neither pruned their shrubs and trees nor mowed their lawns. This shows that there is inadequate maintenance of some botanical gardens.

All botanical gardens are susceptible to attack by pests and diseases. The degree of attack may be dependent on the locality or environment. Some pests and diseases may only be tropical while some temperate. Because of the warmer climate of the tropics, there tend to be more pests; insects are more abundant in the tropics than in the temperate regions. Some of the pests may be migratory in nature, for example, the migratory locusts. For a botanical garden to thrive well it has to combat these pests. The botanical gardens in Nigeria used two methods to combat pests

and diseases: application of chemicals, and destruction of affected plants (in the case of diseases).

Another aspect of the maintenance of botanical gardens is finance. Chemicals, tools, appliances, etc. have to be bought. The garden staff have to be paid, etc. Funds for botanical gardens elsewhere are usually got through private endowment funds, government support, and sometimes through other activities of the botanical gardens. In Nigeria, it was found that most of the botanical gardens are financed by the institutions with which they are affiliated. Quite a negligible number of botanical gardens (from the gardens investigated, only Naraguta Parks and Garden) in Nigeria were financed directly by the State government. Some botanical gardens, like those of A.B.U., Naraguta Parks and Garden, and University of Calabar, obtained some income from sales of the produce of the gardens, which were used for maintaining the gardens. In most parts of the world, botanical gardens have been supported by governments. In Nigeria, however, the governments are yet to realise their role in the development of botanical gardens.

Some botanical gardens of the world for example, Royal Botanic Gardens at Kew, charge certain fee when members of the public visit them. The fee is just to help limit the number of visitors to the gardens,

especially those who do not have any genuine reason to enter the garden. The fee is usually small, for instance, in the case of Kew, only one penny (One Kobo) was charged. In Nigeria, none of the botanical gardens indicated that it charged any fee. The reason for this, perhaps, may be due to the fact that not many people in Nigeria care to visit botanical gardens.

Botanical gardens, as an institution need rules and regulations. If these rules are displayed for the public to read, visitors to the gardens may abide by them for the smooth running of the botanical gardens. Visitors to the botanical gardens need to know the required pattern of behaviour while in the gardens. Most of the Nigerian botanical gardens did not have any set of rules governing them. This may be attributed, perhaps, to the fact that very few people in Nigeria cared to visit some of these botanical gardens, therefore there was no need for rules. The few botanical gardens (C.A.S.T, A.B.U., and A.I.C. Kano) that claimed to have some set of rules governing them indicated that such rules were not displayed for the public to read.

Generally, botanical gardens in Nigeria were not used to provide teaching or training programmes for adults and children. In some botanical gardens

of the world, teaching or training programmes are provided; either full-time or part-time teachers are employed for that purpose. An example of such a botanical garden is that of Kew, where diploma courses in horticulture are offered.

In Nigerian botanical gardens, publications were lacking. Most of the botanical gardens of the world have some form of publications. Such publications may include Index Seminum, descriptive notes, guide to the gardens, postcards, annual reports, etc. From the data gathered, none of Nigerian botanical gardens produced any of the above. This effects efficiency of the gardens. For instance, if a particular species of plant had been tried in a particular garden and it did not cultivate well, and there has been no record to show that such a plant had been tried but failed, other garden workers may later duplicate the work, which will amount to waste of time and effort. Also, researchers or later botanical workers may like to know the sources of plants within a particular garden and this will be difficult without records. Most of the botanical gardens investigated indicated that they gave out some of their plants or seeds on request. Some, however, indicated that they did not. Such attitude will restrict the value of botanical gardens

in Nigeria. Botanical gardens in other countries usually give and receive plants and seeds on an exchange basis with other botanical gardens.

Problems

Botanical gardens in Nigeria have some factors which act as hinderances to their growth. The limiting factors may vary from one garden to another.

From the study carried out, the most critical factor directly inhibting the growth of botanical gardens in the country is lack of funds. The shortage of funds may be attributed to lack of proposals from the botanical gardens to the governments, so that the governments may render support. The decision-makers of the country may be ignorant of what a botanical garden is and what its functions and purpose, and needs are. But if a proposal is submitted, there may be some responses from the Government. Wealthy private individuals in Nigeria also have not yet contributed towards the welfare of botanical gardens, probably because of lack of knowledge of what botanical gardens are or what they could do. There has not been any record that any of the Nigerian botanical gardens has launched an appeal to raise funds for its maintenance. Such an appeal sometimes may be necessary because the public

may not know there have been in existence botanical gardens, and what their goals and problems are.

Other limiting factors of great importance are inadequate trained manpower, and inadequate water supply. Lack of trained manpower may be a limiting factor of greater gravity than funds. This is because manpower manages everything, including money. There may be money available but it may be mismanaged and the problems of the gardens will not be solved. Some botanical gardens of the world have garden staff specialising in different areas, such as plant systematics, ecology, pathology, specialised groups such as ferns, orchids, etc. In such botanical gardens there is a division of labour, and this often leads to greater efficiency. In Nigeria there is great need for trained manpower to man the botanical gardens. The problem of water may be difficult to solve in some cases. This may be tied to the problem of funds. If the source of water is far from the gardens, pipes have to be laid and these cost money. Wells may be dug in some cases, but their water supply may be limited, especially at times of water shortage. Water is a critical factor in the lives of plants and other living organisms. Where it is in short supply, success can not be achieved when trying to grow plants.

In some botanical gardens, lack of garden tools and difficulty in importing plants were considered as limiting factors. In some other botanical gardens shortage of land, pest problems, lack of ideal garden plan had been indicated as limiting factors to the growth of botanical gardens. Other factors that were considered by respondents to be hinderances to the growth of botanical gardens included the availability of only local plant varieties, the nature of the Nigerian soil not supporting some foreign plants, members of the society not valuing botanical gardens, climate being poor for some essential plants, soil erosion, lack of greenhouses and shadehouses, and presence of termites. Careful study of these alleged hinderances will, however, often reveal how they can be overcome.

The study shows that there are a great variety of factors allegedly limiting the growth of botanical gardens in Nigeria, but none of the factors is universal to all the botanical gardens. Some factors, such as lack of funds, may limit the growth of most botanical gardens. There were some factors that were universally considered not limiting factors to the growth of Nigerian botanical gardens. These included botanical gardens not yielding monetary profit, water logging of the

ground, use of earthen pots being fragile, too many requests for quality plants, and absence of institutions of higher education.

Regarding why botanical gardens were lacking in many parts of Nigeria, the greatest reasons were that members of the Nigerian society did not value botanical gardens and lack of public awareness of what botanical gardens were and what they could do. Other important reasons given were inadequate trained manpower and lack of funds. In some few cases, reasons such as inadequate water supply, botanical gardens not being profit-oriented, shortage of land, difficulty in importing plants, fencing difficulty, presence of other problems of greater significance, and soil erosion were indicated as contributing to lack of botanical gardens in Nigeria.

Areas Without Botanical Gardens

When the investigation was carried out, it was discovered that there were far more areas without botanical gardens than those with botanical gardens (see list of respondents in pages 43-45). From the feedback received through the questionaires, the number of QB questionaires received were two and a half times that of the QA questionaires.

The respondents gave several reasons for lack of botanical gardens in their parts of Nigeria. The most common reasons were lack of trained manpower and lack of funds. Quite a significant proportion of the respondents indicated that the present austerity measures were the reasons for their being unable to establish botanical gardens. Other reasons given for lack of botanical gardens were the problems of how to manage a botanical gardens(this is also tied to the lack of trained manpower), poor climate, poor soil condition for foreign plants, lack of universities within some localities, shortage of water, ignorance about what botanical gardens were or could do, shortage of land, problem of importing plants, young age of some institutions, and lack of time.

Other respondents, indicated that lack of interest and public awareness and lack of encouragement from the appropriate authorities contributed immensely to the lack of botanical gardens in many parts of Nigeria. A large proportion of the respondents attributed their inability to establish botanical gardens to their institutions still being at their temporary sites.

All the respondents would like to establish botanical gardens in the near future, provided funds were available and other limiting factors were reduced to minimum. In most cases, they relied on the governments or their respective institutions to provide

the funds. There were a few who indicated that they would like to establish private botanical gardens, for which they would be solely responsible. These few would start, as soon as they were ready.

Conclusion and Recommendation

The survey of botanical gardens in Nigeria has shown that there are several problems limiting their growth. Also there are many parts of Nigeria that do not have botanical gardens.

For botanical garden in Nigeria to function properly through proper maintenance, and for more of such gardens to be established, especially in areas where they are lacking, trained manpower is needed. This calls for manpower planning. With trained manpower such gardens may incorporate research activities which may lead to improvement of gardens as well as agricultural output in the country.

It is important that the governments of Nigeria get involved directly in establishment and maintenance of botanical gardens. The various institutions should endeavour to enlighten the public as well as the decision-makers of the governments on what botanical gardens are all about and what they can do, and also make their problems known. By so doing some wealthy private individuals as well as the governments may

render support for establishment and maintenance of such gardens by providing funds, and land in some cases. Also, appeals may be launched from time to ttime to raise funds for the maintenance of the gardens. If the public is well informed about botanical gardens, some wealthy private individuals may be encouraged to established private botanical gardens, which are greatly lacking in Nigeria at present.

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APPENDIX I

QA

DEPARTMENT OF BIOLOGICAL SCIENCES
AHMADU BELLO UNIVERSITY, ZARIA

Date: _____

Dear Sir/Madam,

BOTANICAL GARDEN SURVEY

I wish to request for your participation in this investigation. This research is undertaken as part of the fulfilment of a Master's degree programme in the Department of Biological Sciences.

I shall appreciate frank and honest responses from all participants to enable me to evaluate accurately and assess realistically the problems of botanical gardens in Nigeria, or why there are no botanical gardens in many parts of Nigeria.

It is not my purpose to indulge in criticising gardens, nor those who are involved in their management, but rather to investigate the problems so that in the future Nigeria may have a greater number of high quality Botanical Gardens.

Please, complete either questionnaire A (QA) or questionnaire B (QB) and return to me.

Yours faithfully,

Jeremiah Danbeki

GENERAL INFORMATION

1. Name of the Botanical Garden _____

2. Locality _____

3. State _____

4. Indicate the university to which the Botanical Garden is attached _____

5. Total number of staff _____

6 Indicate number of staff in each category:

Uneducated _____

Primary School leavers _____

Secondary School leavers _____

University graduates _____

Others _____

6. Size of the Garden: Length_____ Breadth _____

Area _____

7. Is there any herbarium associated with the Garden?

_____

8. Is there any brochure for the garden?___ _____

9. Is the Garden a private corporation?_____

10. Is there any board of trustees for the garden_____

11. Total number of plant collections (number of species)

_____

12. The purpose(s) of the garden is:

a) Ornamental

b) Educational

c) Recreational

d) Conservational

e) Medicinal

13. Date of establishment of the Garden _____

14. Types of Garden tools available:

_____

_____

_____

15. A brief historical background of what led to the establishment of the Garden: _____

_____

_____

_____

I. Could you give information about how the Garden was prepared by answering the following questions:

16 Why was the present position (location) chosen for the Garden? _____

17. Was the Garden started on virgin land? _____

18. If on virgin land, what was done to the vegetation existing there? _____

_____

19. Was the Garden started by first of all getting a proper plan? _____

20. Are there paths and walks? _____

21. Do lawns predominate? _____

22. The source(s) of water for the Garden is:

a) Wells

b) Dams

c) Taps

d) Irrigation channels

e) Some other source (Give details) _____

23. How many taps, or and wells are there in the Gardens_____

24. Was manure (chemical or organic) initially added to the soil before planting?_____

25. Initially, was temporary shade/shelter from strong wind provided before planting?_____

26. Where were the sources of plants for the Garden?

_____

_____

27. What indigenous plants were included in the Garden?

_____

_____

28. Were the plants brought after or before the preparation of the ground?_____

29. Is there any drainage pattern?_____

Natural or artificial? _____

30. Has the Garden got any fence/hedge?_____

Of what is it made?_____

Give details of fence/hedge_____

_____

_____

31. Are there latrines/toilets for visitors?_____

32. Are there any seats for visitors in the Garden?

_____ Where are they located?

33. Are there pot-plants? _____

How did you get the pots and of what are they made? _____

_____

_____

34. Do you sell potted plants? _____

Do you sell cuttings? _____

Estimated income from sales in a year _____

35. Do you prune your shrubs and trees? _____

36. How often do you prune trees? _____

trim shrubs? _____

mow lawns? _____

37. Does the Garden have any bungalow or house for staff, either inside of near the Garden? _____

38. Is there any library in the Garden? _____

Librarian? _____

39. Do you have a green house? _____

How many? _____

40. Do you have a shade-house? _____

41. Does the Garden provide any teaching programme for adults and children? _____ Any teacher(s) for that? _____

Full time or part-time? _____

42. Any other information about the preparation of your botanical garden? _____

_____

II. Use the following to answer the questions that follows. One question may have more than one answer. Therefore use as many answers as are applicable. Write the letter(s) of your choice infront of the

questions. (Note that one alternative may be used for more than one question).

A - Inadequate trained manpower

B - Shortage of land

C - Inadequate water supply

D - Difficulty in importing plants

E - Because only local plant varieties are available

F - Lack of funds

G - Botanical gardens do not yield any profit in terms of money.

H - Because fencing is a great difficulty.

I - Our soil doesn't support foreign plants.

J - Too many pests

K - Members of our society do not value the botanical gardens in any way.

L - There is no public awareness of what a botanical garden is or can do.

M - There are more important problems than botanical gardens that require money.

N - The climate doesnot favour the growth of some plants that are a necessity to botanical gardens.

P - Soil erosion

Q - Plants dying off due to heavy rains which cause the ground to become water-logged.

R - Lack of Garden tools.

S - It is difficult to label plants

T - Earthen pots easily get broken, and the plastic types are difficult to get.

U - Constant presence of termites, destroying fences.

V - Too many requests for our quality plants.

W - Lack of ideal garden plan

X - Absence of nearby institutions of higher learning, especially universities.

Y - Lack of green house.

Z - Lack of shade house.

Questions

43. What do you think are the factors limiting the growth of your botanical garden? _____

_____

44. The main reason(s) for lack of botanical gardens in many parts of Nigeria are: _____

_____

45. List other factors (other than those stated above) that limit the growth of your garden

_____

_____

III. Please, answer the following questions in the space provided after each question:

46. What are the criteria for the arrangement of plants in the garden? _____

_____

_____

47. How do you combat enemies of the garden, such as pests?

48. How many of your plants are labelled?

49. What details are given on your label? Give example

50. Are your labels made of wood, plastic or metal?

51. Do you designate your plants accordi

If so, what families are represented?

52. Are the plants within the garden imported, local or both?

53. Do you give out some of your plants/seeds on request?

54. Has the garden ever produced an index seminum (seed list)?

55. Are there rare and endangered or threatened plants within the garden?

do you bring them into cultivation (by seed

cutting, grafting, budding)? _____

56. Is the garden financed by a university, Federal State or Local Government?_____

Are there any other sources of funds?_____

57. Do you charge any fee when members of the public visit the garden? _____ If so, what is the fee? _____

58. Do you have some set of rules governing the garden?

_____

If yes, what are some of them? _____

_____

_____

_____

Are the rules displayed for the public to read?

_____

Ddte:_____

QB

DEPARTMENT OF BIOLOGICAL SCIENCES
AHMADU BELLO UNIVERSITY, ZARIA.

Date_____

Dear Sir/Madam,

BOTANICAL GARDEN SURVEY

I wish to request for your participation in this investigation. This research is undertaken as part of the fulfilment of a Master's degree programme in the Department of Biological Sciences.

I shall appreciate frank and honest responses from all participants to enable me to enumerate accurately and assess realistically the problems of botanical gardens in Nigeria, or why there are no botanical gardens in many parts of Nigeria.

It is not my purpose to indulge in criticising gardens, nor those who are involved in their management, but rather to investigate the problems so that in the future Nigeria may have a greater number of high quality Botanical Gardens.

Please, complete either questionnaire A (QA) or Questionnaire B (QB) and return to me.

Yours faithfully

Jeremiah Danbeki

QB

I. From the following alternatives choose the one(s) which best answer the question which follows, by writing the letter(s) of the correct alternative(s) in front of the question.

A - Botanical gardens are not so important

B - We have more problems of greater significance that need our money than botanical garden.

C - We do not know what botanical garden is or what functions it performs.

D - Shortage of land.

E - We are sure that we shall not be able to manage a botanical garden, therefore we forget about it.

F - We do not derive any benefits from botanical gardens

G - We don't want to get into the trouble of importing plants.

H - We cannot start a botanical garden since water is in short supply.

I - We don't have a university, therefore there is no need for a botanical garden.

J - Our university has just taken off, therefore we shall think of establishing a botanical garden soon.

K - We don't have trained manpower to man a botanical garden,

L - Our soil condition is too poor for foreign plants.

M - It is nonsense to have a collection of plants

N - The idea of botanical garden is good but we don't have time for that now.

P - The climate there is quite unfavourable for botanical garden.

Q - Botany is not one of the criteria for establishing this institution.

R - We would have established one, were it not for the present austerity measure.

Question

1. What are the factors responsible for the lack of a botanical garden in your institution/state? _____

2. List other factors (other than those listed above that are responsible for the lack of a botanical garden in your institution/state._____

II. 1 Do you intend establishing a botanical garden in the near future?_____

2. If yes, what will be the possible sources of funds for the garden?_____

_____

_____

3. If yes, when do you expect to start?_____

_____

Date _____ Institution _____

Town _____ State _____

THANK YOU!

APPENDIX II

Questionnaires sent out

Questionnaires were sent out to the following addresses and replies were received from some, while others did not reply.

No. Replies Received	Replies received
	QA
1. University of Benin, Benin Bendel State	1. A.T.C., Kano
2. College of Agriculture Aseba, Bendel State.	2. College of Education, Ikere-Ekiti, Ondo State
3. Auchi Polytechinc, Auchi, Bendel State	3. A.T.C., Zaria, Kaduna State.
4. College of Education, Benin, Bendel State	4. C.A.S.T., Zaria, Kaduna State
5. University of Nigeria Nsukka, Anambra State	5. University of Calabar, Calabar, Cross River State.
6. University of Technology, Enugu, Anambra State	6. A.B.U., Zaria, Kaduna State.
7. College of Education Owerri, Imo State	7. Naraguta Parks and Garden, Jos, Plateau State
8. School of Science and Techonology, Owerri Imo State.	8. College of Education, Jalingo, Gongola State

No.	Replies received	Replies received
9.	Federal School of Agricultural Research Umudike, Imo State	9. Lagos University, Lagos, Lagos State.
10.	College of Science and Technology, Enugu, Anambra State.	10. F.A.T.C. (Garden and Parks) Okene, Kwara State.
11.	University of Ilorin Kwara State.	QB
12.	Kwara College of Technology, Ilorin, Kwara State	1. Federal Polytechnic, Bida, Niger State.
13.	Rivers State College of Technology, Port Harcourt, Rivers State	2. F.A.T.C. Bida, Niger State
14.	Ogun State Polytechnic Abeokuta, Ogun State	3. Plateau Polytechnic, Barkin Ladi, Plateau State.
15.	Ogun State College of Education, Ijebu-Ode, Ogun State.	4. F.A.T.C., Pankshin, Plateau State.
16.	Federal Polytechnic Ilaro, Ogun State	5. A.T.C. Azare, Bauchi State.
17.	University of Ibadan Ibadan, Oyo State	6. S.H.S., Makurdi, Benue State
18.	University of Ife, Ile Ife.	7. Federal Polytechnic, Mubi, Gongola State.
		8. C.P.S., Yola, Gongola State.
		9. College of Agriculture. A.B.U., Kabba Kwara State

No replies received	Replies received
19. College of Education Ilesha, Oyo State	10. Sokoto University, Sokoto, Sokoto State
20. Adeyemi College of Education, Ondo, Ondo State.	11. College of Education, Abraka, Bendel State.
21. Yaba College of Technology, Yaba, Lagos State.	12. University of Maiduguri, Maiduguri, Borno State.
22. S.B.S. PortHarcourt	13. College of Education, Warri, Bendel State.
23. Federal College of Arts and Science, Ondo, Ondo State	14. A.T.C., Katsina-Ala, Benue State.
24. College of Education, Uyo, Cross River State	15. College of Education, Awka, Anambra State.
25. Federal College of Arts and Science, Ogoja, Cross River State.	16. University of Technology, Yola, Gongola State.
26. College of Agriculture, Mokwa, Niger State	17. Omu-Aran High School, Omu-Aran, Kwara State
27. Federal School of Arts and Sciences Abuja, Nigeria	18. University of Technology Bauchi, Bauchi State.
28. College of Education Minna, Niger State	19. College of Agriculture, Jalingo, Gongola State.
	20. F.A.T.C. Yola, Gongola State.
	21. Kwara College of Education, Ilorin, Kwara State.

No replies received	replies received
29. Zungeru College of Advanced Studies, Zungeru, Niger State.	22. College of Education, Oro Kwara State.
30. F.A.T.C., Kantagora Niger, State	23. Institute of Agricultural Research and Training Akure , Ondo State
31. A.T.C., Gumel, Kano State	24. A.T.C. Maiduguri, Borno State.
	25. University of Jos, Plateau State.
32. Federal Polytechnic, Bauchi,	Late Replies
33. Wild life Park, Jos, Plateau State	1. University of PortHarcourt Rivers State.
34. C.P.S., Keffi, Plateau State.	
35. School of Forestry Jos, Plateau State	
36. College of Education Sokoto.	
37. College of Agriculture Bakura Sokoto State	
38. College of Agriculture, Yandev, Benue State	
39. Federal University of Technology, Makurdi, Benue State.	

No Replies Received	Replies Received
40. Federal Polytechnic, Idah, Benue State	
41. Murtala College of Arts Science and Technology, Ugbokolo, Benue State.	
42. Ramat Polytechnic, Maiduguri, Borno State.	
43. S.B.S./A.B.U., Zaria, Kaduna State	
44. College of Agriculture, A.B.U., Zaria.	
45. Kaduna Polytechnic, Kaduna Kaduna State.	
47. F.A.T.C., Katsina, Kaduna State.	
48. Kaduna Garden, Kaduna	
59. Bayero University, Kano	