KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI

COLLEGE OF AGRICULTURE AND NATURAL RESOURCES

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DEPARTMENT OF HORTICULTURE

ASSESSMENT OF THE CURRENT STATE OF BOTANIC GARDENS IN GHANA AND HOW THEY CAN BE IMPROVED. CASE STUDY – KNUST AND LEGON BOTANIC GARDENS

BY

ANKOMA MENSAH GEORGE

JUNE, 2014

ASSESSMENT OF THE CURRENT STATE OF BOTANIC GARDENS IN GHANA AND HOW THEY CAN BE IMPROVED. CASE STUDY – KNUST AND LEGON BOTANIC GARDENS

A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE AND RESEARCH STUDIES, KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI, IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE

(MSc. FLORICULTURE) DEGREE

BY

ANKOMA MENSAH GEORGE

JUNE, 2014

DECLARATION

I do hereby declare that, except for specific references to other peoples work, which have been duly acknowledged, the work presented in this dissertation was done entirely by me and has not been presented, in part or in a whole, for any other degree in this university or elsewhere.

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DEDICATION

I dedicate this thesis to my family, friends and all the Pastors who assisted me in prayers.

ACKNOWLEDGEMENT

This thesis would not have been possible without the presence of God in my life. I am greatly indebted to him for seeing me through this project.

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Lastly I offer my regards and blessing to all those who supported me in any respect during the completion of the project.

LIST OF ABBREVIATIONS

B.G	Botanic Garden
KNUST	Kwame Nkrumah University of Science and Technology
UG	University of Ghana (Legon)
UCC	University of Cape Coast

ABSTRACT

This study emphasized the current states of botanic gardens in Ghana and how they could be improved using the Kwame Nkrumah University of Science and Technology and the University of Ghana's Botanic Gardens as study areas. The study aimed at coming out with proposals which will help improve the general outlook of these two university botanic gardens and make them excellent scientific facilities in Ghana. Structured questionnaires were administered within a period of two weeks to about 120 respondents of whom 40 each were workers, students and visitors to these two botanic gardens. Some of the parameters considered in the design included bio-data of respondents, management practices, staff strength, educational and research programs, some cultural activities and students' perception of the botanic gardens.

Analysis of data by SPSS (Version 16) showed that majority of workers in both gardens were males and their ages ranged between 41-50 years. Urban residents visit botanic gardens at a much higher rate than people living in other parts of the country. Considering the gender distribution of visitors to both botanic gardens, females visit botanic gardens in Ghana than males and the main reasons why people visited the botanic gardens were because of their medicinal and floristic compositions. On the state of the gardens, most of the students thought the standards of the botanic gardens are falling and can easily lead to deterioration and into being an ordinary pleasure park. The study also showed that the several problems identified with these botanic gardens occurred due to negligence and ignorance on the part of the Government and stakeholders. In conclusion, it is proposed that, the only way forward to maintain, expand and to make the botanic gardens survive in Ghana, and stand the test of academic and research times for today and the future is to re-engineer it into an income generation venture since that is done globally in most botanic gardens.

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CHAPTER ONE

1.0 INTRODUCTION

Gardens and the cultivation of plants have been around for thousands of years with the first examples dating as far back as 2697 BC in ancient Egypt and Mesopotamia. According to Bacon, God Almighty first planted a garden and indeed it is the purest of human pleasures (Encarta, 2007). There are no formal criteria or general agreement as to what constitute a botanic garden, as such any list of botanic gardens is somewhat subjective and can neither be fully comprehensive or regarded as definitive. A botanic garden is not easy to classify though an underlying scientific basis is a necessity (Leadlay, 2007).

As defined in Encarta (2007), a botanic garden is a garden in which plants are grown and displayed primarily for scientific and educational purposes. It consists chiefly of a collection of living plants grown out-of-doors in a greenhouse and conservatories. It usually includes in addition, a collection of dried plants or herbariums and such facilities as lecture rooms, laboratories, libraries, museums and experimental or research plantings (Encarta, 2007). Manie (2007) also defined a botanic garden as a collection of living plants that is scientifically managed for the purpose of education, research, conservation and community service. In summary a botanic garden can be defined as an arboretum: - a facility where trees and shrubs are cultivated for exhibition or an area where wide variety of plants are grown for scientific purposes, enjoyment and education of visitors (Manie, 2007).

According to Norman (2002), the floriculture industry in Ghana has gone through a checkered development, lagging behind the development of horticulture in particular, and agriculture as a whole since it was practiced by some very few institutions. In recent years however the industry has been growing rapidly, with ornamental plants springing up all over the country, especially in the major towns and cities. The floriculture industry can further

grow if critical attention is also directed towards assessing the current states of some botanic gardens in Ghana and improving upon them. The Legon botanic garden makes sales from plants and wreaths produced in the garden but lack some other essential facilities. Landscaping and other horticultural services also need to be addressed. The 64-acre KNUST botanic garden has only 10 casual workers. Standards of the botanic gardens are falling and likely not to fit into any of the definitions of a botanic garden given above. This can easily lead to deterioration and falling of standards and into being an ordinary pleasure park.

1.1 OBJECTIVE OF STUDY

The aim of this study is to come out with proposals which will help improve the general outlook of the two Universities botanic gardens and make them places of scientific excellence in Ghana.

The specific objectives were:

- To provide a list of some essential materials and facilities that are available in other botanic gardens but absent in these two universities botanic gardens.
- To identify why people visit botanic gardens in Ghana.
- To determine who visits these botanic gardens in order to plan better for them.
- To come out with proposals that will attract all stakeholders of the gardens to invest into the gardens activities.
- To come out with some educational and entertainment programs that will help these botanic gardens generate funds for their operations and maintenance.
- To come out with proposals that will highlight the efficiency of managing the gardens.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 BOTANIC GARDENS AND THEIR DISTRIBUTION

Presently there are 2,178 botanic gardens known throughout the world. Over 500 of these botanic gardens can be found in Western Europe, more than 350 in North America and over 200 in East and Southeast Asia, of which the majority are in China. Most of the Southern Asian botanic gardens are however found in India (Akeroyd, 1995). Most regions of the world have a range of botanic gardens although there are relatively few in North and South Africa, the Caribbean islands, South West Asia and the Middle East.

Table 1 Distribution of Botanic Gardens worldwide

Region	**No. of botanic gardens recorded**
Africa	127
America	617
Asia	403
Australasia/Oceania	153
Europe	878
Total No. of Botanic Gardens in the World	**2,178**

(BGCI, 2000)

2.2 THE CHARACTERISTICS OF A BOTANIC GARDEN

The lack of a very clear definition as to what constitutes a 'botanic garden' has blurred the edges between what are public parks or private collections and what are true scientifically-based botanic gardens (Wyse and Sutherland, 2000). Some institutions have been accepted

into the list of botanic gardens even though they might only be marginally described as botanic gardens (Wyse and Sutherland, 2000).

According to Wyse (1999), a botanic garden or arboretum is one open to the public and in which the plants are labeled'. The characteristics of botanic gardens, according to *the Botanic Gardens Conservation Strategy* (IUCN-BGCS and WWF, 1989) should include the following:

- adequate labeling of the plants.
- an underlying scientific basis for the collections.
- communication of findings to other gardens, institutions, organizations and the public.
- exchange of seeds or other materials with other botanic gardens, arboreta or research stations (Within the guidelines of international conventions and national laws and customs regulations).
- long term commitment to, and responsibility for, the maintenance of plant collections.
- maintenance of research programmes in plant taxonomy in associated herbaria.
- monitoring of the plants in the collection.
- opening of the garden to the public.
- promoting conservation through extension and environmental education activities.
- proper documentation of the collections, including those of wild origin.
- undertaking scientific or technical research on plants in the collections.

This list does not however constitute a comprehensive summary of the activities undertaken by botanic gardens. It should be recognized that there are many institutions that are clearly botanic gardens but are only able to meet some of these criteria (IUCN-BGCS and WWF, 1989). In some instances a garden has retained the name 'botanic' for historic reasons; some or even most of the plant collection may survive but all scientific activities have ceased and

documentation has been lost. One might argue for the removal of these from the global list of botanic gardens. However, experience has shown that it is precisely these institutions in many parts of the world that are currently being revived, redeveloped and re-established to become potentially important botanical centers (Wyse, 1999).

2.2.1 Definition of Botanic Gardens

The role of major botanical gardens worldwide has been considered so broadly similar as to fall within textbook definitions. The following definition was produced by staff of the Liberty Hyde Bailey Hortorium of Cornell University in 1976. It covers in some detail the many functions and activities generally associated with botanical gardens:

A botanical garden is a controlled and staffed institution for the maintenance of a living collection of plants under scientific management for purposes of education and research, together with such libraries, herbaria, laboratories, and museums as are essential to its particular undertakings. The botanic garden maybe a independent institution, a governmental operation, or affiliated to a college or university. If a department of an educational institution, it may be related to a teaching program. In any case, it exists for scientific ends and is not to be restricted or diverted by other demands. It is not merely a landscaped or ornamental garden, although it may be artistic, nor is it an experiment station or yet a park with labels on the plants. The essential element is the intention of the enterprise, which is the acquisition and dissemination of botanical knowledge.

A contemporary botanic garden is a strictly protected natural urban green area, where a managing organization creates landscaped gardens and holds documented collections of living plants and/or preserved plant accessions containing functional units of heredity of actual or potential value for purposes such as scientific research, education, public display,

conservation, sustainable use, tourism and recreational activities, production of marketable plant-based products and services for improvement of human well-being. The New Royal Horticultural Society Dictionary of Gardening (1999) points out that among the various kinds of organisations now known as botanical gardens are many public gardens with little scientific activity, and it cites a more abbreviated definition that was published by the World Wildlife Fund and IUCN when launching the "Botanic Gardens Conservation Strategy'' in 1989: "A botanic garden is a garden containing scientifically ordered and maintained collections of plants, usually documented and labelled, and open to the public for the purposes of recreation, education and research. This has been further reduced by Botanic Gardens Conservation International to the following definition which "encompasses the spirit of a true botanic garden": "A botanic garden is an institution holding documented collections of living plants for the purposes of scientific research, conservation, display and education. Within the context of the BGCI, the use of the term 'botanic gardens' should be interpreted to include arboreta and other specialized forms of plant collection. Despite the difficulties in deciding what institutions should be included in a list of botanic gardens worldwide, it is believed that the majority of botanic gardens, arboreta and similar institutions worldwide hold significant ex situ collections of living plants (BGCI, 1999).

2.3 TRENDS IN THE ESTABLISHMENT OF BOTANIC GARDENS

Of a total of 1,594 botanic gardens, for which the dates of their foundation are known, 54% (865) were established during the 50 years between 1951 and 2001. The current trend for the creation of new botanic gardens in many parts of the world shows no signs of diminishing and indeed since 1990 over 100 botanic gardens have been created. According to Wyse and Sutherland (2000), during the last 50 years botanic gardens have been created in most

regions, however, it is in the tropics that the greatest proportional percentages of new botanic gardens have been created. They indicated that botanic gardens worldwide have been classified under the following types:

1 '**Classic' multi-purpose gardens'**– These are often institutions with a broad range of activities in horticulture and horticultural training; research is particularly in taxonomy with associated herbaria and laboratories and public education and amenity. They are generally state supported.

2. **Ornamental gardens** – These are often very beautiful establishments with diverse plant collections that are documented; they may or may not currently have research, education or conservation roles. Some ornamental gardens are privately owned and many municipal gardens fall into this category.

3. **Historical gardens** - Include the earliest gardens developed for the teaching of medicine; some were established for religious purposes. A number of these gardens are still active in medicinal plant conservation and research and today are primarily concerned with the collection and cultivation of medicinal plants and increasing public awareness about them.

4. **Conservation gardens** - Most have recently been developed in response to local needs for plant conservation. Some contain, or have associated areas of, natural vegetation in addition to their cultivated collections. Included in this category are native plant gardens, which only cultivate plants from their surrounding region or national flora. Most conservation gardens play a role in public education.

5. **University gardens** – Many universities maintain botanic gardens for teaching and research. Many are open to the public.

6. **Combined botanical and zoological gardens** – These gardens are currently reassessing the roles of their botanic collections. Plant collections are being researched and developed

and these provide habitats for the displayed fauna, and interpretation of these habitats to the general public are an important element.

7. **Agro-botanical and germplasm gardens** – These function as an ex situ collection of plants of economic value or potential for conservation, research, plant breeding and agriculture. Some are experimental stations associated with agricultural or forestry institutes and contain associated laboratory, plant breeding and seed testing facilities but many are not open to the public.

8. **Alpine or mountain gardens** – This garden type is most frequently found in mountain regions of Europe and some tropical countries. They are specifically designed for the cultivation of mountain and alpine flora, or in the case of tropical countries, for the cultivation of subtropical or temperate flora. Some alpine and mountain gardens are satellite gardens of larger lowland botanic gardens.

9. **Natural or wild gardens** – these gardens contain an area of natural or semi- natural vegetation which is protected and managed. Most are established to play conservation and public education roles and include areas where native plants are grown.

10. **Horticultural gardens** – Horticultural gardens are often owned and maintained by horticultural societies and open to the public. They exist primarily to foster the development of horticulture through the training of professional gardeners, plant breeding, registration and conservation of garden plant varieties.

11. **Thematic gardens** – These specialize in growing a limited range of related or morphologically similar plants or plants grown to illustrate a particular theme generally in support of education, science, conservation and public display. Plants grown include orchid, rose, rhododendron, bamboo and succulent. These gardens are established on such themes as ethno botany, medicine, bonsai, topiary, butterfly gardens, carnivorous plants and aquatics.

12. **Community gardens** – These are generally small gardens with limited resources, developed for, and by, a local community to fulfill its particular needs, such as recreation, education, conservation, horticultural training, and the growth of medicinal and other economic plants.

2.4 ROYAL BOTANIC GARDENS, KEW

The Royal Gardens at Kew were founded in 1759, initially as part of the Royal Garden set aside as a physic garden. William Aiton (1741–1793), the first curator, was taught by garden chronicler Philip Miller of the Chelsea Physic Garden whose son Charles became first curator of the original Cambridge Botanic Garden (1762). In 1759, the "Physick Garden" was planted, and by 1767, it was claimed that "the Exotic Garden is by far the richest in Europe". Gardens such as the Royal Botanic Gardens, Kew (1759) and Orotava Acclimatization Garden (Spanish), Tenerife (1788) and the Real Jardín Botánico de Madrid (1755) were set up to cultivate new species returned from expeditions to the tropics; they also helped found new tropical botanical gardens. From the 1770s, following the example of the French and Spanish, amateur collectors were supplemented by official horticultural and botanical plant hunters. This was the great era of European, and especially British, imperialism which was the means by which ideas, knowledge, styles of economy, politics and goods were given international reach and justified as the spreading of "civilisation" through "development" and "improvement" (Ray, 2007).

At this time, England was importing many woody plants from North America, and the popularity of horticulture had increased enormously, encouraged by the horticultural and botanical collecting expeditions overseas fostered by the directorship of Sir William Hooker and his keen interest in economic botany. At the end of the 18th century, Kew, under the

directorship of Sir Joseph Banks, enjoyed a golden age of plant hunting, sending out collectors to the Southern African Cape, Australia, Chile, China, Ceylon (now Sri Lanka), Brazil, and elsewhere, and acting as "the great botanical exchange house of the British Empire". From its earliest days to the present, Kew has in many ways exemplified botanic garden ideals, and is respected worldwide for the published work of its scientists, the education of horticultural students, its public programmes, and the scientific underpinning of its horticulture. In 2009, Kew celebrated 250 years as a botanic garden, providing inspiration and sharing knowledge about the world's plant life. Kew today is a global centre for research on plants and fungi, as well as a site of World Heritage, rich in history and with the Earth's largest botanical and horticultural collections under its care (Christina and Paul, 2007).

2.5 FIRST AFRICAN BOTANIC GARDEN CONGRESS

The first ever African Botanic Gardens Congress was held from 24-29 November, 2002 in Durban Botanic Gardens, South Africa. About 67 delegates representing 23 African countries and various non-African delegates attended this congress which established the new African Botanic Gardens Network (ABGN). Africa, defined as continental Africa and the surrounding islands, was divided into six regions, namely North Africa, West Africa, Central Africa, Eastern Africa, Southern Africa and the Indian Ocean Islands (Willis, 2004). The theme of the Congress was 'Partnerships and Linkages' and the main objectives of the Congress were to:

1. Create a contemporary database of African botanic gardens.
2. Undertake a comprehensive assessment of the common needs of African botanic gardens.
3. Identify ways to address these needs.

4. Determine the structure of and support required for an African Botanic Gardens Network and its Secretariat.

5. Adopt the universally applauded *International Agenda for Botanic Gardens in Conservation (BGCI*, 2000).

6. Review and adopt a draft constitution for the African Botanic Gardens Network.

7. Produce an Action Plan for the conservation of Africa's threatened endemic flora.

8. Publish the Proceedings of the Congress.

Presentations from various delegates were made during the Congress and the outcomes of the Congress included a draft Strategic Framework and Action Plan for the African Botanic Gardens Network.

2.6 OVERVIEW OF ORNAMENTAL GARDENS IN GHANA

The Natural Heritage of Ghana comprises features related to the natural environment and ecology. It includes attractions such as national parks and game reserves, wildlife, waterfalls, beaches, lakes, a range of vegetation types, wetlands, mountains, caves and botanic gardens. These features could be visited and enjoyed in a warm tropical climate with scenic sunset beauty in Ghana. With the prevailing climatic conditions that require minimal modification for floriculture purposes and the abundant agricultural labour, Ghana is well placed to benefit from investment in its botanic gardens (Adowa, 2004).

In the past, the Ghanaian Culture made it imperative that people lived in family homes and family communities. These homes and communities were very large, crowded and had little or no outside space for home gardens. However, under present conditions the family and community living is broken down and now the individual lives in isolation with a wife and few children in homes with more space for gardening (Sekyi, 2009). There have been

developments of home gardens in Ghana from the time of the missionaries in the 19th century to the present but almost all the five botanic gardens in Ghana have been neglected and most Ghanaians are ignorant about the need for botanic gardens. The question as to what ministry or department is responsible for botanic gardens in Ghana is even not well defined. According to Norman (2004), ornamental horticulture has become very popular in tropical West Africa over the past two decades or so due to such factors as the promotion of horticultural education in schools, increased educational standards of the people and the establishment of botanic gardens. Botanic gardens hold documented collections of living plants for the purpose of scientific research, conservation, aesthetic appreciation and education (Willis, 2004). The total number of botanic gardens in Ghana is five (5) and the approximate number of living plant accessions recorded in these gardens adds up to about 5,000 (*Akeroyd et al.,* 1994). These are The Aburi Botanic Garden, Bunso Arboretum, KNUST, Legon, and UCC Botanic Gardens located in Aburi, Bunso, Kumasi, Accra, and Cape Coast respectively. The Domenase Botanic Garden which was a vision of the M and J Research Centre at Asante Mampong was to be established in 2005 to attract the western world to patronize the medicinal plants that are abundant in Ghana but in short supply in the western world. The establishment of this garden is still ongoing and will soon be categorized as one of the major botanic gardens in Ghana (GNA, 2005).

Of the five botanic gardens in Ghana, Aburi is the largest and was established as an agricultural research station and convalescent home for the British Colonial Administration (BGCI, 2005).

2.6.1 Aburi Botanic Garden

The Aburi Botanic Garden is one of the most beautiful, peaceful and fascinating places in Ghana. The garden situated on the Akwapim ridge is about 39 kilometers north-east of Accra along the old Accra Koforidua road. It is also 22 kilometers from Nsawam and 48 kilometers from Koforidua. The garden which was opened in March, 1890 overlooks the coastal plain at an elevation of 370 to 460 meters (1,200 - 1,500 ft) above sea level (Debrah, 2005).The Garden covers an area of 64.8 hectares (160 acres) but only 12.2 hectares (3 acres) have been developed in to a formal garden with the remaining 52.6 hectares forming the botanical reserve. Visiting the Aburi Botanic Garden is both an educational and aesthetic experience with beautiful palm lined lanes and a wide variety of traditional, medicinal plants, including a silk cotton tree (*Ceiba pentrandra*; one of the sacred trees of West Africa) that is the sole survivor of the original forest that once covered the Aburi hills (Adowa, 2004). Represented are 375 species of plants including some endangered species, all arranged on beautifully manicured lawns spread over 30 acres.

Plate 1. Beautiful scenes from the Aburi Botanic Garden

Aburi Botanic Garden is among the 1600 botanic gardens worldwide, leading the fight to save plant diversity as well as creating an understanding and awareness for the promotion of methods of conservation and development of plant resources in Ghana. The beauty and

uniqueness of this garden stem from its relatively bracing, relieving climate and the lushly scenic setting. Its serenity makes it an ideal place for the stressed who wants relief, the writer who wants solitary to write, the thinker for reflections, newly weds for honeymoon, campers, nature lovers, recreationists and sanatorium for the recuperating (Debrah, 2005).

It is also an excellent place for picnic activities. Butterfly and bird lovers would love Aburi Gardens for the presence of many species of butterflies and birds that would come so near as if wanting to perch on ones head. Another delight of Aburi Botanic Garden is the blossoming mixture of indigenous and exotic trees of global importance, aesthetics and medicinal properties. The garden's main activities include scientific research, horticultural training, growing endangered plants, introducing rare plants into nature, managing natural reserves and environmental education. Among the many exciting attractions within the garden are The Bush House, The Rock Garden, The Pergola or Lovers lane, The Ficus tree, The Retired Helicopter, and the School of Horticulture. The bush house, which is a relic of history, is an open shed with thatched roof supported on stone pillars. The floor is made of mud and decorated weekly with red clay as is practiced in rural Ghana. Between 1939 and 1953 several departments sojourned in the Garden. The Aburi Botanic Garden is a must experience for every Ghanaian as well as visitors to Ghana. It is ideal for tourists of all ages, particularly, those interested in tropical flora in a park-like environment (Adowa, 2008).

2.6.2 The KNUST Botanic Garden

The KNUST Botanic Garden (which lies between latitude 6°35 N-6°40 N and longitude 1°30 W-1°35 W) was established in 1960 and since then has played very useful roles in education, research and recreation (Addo-Fordjour *et al*., 2005). A map of a section of the Kwame Nkrumah University of Science and Technology (KNUST) showing the Botanic

garden has been shown in Fig.1 below. According to Mr. Dugan Amissah (a former chief technician of the garden), the 12.9 ha (64-acre) botanic garden was founded by a British, Governor Paul, who became its first curator. The garden which falls within a semi-deciduous rain forest was in its best state until the early 1970 when retrenchment of staff affected its activities (V.Sore, personal communication).

According to Sore (2008), the then curator and an international consultant (Mr. Kutin Saul) died with the whole garden plan which was designed to renovate the garden. Some measures which were instituted to prevent people from encroaching on the garden included fencing of the whole garden and the provision of security to guard the garden. In spite of this, people still managed to sneak in and conduct illegal activities such as felling of trees for firewood, cutting of bamboo and hunting for animals in some parts of the garden. These areas together with the part of the garden that has been developed for recreational activities have thus experienced maximum form of human disturbance. The rest of the garden which forms the major part has remained undisturbed for many years (Addo-Fordjour *et al*., 2005).

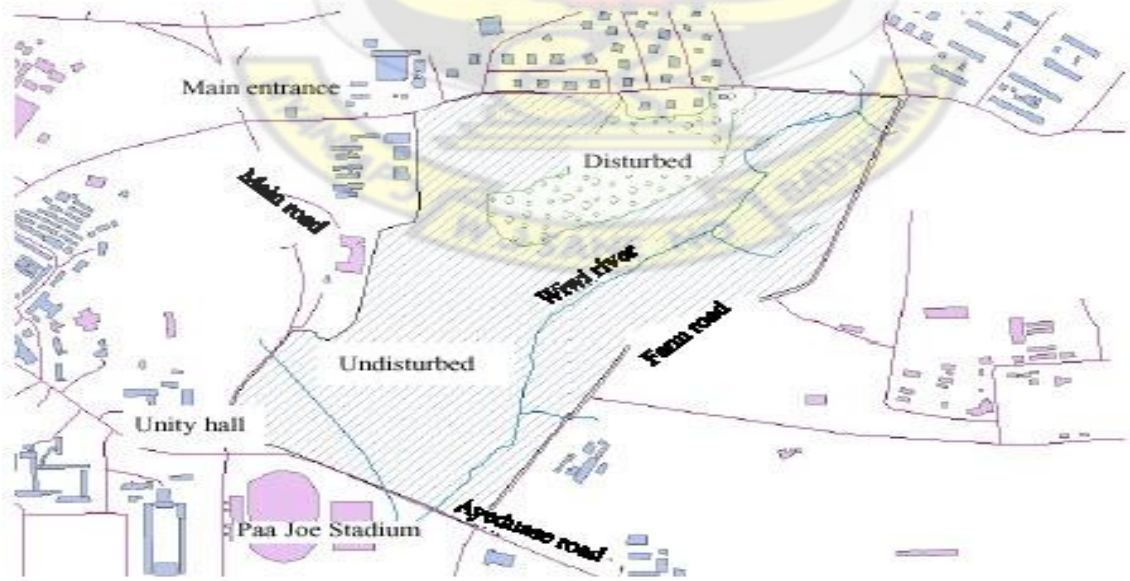

Fig. 1: Map of a section of the Kwame Nkrumah University of Science and Technology (KNUST) showing the botanic garden.

The garden is endowed with diverse species including tropical palms, timber species and medicinal plant species. The vegetation is made up of about 68% native species and 32% exotic species (Anning *et al*., 2006). The semi-deciduous vegetation receives relatively high amount of annual rainfall, approximately 731 mm per year. The average annual temperature ranges from 21.55 to 32.12°C. The average annual humidity in the area is 599.2% (The KNUST Meteorological Department, 2006). 184 species which belonged to 146 genera, 51 families and six growth forms were recorded in the *International Journal of Botany* in 2008 (Anning *et al*., 2008)

The most dominant tree species in the garden were *Elaeis guineensis* Jacq, *Hevea brasiliensis* (Wild.) *Muell.-Arg*. and *Parkia biglobosa* (Jacq.) with a combined importance index of 60.09 (20 % relative importance). The differences in importance value indices of species between the cultivated and uncultivated areas of the garden were statistically insignificant, suggesting the presence of conducive growth environments for plants in both areas. The most dominant families were Fabaceae, Moraceae, Arecaceae and Euphorbiaceae whilst trees were the most predominantgrowth forms (62.5 %). Average crown height and percentage canopy were 28.8 ± 8.81 m and 66.4 ± 8.26% respectively. These results show the floristic richness of the KNUST botanic garden and underscore the garden's potential as a centre for ex-situ conservation beside its traditional roles in education, research and recreation.

2.6.3 The Legon Botanic Garden

The Legon Botanic Gardens covering an area of approximately 25 hectares was founded in 1950 to support the scientific research of the Department of Botany. It lies within latitude 5.5447 and longitude -0.2065 and it contains plant species of the tropics and semi-tropics, including a large collection of palms from various tropical areas, West African orchids, local

flora, economic collection of cacao, timbers and some fruits. According to Yiadom (2009), the gardens have no data on Conservation Programmes and Research Programmes resulting in limited seedlings and plant materials for sale. A reputable company in Ghana known as 'Pine Springs Limited' expressed interest in teaming up with the Department of Botany of the University of Ghana on the subject matter of rehabilitating, managing and developing the botanic garden. The great need of the partnership was to put up a management team that will ensure that the academic and research focus of the University is not sacrificed for the recreation and income generating mechanisms of the botanic garden (Yiadom, 2009). Pine spring therefore proposed that,

1. The infrastructure, example, security network, fencing, drains, waste disposal systems, drive and walk ways, first aid centre among many others, in the garden be rehabilitated properly.
2. With the infrastructure in place, the facilities such as restaurants, camping sites, sitting areas, gift shops, playground and their like will be zoned out in consultation with the Development Office and the Department of Botany. Once these facilities have been zoned out, an open tender approach will be put in place to invite prospective bidders for the facilities available.
3. The Department of Botany's pursuit in academic exercises, teaching and research will still continue in the garden without any interference.

CHAPTER THREE

3.0 METHODOLOGY

3.1 SELECTION OF STUDY AREAS

Two study areas were chosen for this project (The KNUST Botanic Garden in Kumasi and the Legon Botanic Garden in Accra). These botanic gardens were selected based on the rate of development of the two largest cities in Ghana and the potential for the improvement of such botanic gardens. Tourism has potential and tourist accommodation is gradually being improved but outside the two main cities, infrastructure and communication are poor. These suggest reasons why the two botanic gardens in Accra and Kumasi had to be given the necessary attention so to attract investors and reserchers from all over the world.

3.2 ADMINISTRATION OF QUESTIONNAIRES

Pictures were taken from the sites and attached to the questionnaires to make it easy for respondents to answer the questions.

Questionnaires were designed for:

1. The workers of the two botanic gardens (Legon and KNUST Botanic gardens).
2. Students of the universities.
3. Visitors of the two botanic gardens.

40 questionnaires were administered for each of the targeted groups and distributed randomly. The questionnaires were administered within a period of two weeks and data was collected over a four week period.

3.3 PARAMETERS STUDIED

Some of the parameters considered in the design included bio-data of respondents, students perceptions of the two gardens, management practices, staff strength, educational and research programs, some cultural activities and problems of the botanic gardens.

3.4 ANALYSIS OF DATA

All data collected were analyzed using The Statistical Package for Social Sciences (SPSS) (Casey and Lury, 1981; Foreman, 1981).

3.5 FLORISTIC COMPOSITION OF THE GARDENS

The Department of Theological and Applied Biology, KNUST was contacted for assistance on some data on the floristic composition and vegetation structure of the KNUST Botanic garden whilst the Department of Botany at the University of Ghana, Legon also provided a website from where the floristic composition and vegetation structure of the Legon botanic garden could be obtained.

3.6 WEB SEARCH

The website of a lot of botanic gardens were visited to compile information for comparative studies. Copies of the questionaires were also forwarded to some botanic garden experts via an email for their suggestions.

CHAPTER FOUR

4.0 RESULTS

4.1 DATA COLLECTED

Of the total 120 questionnaires sent out, 60 each were administered to the two universities botanic gardens. Those consisted of 20 each for workers, students and visitors to the two botanic gardens under this study. On the whole 113 questionnaires out of the 120 administered were collected and a summary of their responses have been represented in the charts below.

4.1.1 ROLE OF WORKERS, MODE OF EMPLOYMENT AND NUMBER OF YEARS OF EMPLOYMENT IN THE TWO GARDENS

The questionnaires sought to find the role of workers, their mode of employment and how long they have been working in these botanic gardens. It was realized that the workers interviewed in these gardens were fewer than their numbers anticipated (hence only 33 out of the 40 questionnaires administered to the workers of these universities were collected). This suggests that, a preliminary test, given in advance of instruction of evaluation could have been necessary.

4.1.1.1. Number of Workers and Their Respective Roles in The Botanic Gardens

Whiles the University of Ghana (UG or Legon) botanic garden recorded 15 casual workers (labourers), 2 security men and 1 curator; the KNUST botanic garden recorded 12 casual workers, 2 security men and 1 curator (Fig.2).

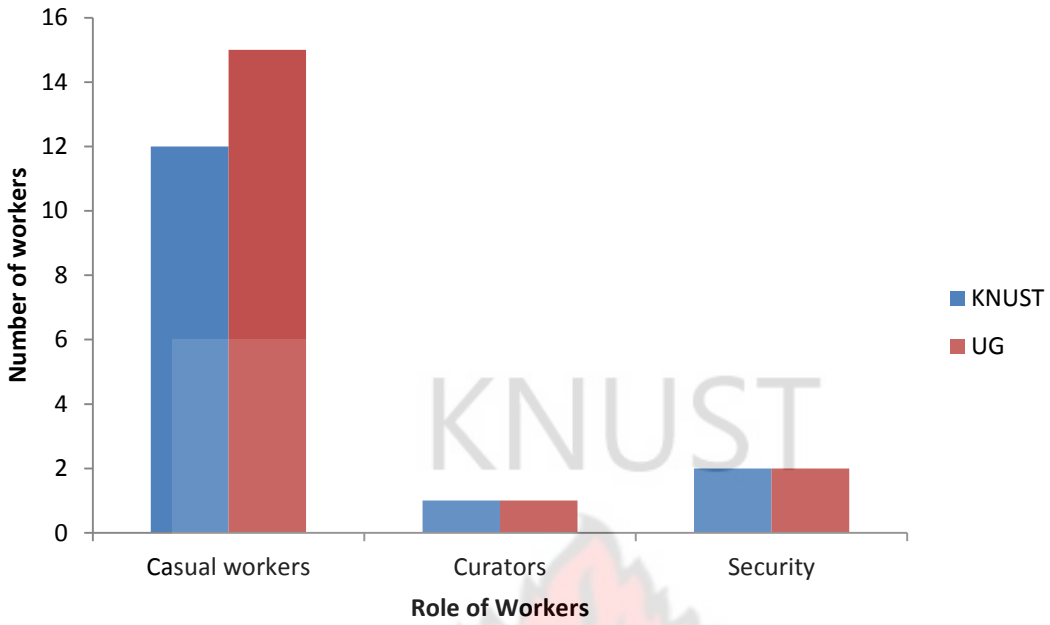

Fig. 2 Role of workers in the botanic gardens

4.1.1.2 Mode of Employment

Majority of the workers in the two botanic gardens were employed by their academic qualifications. UG recorded 73.3% whilst KNUST recorded 66.7 % (Fig. 3).

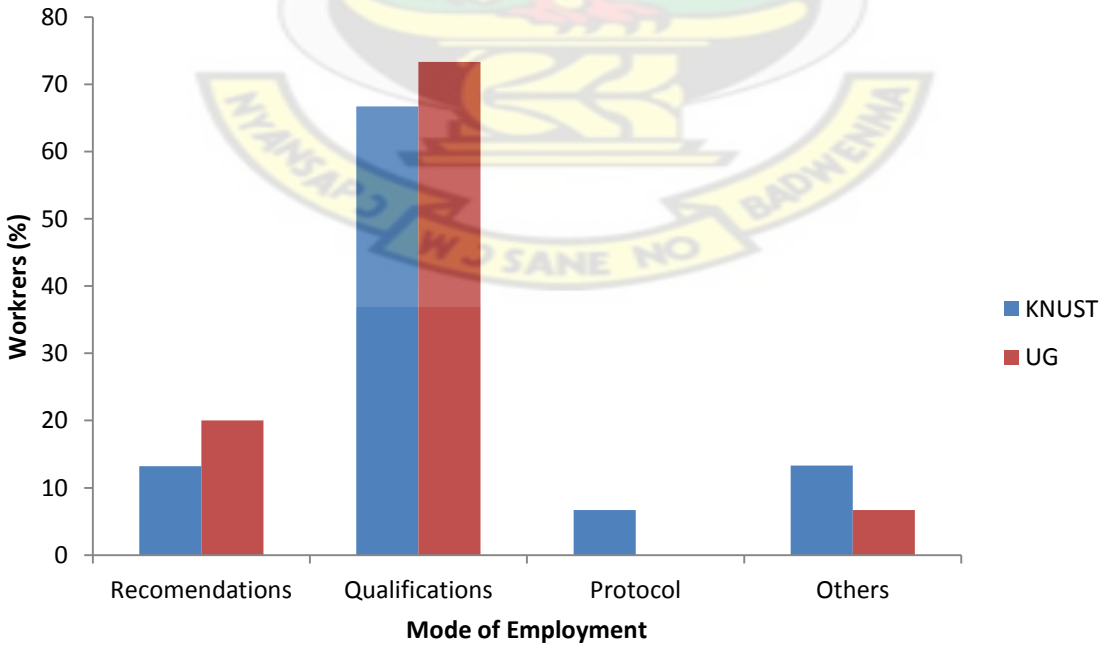

Fig. 3 Mode of employment of workers in the gardens

Some of the workers (20.0% from UG and 13.3% from KNUST), were however recommended from other botanic gardens like the Aburi Botanic gardens into these universities botanic gardens based on their levels of experience. About 13.3% workers from KNUST and 6.7% from UG botanic gardens were working in these gardens on attachments or exchange programs and as such are not permanent staff of the universities botanic gardens. About 6.7% of workers from the KNUST botanic garden were employed through protocol.

4.1.1.3 Number of Years of Employment

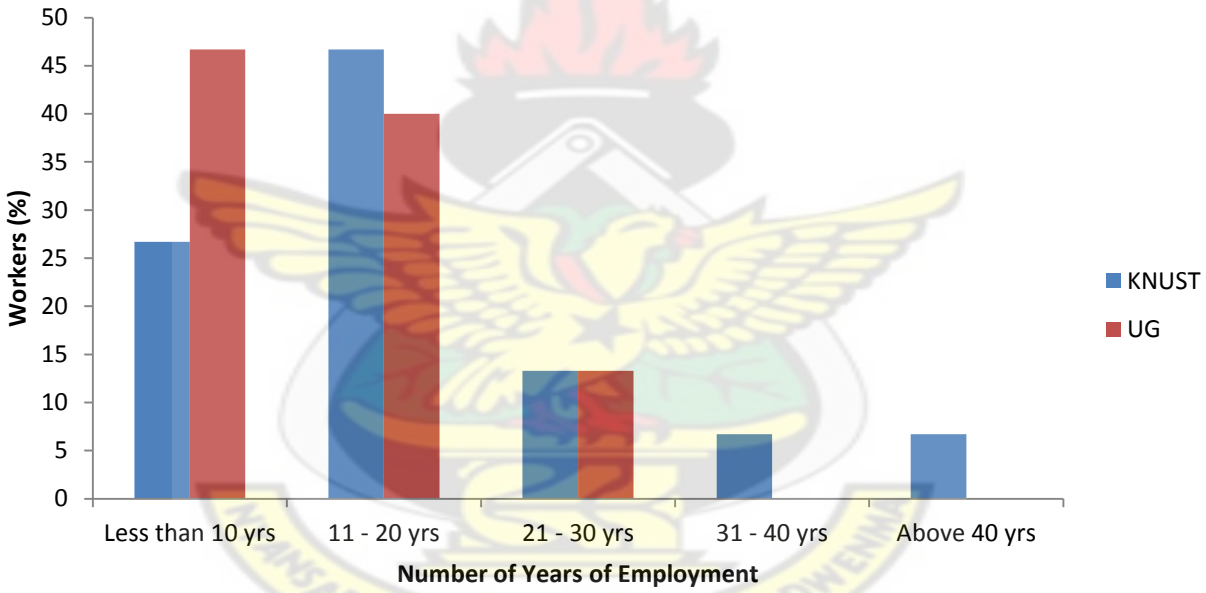

Fig 4. Number of years of employment in the gardens

The survey revealed that 40% of the workers from UG and 46.7% from KNUST Botanic Gardens have worked in the gardens for periods ranging between 11 - 20 years. About 46.7% and 26.7% from UG and KNUST botanic gardens respectively have worked for less than 10 years in these botanic gardens. For workers who have been employed in the gardens between 21 – 30 years, both UG and KNUST botanic gardens recorded the same percentages of workers (that is 13.3% each). None of the workers in the UG Botanic Garden had worked for

more than 31 years but the KNUST Botanic gardens recorded 6.7% of workers who have spent between 31-40 years and another 6.7 who have worked for more than 40 years (Fig. 4).

4.1.2 AGE, SEX, EDUCATIONAL LEVEL AND MARITAL STATUS OF WORKERS

Some major concerns of the study were whether the age, sex, educational level and marital status of the individual workers in these botanic gardens affect their productivity. Most of the respondents in these botanic gardens initially did not want to open up especially with questions concerning their ages and educational level until the objectives of the study were explained better to them.

4.1.2.1 Age and Sex of Workers

Whiles 86.7% males and 13.3% females were recorded in the KNUST Botanic Gardens, 73.3% males and 26.7% females were recorded in the UG Botanic Gardens (Fig.5).

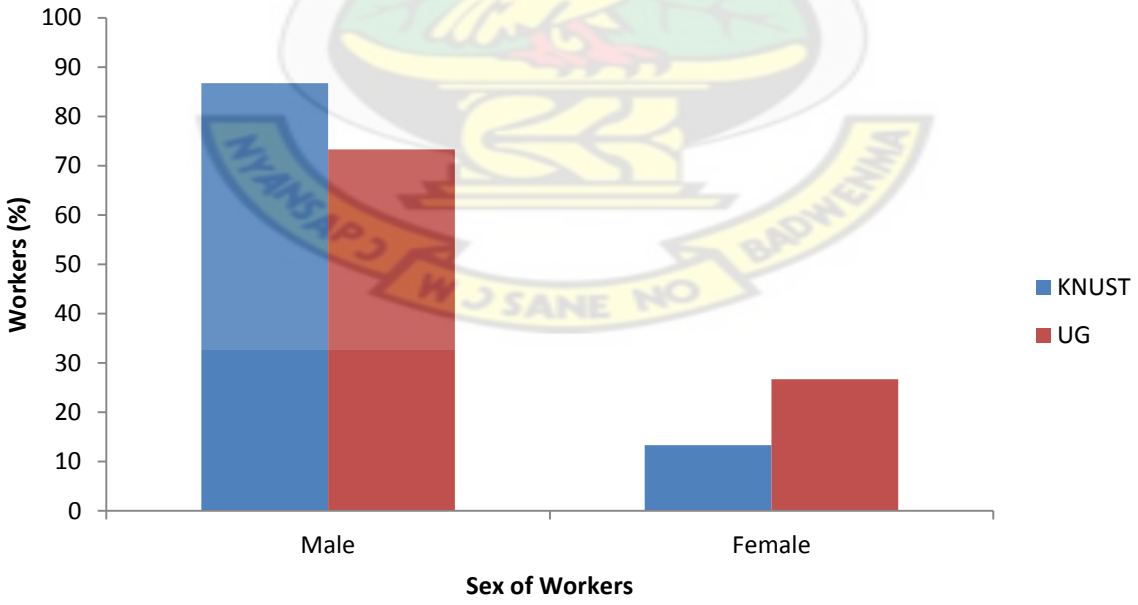

Fig. 5 Sex of workers in the botanic gardens

The survey also showed that while the KNUST Botanic Gardens recorded 66.7%, 20% and 13.3% of workers ages between 41-50 years, 31– 40 years and below 30 years respectively, the UG Botanic Gardens recorded 53.3%, 33.3% and 6.7% in the same order. The remaining 6.7% of workers in the UG Botanic Garden were those between the ages 51-60 years.

None of the workers interviewed at the KNUST Botanic gardens was above 50 years of age (Fig. 6).

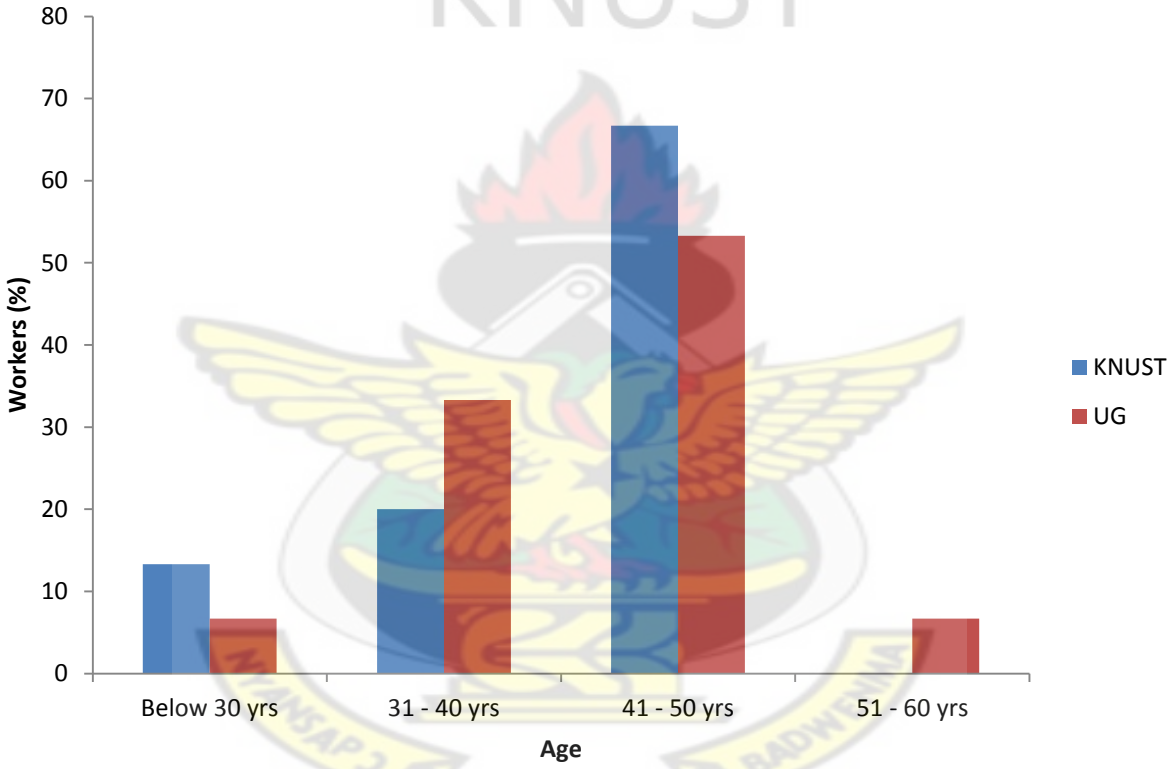

Fig. 6 Age groups of workers in the two botanic gardens

4.1.2.2 Educational Level

In the KNUST Botanic gardens only 6.7% of the workers had no formal education. The others were made up of 40% with tertiary education, 20% with secondary education; 20%, primary education and 13.3% nursery-kindergarten education. In the UG Botanic gardens however about 6.7% and 13.3% values were recorded for nursery-kindergarten and primary

whilst 26.7% and 53.3% values were recorded for secondary and tertiary education levels respectively (Fig.7).

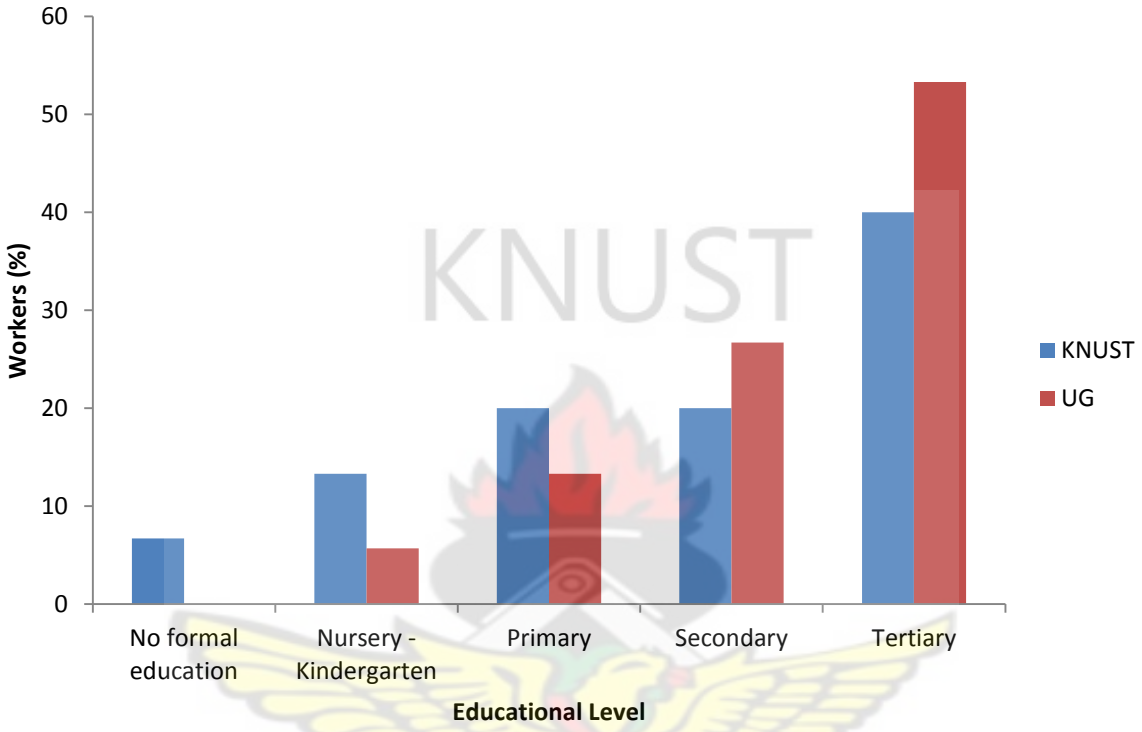

Fig.7 Educational level of workers in the two botanic gardens

4.1.2.3 Marital Status of Workers

From the KNUST botanic garden it was realized that about 46.7% of the workers were married and 33.3% were single. About 20% of the workers were however divorced and none were widowed. In the case of UG botanic gardens about 46.7% of the workers were married, 33.3% were divorced, 13.3% were widowed and the remaining 6.7% workers were single (Fig. 8).

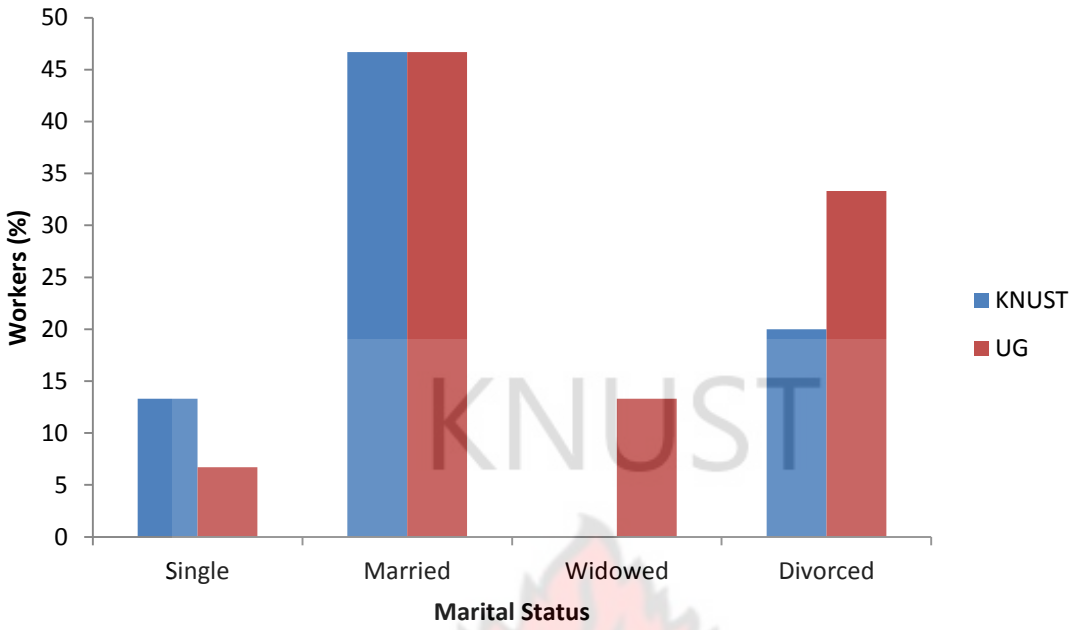

Fig. 8 A chart showing the marital status of workers in percentages

4.1.3 MAINTENANCE AND MANAGEMENT PRACTICES

Considering how the workers perceived the gardens in terms of the kind of infrastructure, wages, and maintenance/management practices in the gardens, about 40% and 46.5% of the workers from the KNUST and the UG Botanic Gardens respectively said the gardens had no management plan. About 10.7% and 10% workers from KNUST and UG Botanic gardens respectively were concerned about the poor maintenane practices in the gardens. About 6.7% and 26.7% from KNUST and UG Botanic Gardens respectively were also interested in the number of few qualified workers employed in these gardens (Fig. 9). To some other 37.7% and 16.7% workers from the KNUST and UG Botanic Gardens respectively, these two botanic gardens are not beeing managed properly due to the negligence of those in authority. According to them, the gardens are gradually being turned into grounds for funeral celebrations and church crusades.

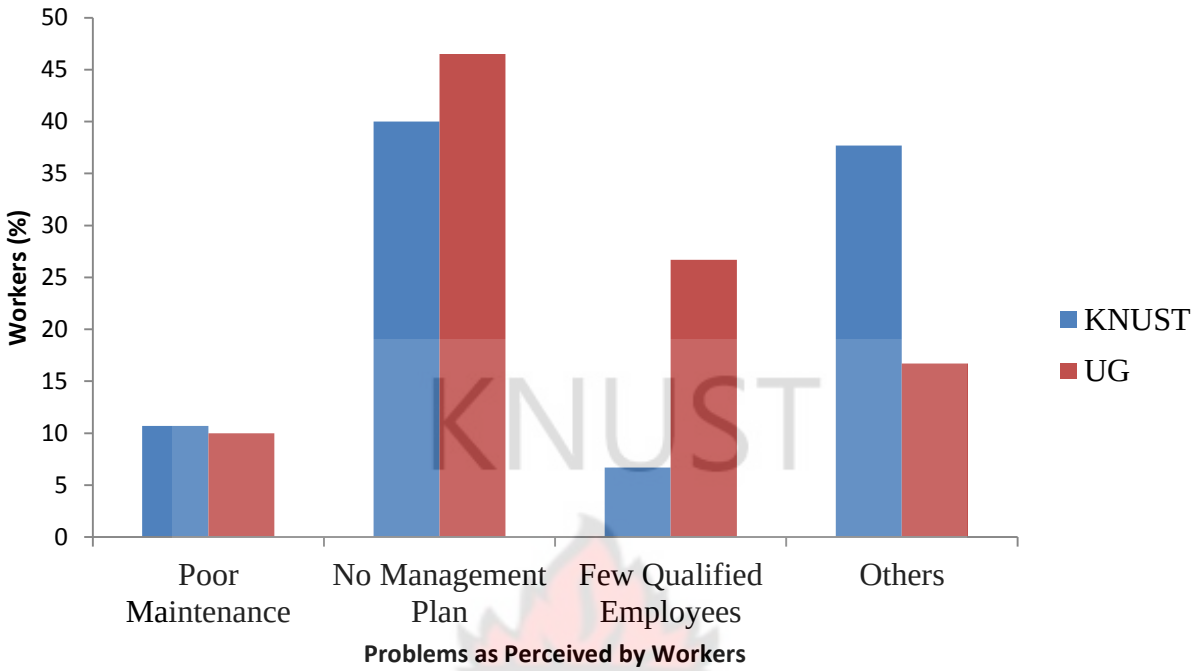

Fig. 9 Some problems perceived by workers

4.1.4 SOME SUGGESTIONS FROM WORKERS

About 33.3% of the workers from the KNUST botanic gardens and 40% from the UG Botanic Gardens suggested that new infrastructure systems (offices, parking lots, security posts) would help improve the state of the gardens. Some workers (20% and 13.3% from the KNUST and UG botanic gardens respectively) said the gardens need to be renovated. About 13.3% of the workers from the KNUST Botanic gardens suggested that some spaces within the gardens should be reserved for the purposes of entertainments only (Fig. 10).

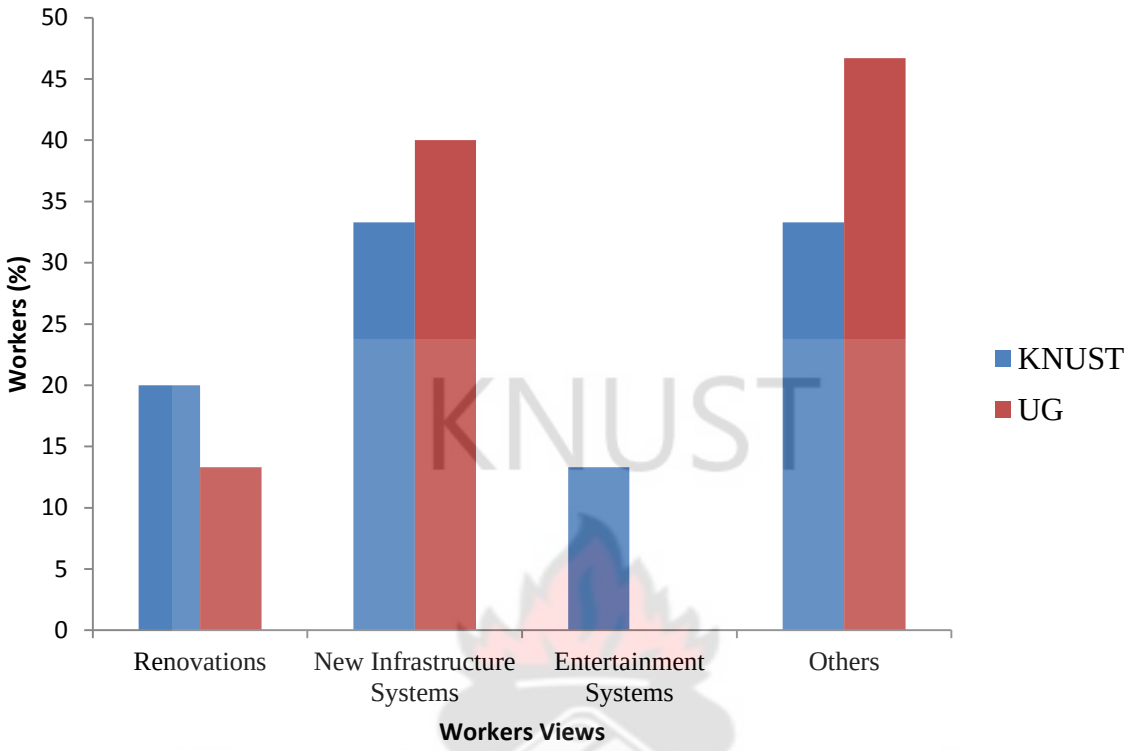

Fig. 10 How the states of the gardens can be improved

Majority of the workers (about 33.3% from KNUST and 46.7% from the UG botanic gardens) suggested that some other activities and facilities introduced into the gardens would contribute to the general improvement conditions in the gardens. A summary of their suggestions have been represented in Fig.11 below.

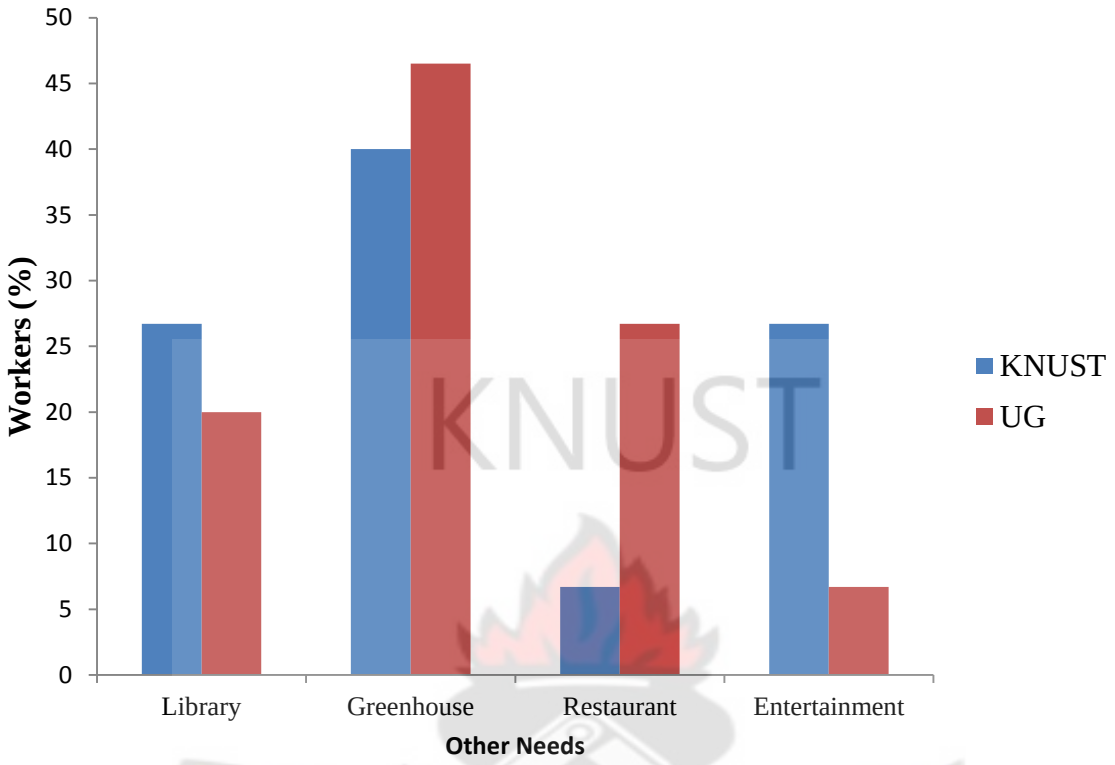

Fig. 11 Other facilities and activities which will help improve the state of the gardens

About 26.7% and 20% of the workers from KNUST and UG Botanic gardens suggested that the presence of libraries, demonstration rooms and lecture rooms in the gardens would change its current state to a better one. Majority of them (about 46.7% from UG and 40% from KNUST) were convinced that the presence of greenhouses, herbariums and plant houses would contribute a lot to improving these botanic gardens. About 26.7% and 6.7% of the workers from KNUST and UG Botanic gardens respectively believe that the holding of music, dance and sports activities occasionally in the botanic gardens will go a long way to increase patronage at the gardens. The rest of 6.7% (KNUST) and 26.7% (UG) indicated that availability of restaurants for local and some continental dishes would help a lot in improving the state of the gardens.

4.1.5 SOME PLANT TYPES IN THE GARDENS

The project also sought to find out if there were any particular plants under research, or any plant with historic backgrounds in these gardens that could be recommended for visitors to the gardens and a summary of their responses has been represented in Fig.12 below. Majority of workers (46.7% and 60% from KNUST and UG Botanic Gardens respectively) recommended medicinal plants. About 26.7% from KNUST and 20% of the workers from the UG Botanic Gardens also recommended some different kinds of palms being made available in these gardens. Others (20% of the workers from KNUST and 6.7% from UG Botanic Gardens) recommended some ornamental plants. The remaining 6.7% and 13.3% of the workers from KNUST and Legon Botanic Gardens respectively listed others like the pines, conifers and bamboos. There were however no any particular plant under research at the time of the assessment.

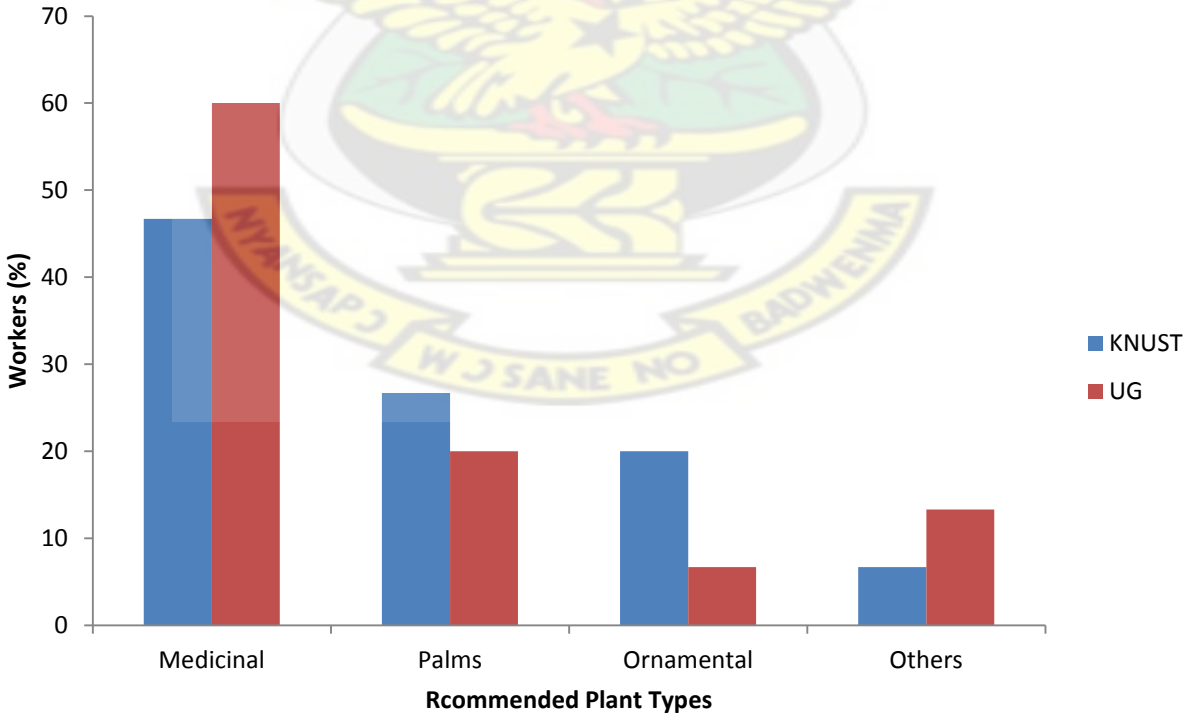

Fig. 12 Type of plants in the gardens

4.2 DATA COLLECTED FROM STUDENTS OF THE TWO GARDENS

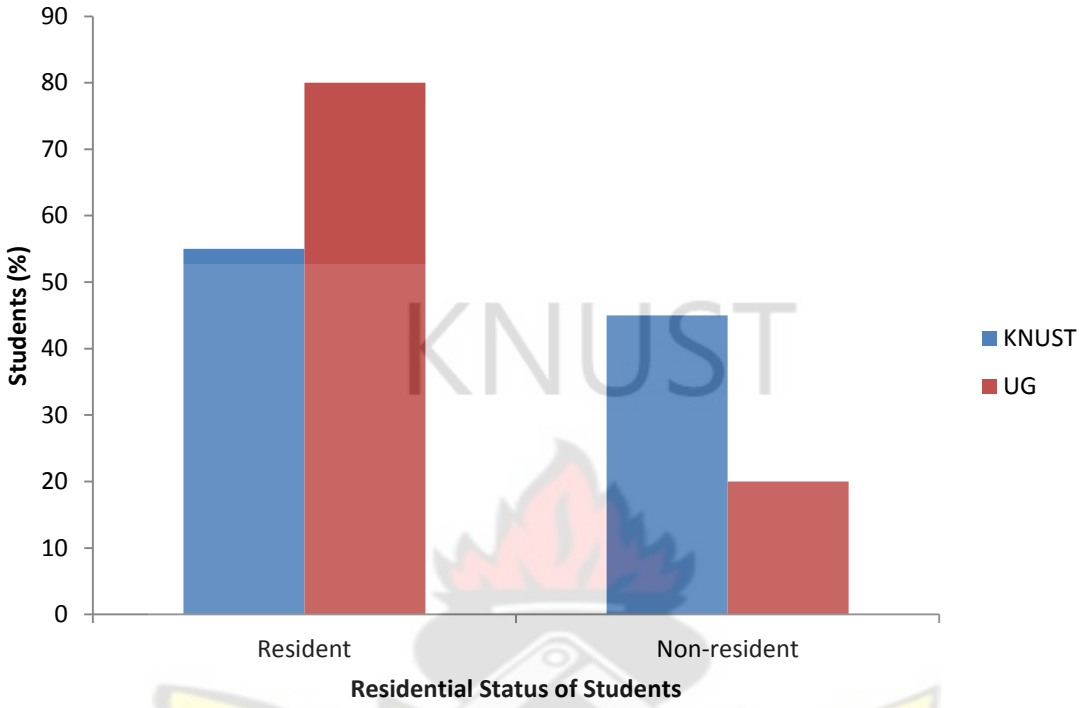

Fig. 13 Residential status of students interviewed

About 80% and 55% of the students interviewed from the UG and KNUST respectively were resident whiles the remaining 20% and 45% respectively were non-resident (Fig. 13).

4.2.1 DEFINITION OF A BOTANIC GARDEN

About 10 % of the students interviewed had no idea what botanic gardens were but the majority (45% from KNUST and 40% from UG) defined a botanic garden as a place for the scientific study of plants. 30% of students each from the two Universities Botanic Gardens defined a botanic garden as a place designated only for education, research and recreation (Fig. 14).

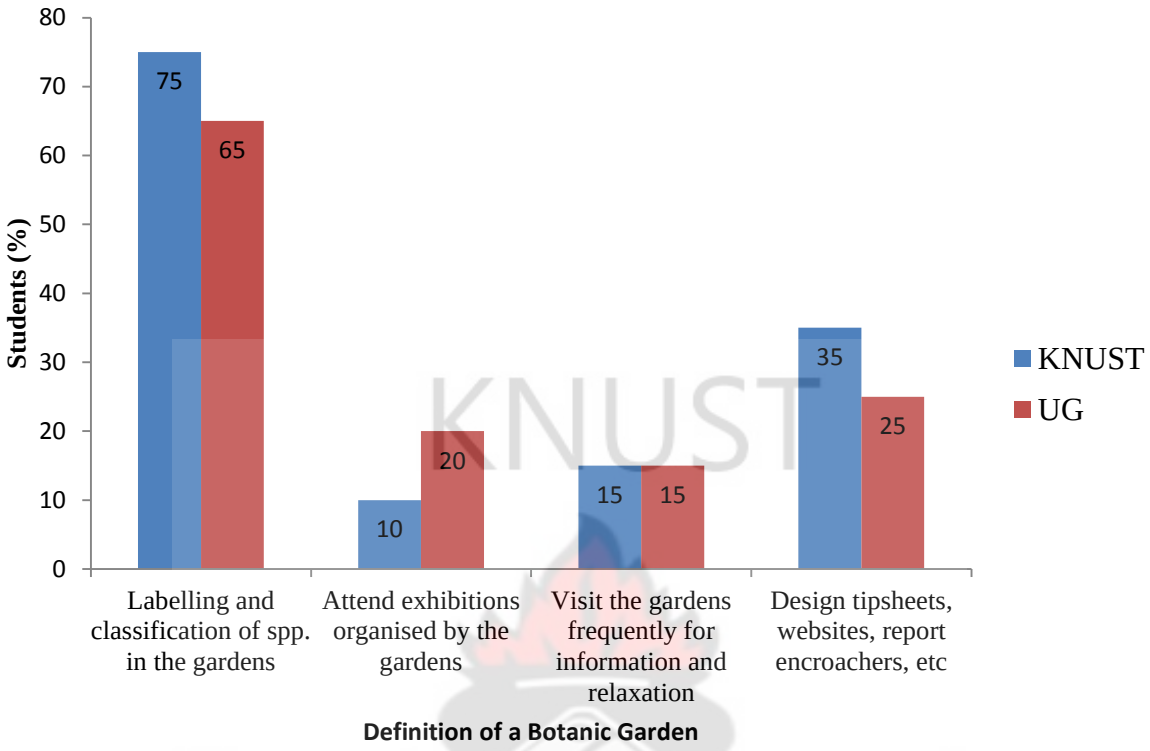

Fig. 14 Students' definitions of a botanic garden

The rest of the students (about 25% from KNUST and 20% from UG Botanic Gardens) gave their own definitions of botanic gardens as follows:

- A geographical area specifically maintained for the planting of uncommon trees and flowers.
- A garden meant to be used as a teaching aid for the various kinds of species of plants and also for studying their scientific names.
- A garden with varieties of trees whose scientific names have been written on them purposely for study, shelter and for tourist attractions.
- A specially reserved place for plants and human relaxations.
- A garden of life and pleasure that provides more support to life than other public gardens.

4.2.2 THE USE OF LATIN/LOCAL NAMES AS A MEANS OF LABELLING IN THE GARDENS

The project sought to find out from students if the local names of some plants could be used as a means of labelling instead of their Latin names, and about 75% and 65% of the students from the KNUST and UG Botanic gardens respectively said, Latin names were accepted worldwide by scientists. About 15% of students each from both Universities indicated that people find both Local and Latin names very interesting whiles the remaining 10% and 20% from the KNUST and Legon universities respectively would have preferred the use of local names only (Fig. 15).

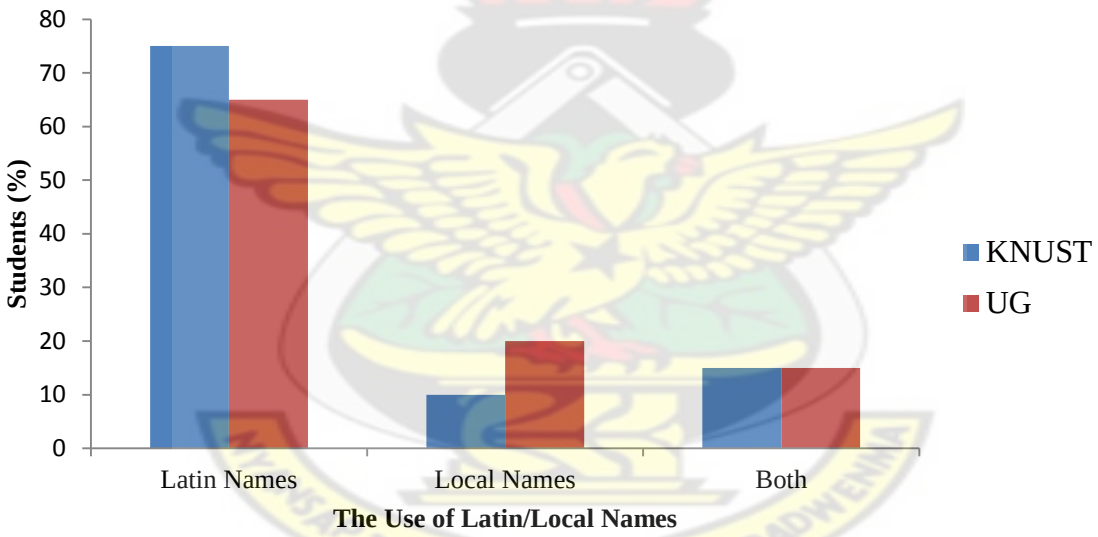

Fig. 15 The use of Latin or local names as means of labelling

4.2.3 STUDENTS PERCEPTIONS OF THE BOTANIC GARDENS

Majority of students (70% and 45% from KNUST and UG Botanic gardens respectively) said the botanic gardens are in a poor state whiles 25% from KNUST botanic garden and 40% of the students from Legon botanic thought they were in a good state. About 10% each from both universities considered the gardens to be in a very good state. None of the students categorised the states of the gardens as very poor or excellent (Fig.16).

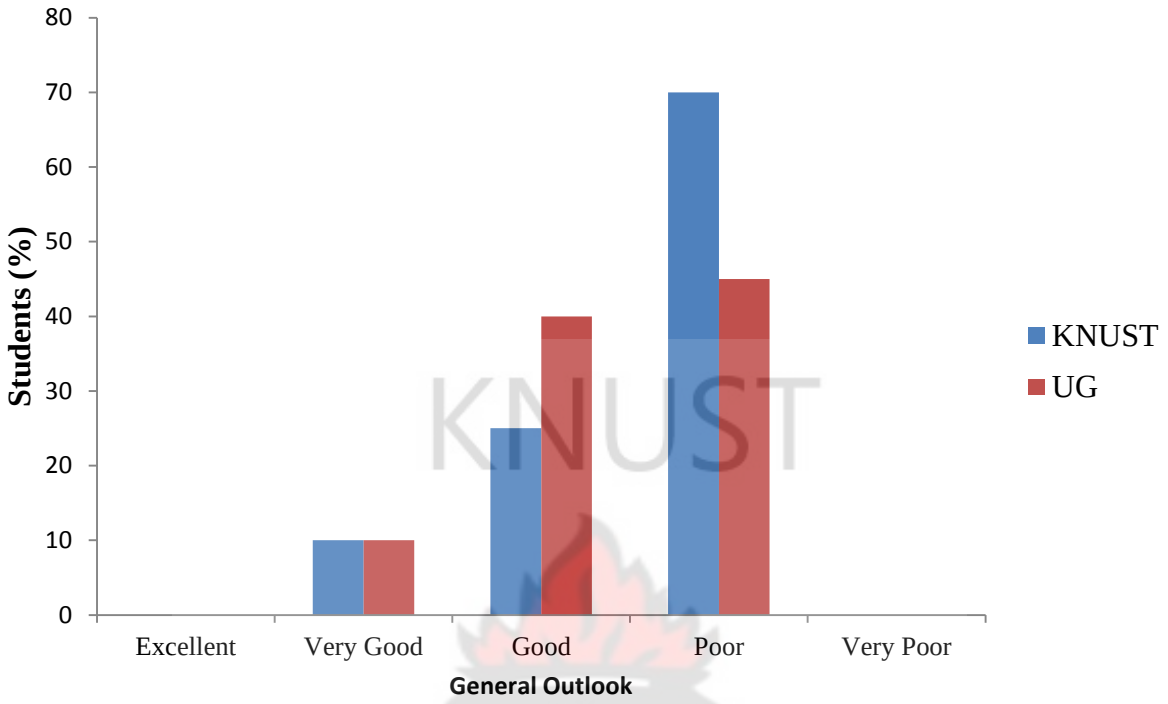

Fig. 16 Assessing the general outlook of the two botanic gardens

For those who thought the gardens were in a poor state, a number of reasons were given which included: lack of funds for maintenance, lack of skilled personnel, illiterate employees, improper fencing of gardens among others.

4.2.4 STUDENTS ROLE IN THE BOTANIC GARDENS

About 35% and 25% from KNUST and UG Botanic gardens respectively suggested that labelling and classification of plant species in the gardens by students can help improve the state of the gardens (Fig. 17). Some 35% of KNUST students and 30% of UG students also suggested that students should organize and attend exhibitions in the gardens. About10% and 40% of the students from KNUST and UG Botanic Gardens respectively advised that students should visit the gardens frequently for information and relaxation while the remaining 20% and 5% of students from the KNUST and UG Botanic gardens respectively

thought students could design tip sheets, websites and other items needed by users of the garden.

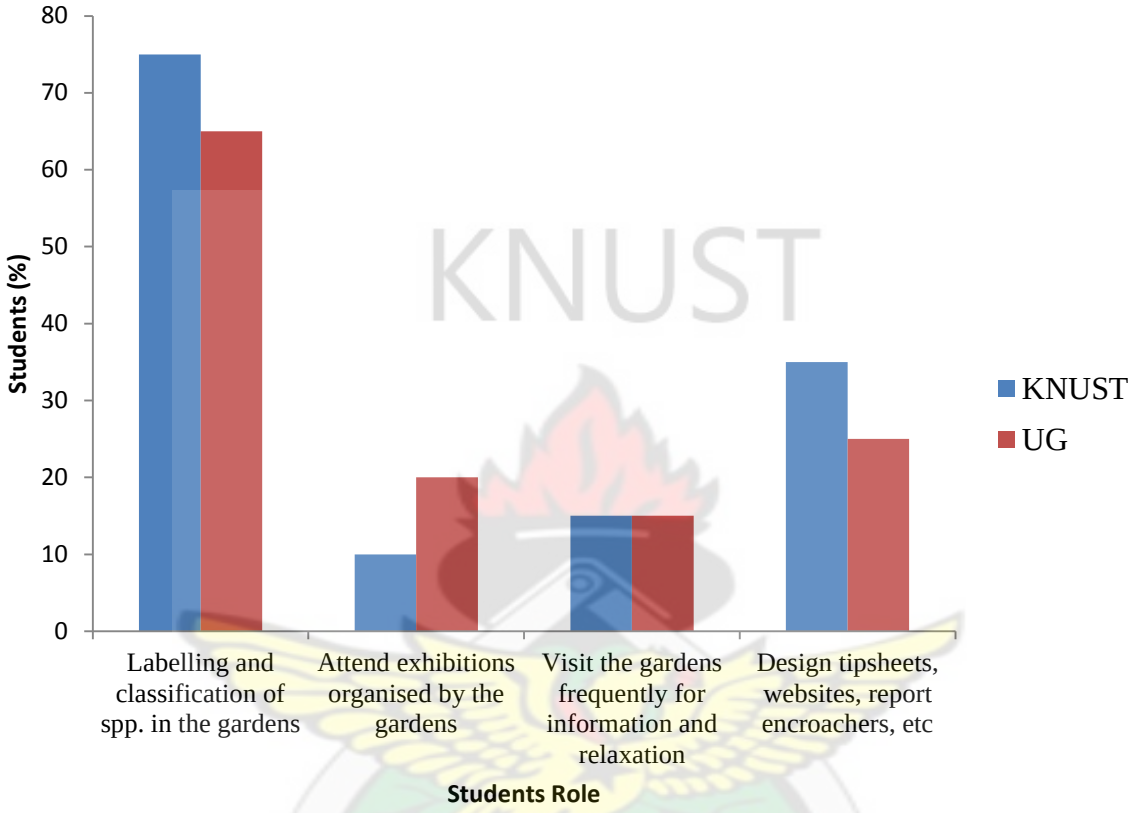

Fig. 17 Some roles students can play to bring about improvements in the gardens

4.3 DATA ASSEMBLED FROM VISITORS TO THE TWO GARDENS

4.3.1 SEX AND AGE OF VISITORS

About 70% and 65% of the visitors to the KNUST and UG Botanic gardens respectively interviewed were females and the remaining 30% and 35% were males (Fig. 18).

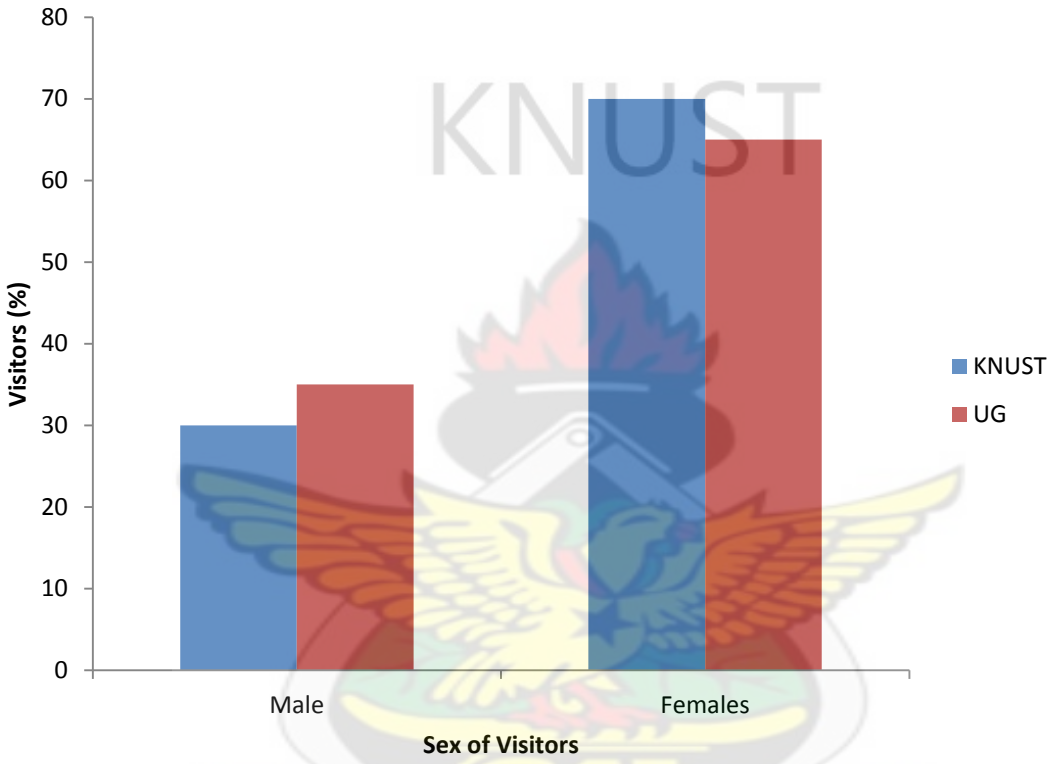

Fig. 18 Sex of visitors to the two botanic gardens

About 40% of visitors to KNUST botanic gardens and 60% of visitors to UG botanic gardens were below the 30 years. About 35% and 20% were recorded for visitors between ages 31 – 40 years at the KNUST and UG Botanic gardens respectively. Some of the visitors to KNUST (20%) and UG (15%) were between the ages of 41 – 50 years (Fig. 19) and very few were above 50 years of age (that is 5% for both gardens)

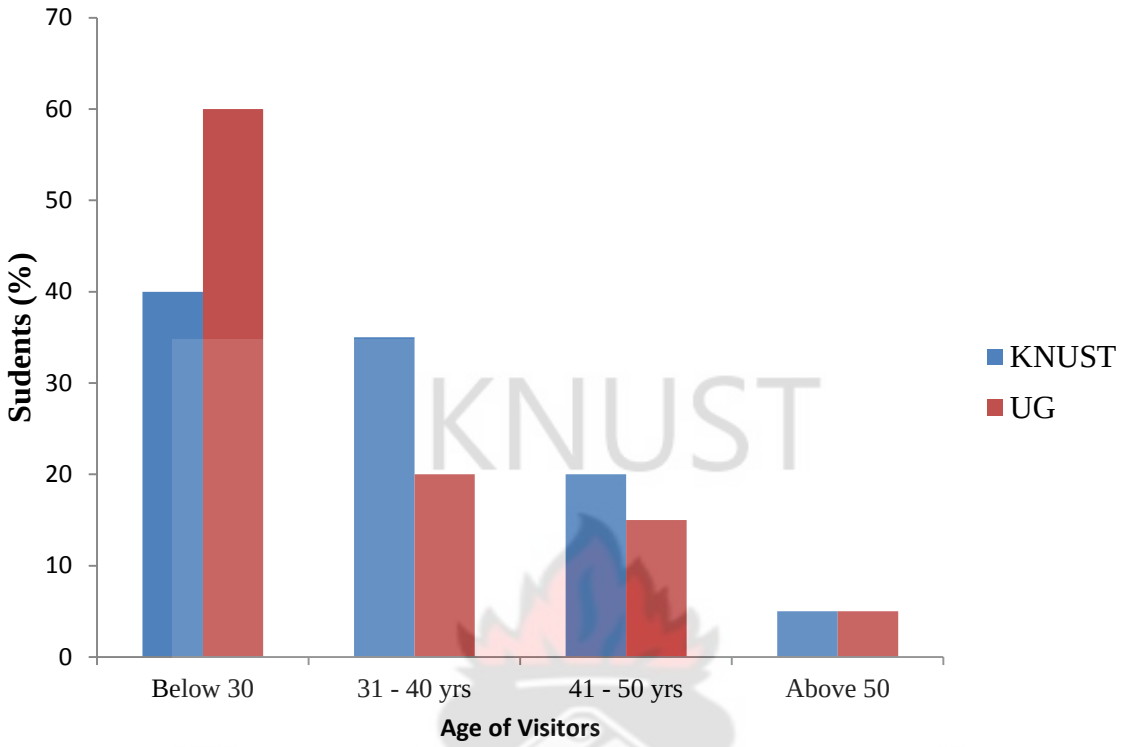

Fig. 19 Age of visitors interviewed in the botanic gardens

4.3.2 EDUCATIONAL LEVEL AND OCCUPATION OF VISITORS

Most of the visitors to the two gardens (60 % to UG and 45% to KNUST botanic gardens) have had education up to the tertiary level (that is, graduates from either universities or polytechnics across the country). 5% of the visitors to the KNUST Botanic garden were illiterates and the rest were either secondary (30% to UG and 25% to KNUST botanic gardens), primary (5 % to UG and 10% to KNUST botanic gardens) and nursery-kindergarten (5 % to UG and 15% to KNUST botanic gardens) school leavers (Fig. 20).

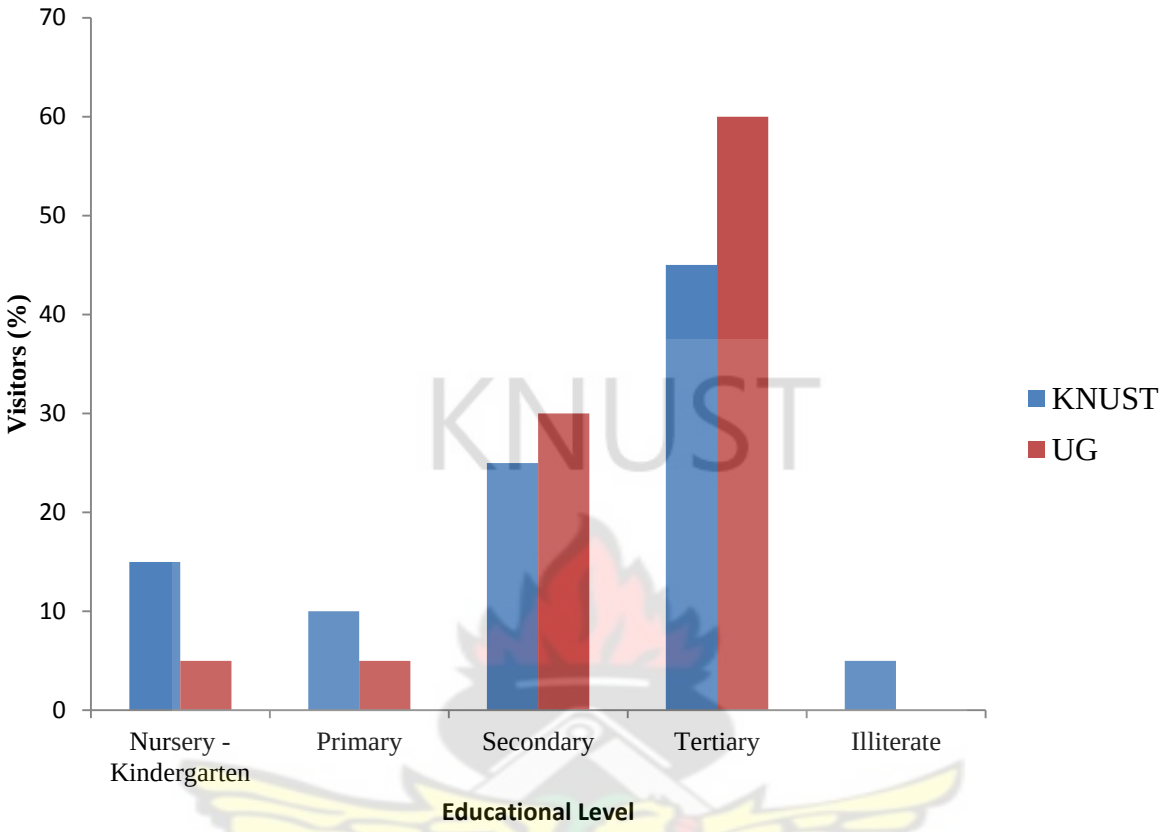

Fig. 20 Educational level of visitors to the gardens

In the UG Botanic Garden, about 45% of the visitors were civil servants, 10% were farmers, 15% were unemployed and 30% were students from other institutions. The case was different in the KNUST Botanic gardens which recorded about 30% Civil servants, 45% farmers, 15% unemployed and 30% children from various schools around the Universities Botanic garden (Fig 21).

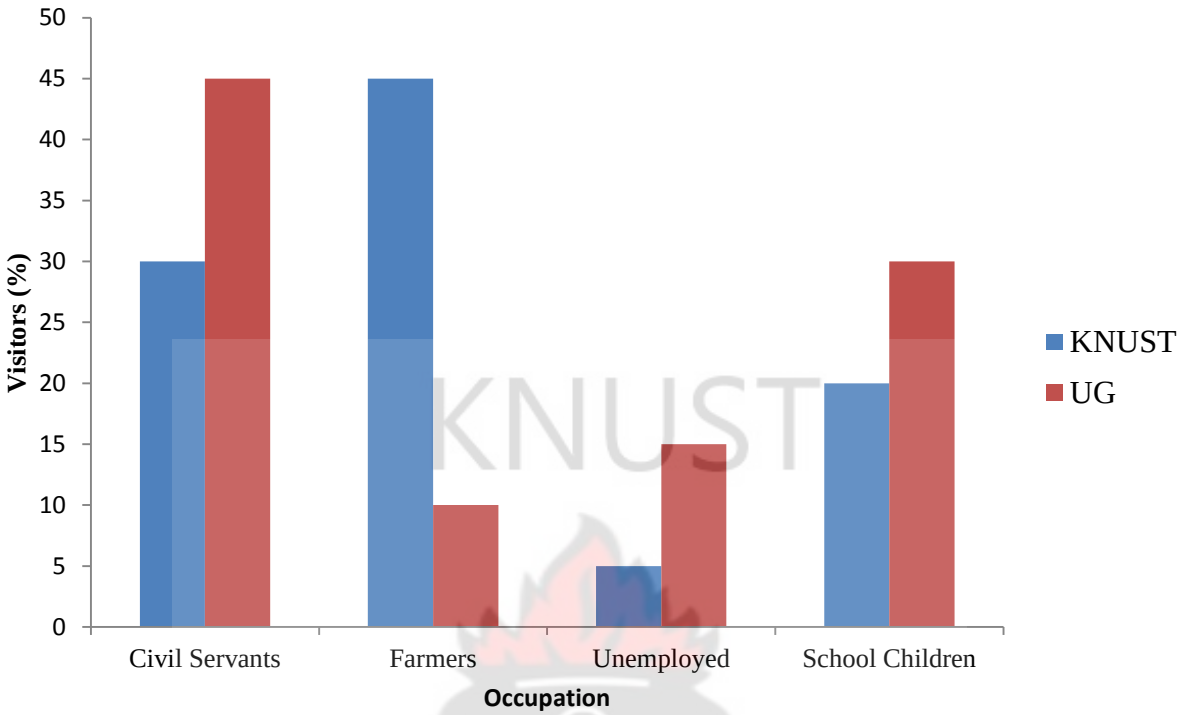

Fig. 21 Occupational status of visitors

4.3.3 PLACE OF ORIGIN OF VISITORS

45% of visitors to the KNUST Botanic gardens were mainly residents of Kumasi and 40% of visitors to the UG Botanic gardens were residents of Accra. Some of the visitors had also come from other places within the country (10% of visitors to KNUST Botanic Gardens were from Accra and 15% from other parts of the country). In the case of UG Botanic Gardens 40% of visitors were from Accra, 5% from Kumasi and 20% from other parts of the country. 30% and 35% of visitors to the KNUST and UG Botanic Gardens respectively however were from outside the shores of Ghana (Fig. 22).

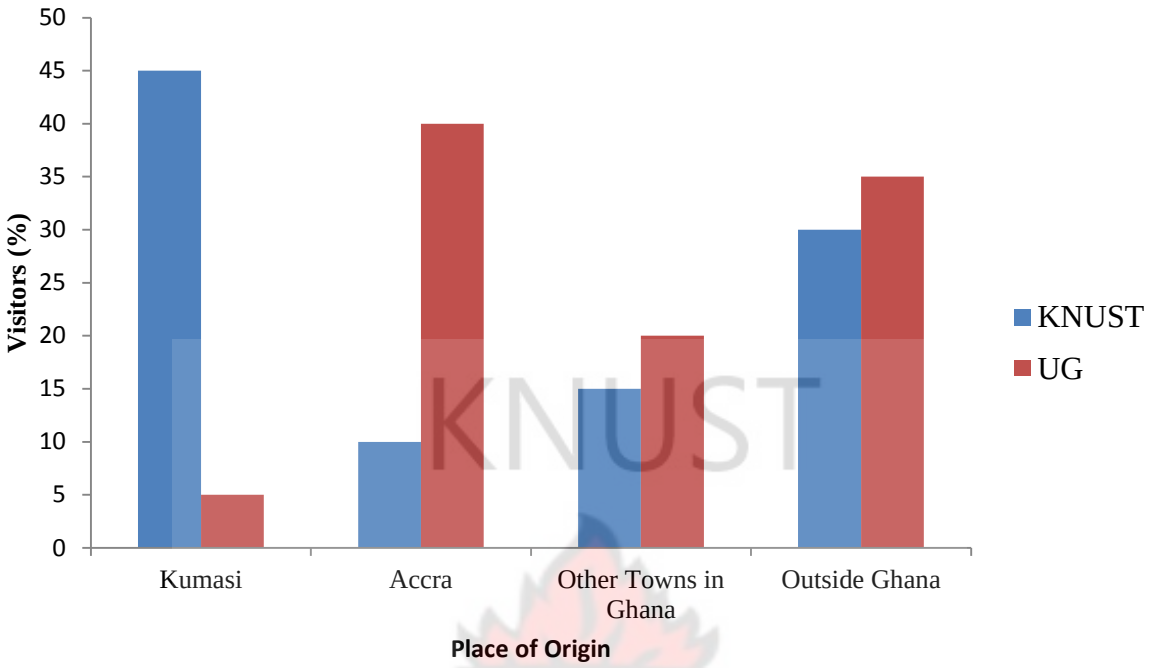

Fig. 22 Place of origin of visitors to the gardens

4.3.4 LIST OF SOME ITEMS FOUND IN OTHER BOTANIC GARDENS IN THE WORLD BUT ABSENT IN THE KNUST AND UG BOTANIC GARDENS

A number of the visitors interviewed had been to other botanic gardens outside Ghana and believed the states of the KNUST and UG Botanic Gardens can be improved if some more features are introduced in these botanic gardens (Fig. 23). In the KNUST Botanic Gardens, 20% of the visitors indicated herbariums should be introduced into the gardens. 25% indicated libraries, 5% indicated access to internet and phones whilst 10% indicated maps and tip sheets. Majority (40%) however indicated that offices, restaurants and demonstration rooms should be provided in the KNUST Botanic Gardens. The UG Botanic gardens also recorded 25% herbariums, 20% libraries, 20% access to phones and internets and 35% offices, restaurants and demonstration rooms.

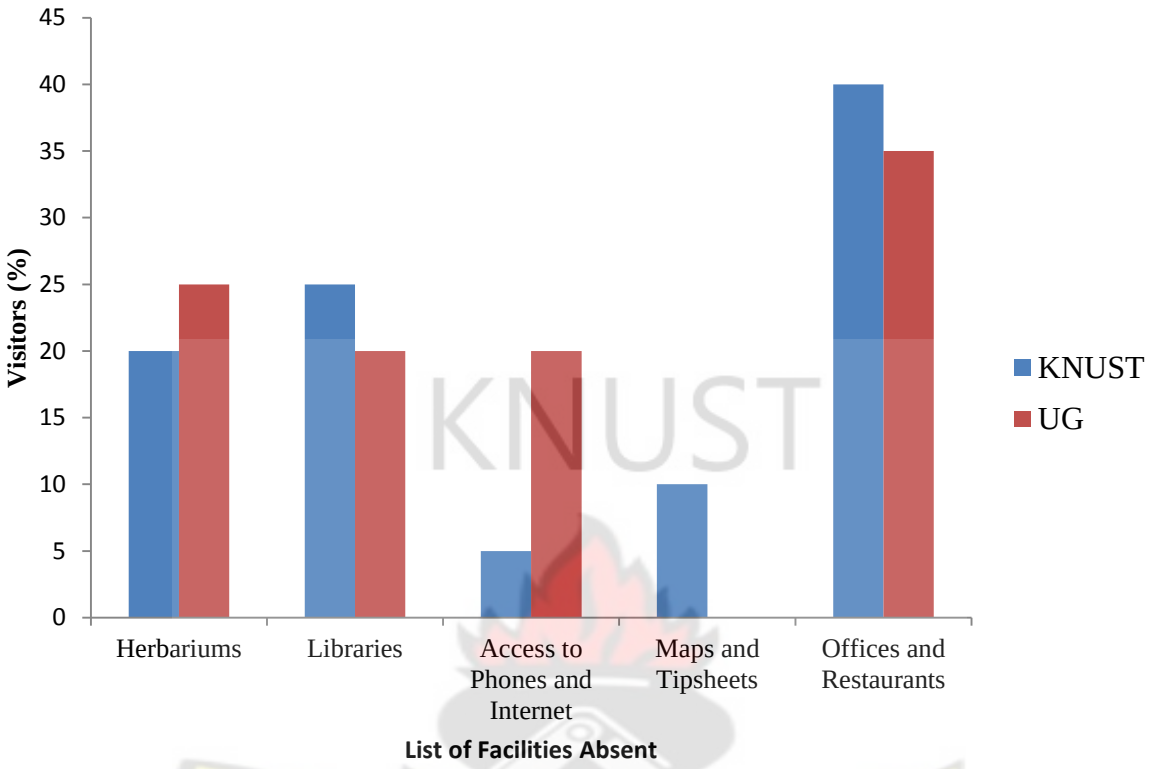

Fig. 23 List of facilities absent in the two Universities Botanic Gardens

4.3.5 EDUCATIONAL PROGRAMMES

Suggestions were received from visitors on some educational programmes that could be studied in these gardens. A summary of their suggestions have been shown in Fig. 24 below. About 30% and 20% of the visitors to the Legon and KNUST Botanic gardens respectively suggested exhibition and gallery tours. Other suggestions included in-service training for staff (KNUST (20%) and Legon Botanic Gardens (10%)), plants identification and classification programs (KNUST (15%) and UG Botanic Gardens (10%)), seminars held on discoveries in the gardens (KNUST (10%) and Legon Botanic Gardens (5%)). The majority (KNUST (35%) and UG Botanic Gardens (45%)) of workers suggested workshops on irrigation

systems, some cultural and management practices for workers, lectures on the history of the gardens and on diversity and distribution of plants in the botanic gardens.

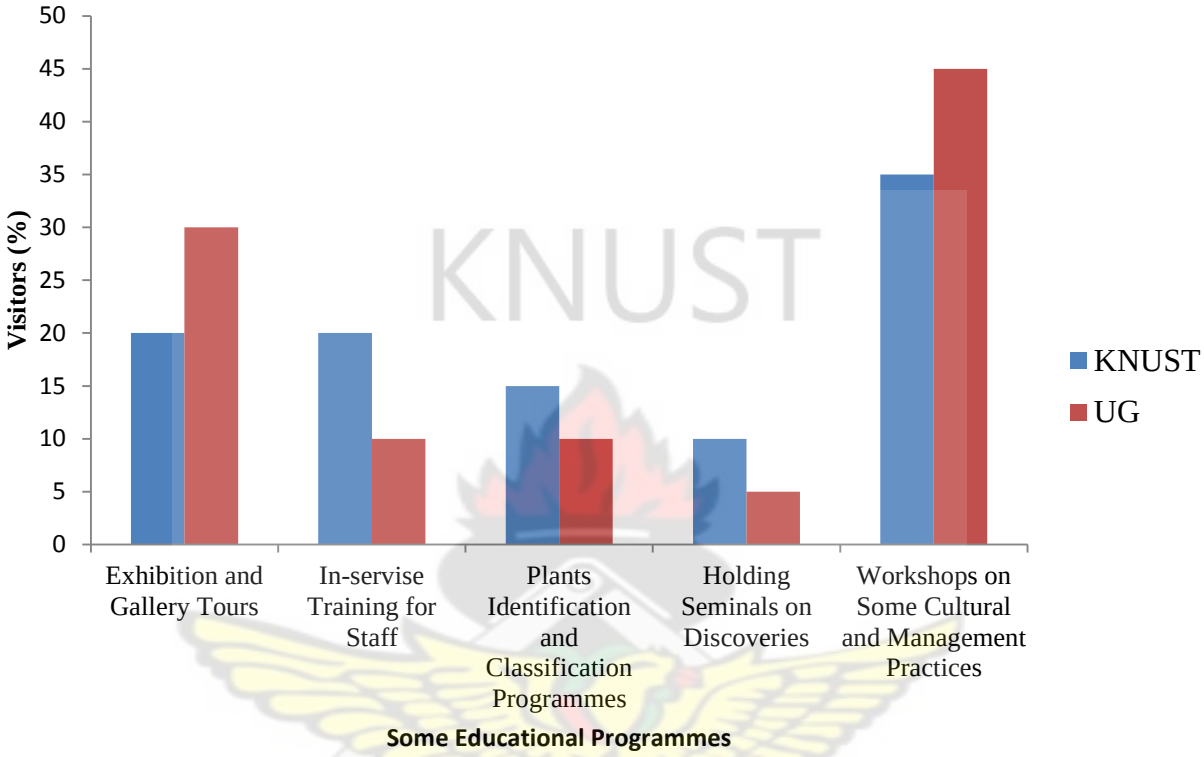

Fig. 24 Some educational programs that should be organized in the botanic gardens

4.3.6 ENTERTAINMENT TYPES AND FEES

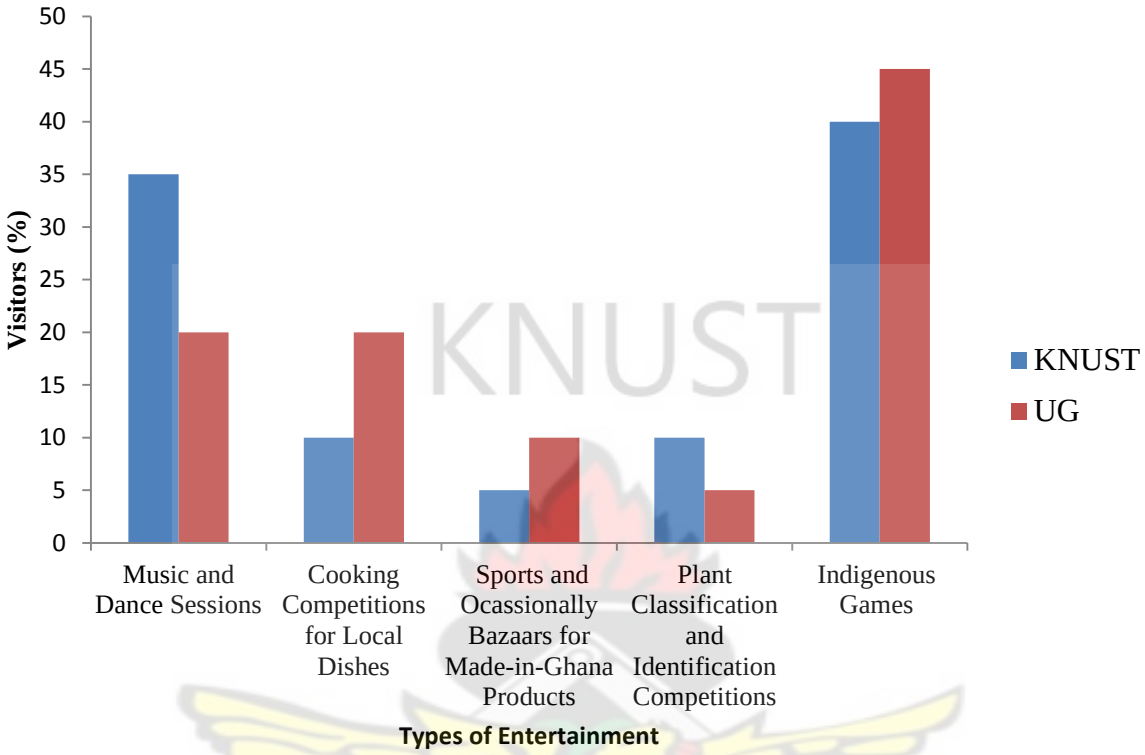

Fig. 25 Some entertainments types which can be organized in these gardens

Some of the entertainment types recommended by visitors were music and dance sessions (35% for KNUST and 20% for UG Botanic Gardens), cooking competitions for local dishes (10% for KNUST and 20% for UG Botanic Gardens), sports and occasionally bazars in made in Ghana products (5% for KNUST and 10% for UG Botanic Gardens). The majority of visitors (40% to the KNUST and 45% to the UG Botanic Gardens) suggested some games like Ludo and Oware competitions to be organized in the gardens. Plants classification and identification competitions were also suggested as well as drama and storytelling in the gardens at night among others (Fig. 25).

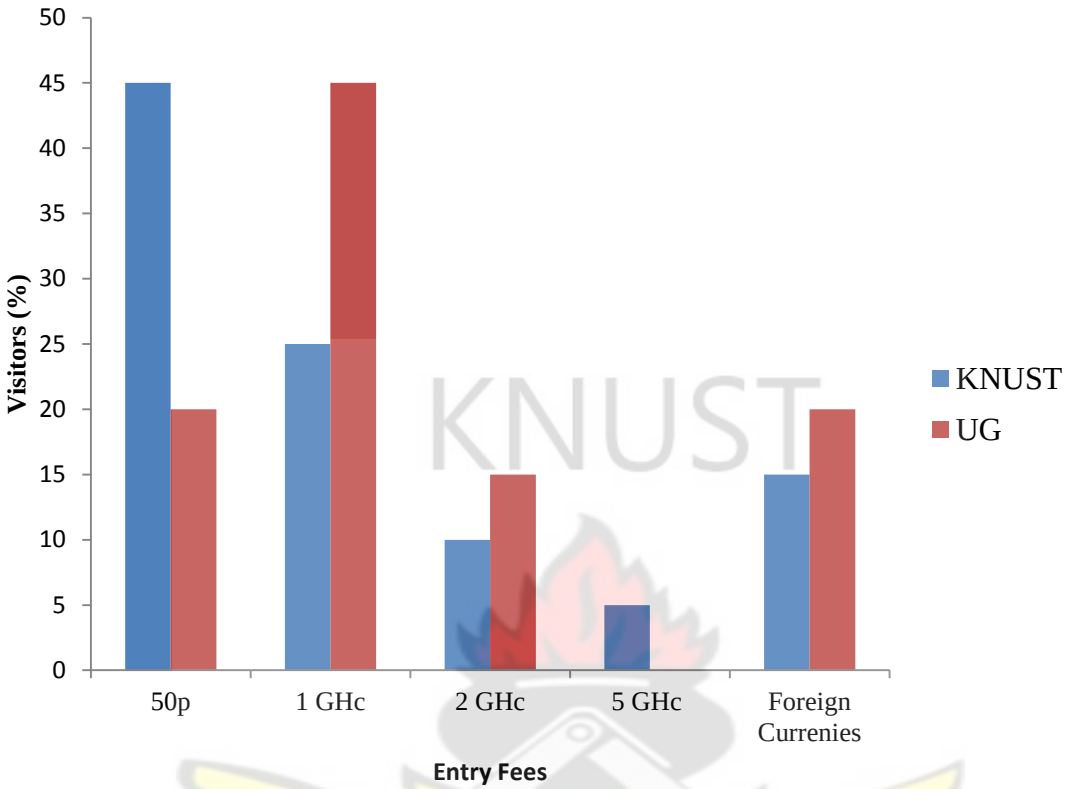

Fig. 26 Fees for entering into the botanic gardens

In the KNUST Botanic Garden, 45% of the visitors to the garden think an amount of 50 Ghana pesewas should be taken as an entry fee, 25% of the visitors suggested 1 Ghana Cedi, 10% suggested 2 Ghana Cedis and 5% of the visitors suggested 5 Ghana Cedis. Some 15% visitors however think payment should be made in foreign currencies for visitors coming from other countries.

In the case of UG Botanic Garden 20% of the visitors to the garden think an amount of 50 Ghana pesewas will be a fair charge, the majority (45%) of the visitors suggested 1 Ghana Cedis, 15% suggested 2 Ghana Cedis and some 20% visitors think entry fees should even be paid in foreign currencies.

CHAPTER FIVE

5.0 DISCUSSION

5.1. OVERVIEW OF DATA COLLECTED FROM WORKERS OF THE TWO GARDENS

Despite the difference in geographical locations of the two gardens under this study, the results obtained from the survey did not reveal much differences with respect to the kind of workers, students and visitors who patronized these botanic gardens. Standards of the two botanic gardens assessed in this study are falling and due to the poor maintenance and management practices by their curators, a lot would have to be put in place to ensure their sustainability. Workers in the universities botanic gardens complain of very low wages which do not encourage them to work well. Below is overview of the most relevant results obtained from workers after the survey of these gardens.

5.1.1 SEX AND MARITAL STATUS OF WORKERS

From the results of the study, it was observed clearly that, majority of the workers in both Universities Botanic Gardens were males and very few were females. This may be attributed to the energy demanding nature of the work in these gardens and perhaps the intensive management and production practices involved. As late as the 1960s, the prevalent thought was that women should not engage in activities involving body contacts, or application of force to heavy objects (Lenskyi, 1999). While strength is a fundamental quality for achieving optimum performance in most activities, females have been socialized to avoid heavy resistance training to gain and exhibit strength (Kaplan, 1999). Gardening is a keen to farming, and in Ghana females contribute to farming a lot. This is the reason why there are female workers too in the gardens.

Majority of the workers in the gardens were married and this suggests reasons why workers are few but have been very efficient in carrying out their duties in the gardens to some extent. According to Waite (1999), marriage improves the health and longevity of men and women, gives them access to a more active and satisfying sex life, increase wealth and assets, boosts children's chances for success and enhances men's performance at their work and earnings.

5.1.2 NUMBER, MODE OF EMPLOYMENT AND AGE OF WORKERS

Considering the sizes of these two botanic gardens, in terms of the hectares of land they occupy, the Legon Botanic Gardens cover an area of approximately 25 hectares whiles the KNUST Botanic Gardens cover only 12.9 hectares of land. This explains why there were many workers in the Legon Botanic Gardens than in the KNUST Botanic Gardens. It was anticipated that in a university's botanic garden as in the Legon and KNUST Botanic Gardens, all the workers would be employed by means of their academic qualifications, but that was actually not the case. Apart from those who were in the gardens on attachments or exchange programs, some were also recommended into these botanic gardens based on their experiences and technical know-how acquired from other gardens in Ghana. Interactions with some workers during the study revealed that in the past there were very few people in Ghana who had knowledge in botanic gardens, so people with any information or evidence about gardens in general were taken as workers regardless of their qualifications. This explains why in the KNUST Botanic garden, for instance, some workers were there by means of protocol. In recent times however, this trend is changing, as the potential of the gardens keep evolving. It is now very difficult for persons without proper qualifications to be taken into universities botanic gardens due to the fact that most botanic gardens in the world aspire to meet international standards. This is reflected by the diversity of workers (in terms of

experiences and qualifications) in the two botanic gardens under study. Most of the workers in these gardens according to the study are middle aged (between the ages of 41 and 50 years) and even some have very low or no educational qualifications. This indeed reveals a problem that needs attention if these two botanic gardens can become competitive in the world. With the growing recognition of the importance of botanic gardens in Ghana, the need to increase the number of professional workers cannot be over-emphasized. More expertise is required in the botanic gardens because of their diverse nature and the specific cultural requirements of the numerous horticultural plants within the botanic gardens.

5.1.3 EDUCATIONAL LEVEL OF WORKERS

No proper documentation, labelling irrigation and propagation of plants can go on in a garden where workers are not formally educated. It was discovered from this project that some few of these workers are illiterates and have not had any formal education in the field they find themselves. The supposed purpose of education as marketed by the education industry is career advancement, higher pay and empowering a college graduate's job search. Education open ones mind to new ideas and education has an immense impact on the human society (Hayek, 2008). It trains the human mind to think of and take right decision. In other words, man becomes a rational animal when he is educated. This may well explain why the majority of the workers in both botanic gardens have had some form of education. Workers with tertiary education levels however dominate in these gardens simply because of the standards the universities hope to set. Stewart (1994) said 'the best way for the non-professional to learn the names of and gather information about plants is to travel in the company of a plant expert'. This implies graduates or workers with botanic know-how would have to be employed instead, to assist some major activities in the garden.

5.1.4 WORKERS EXPECTATIONS, SUGGESTIONS AND PERCEPTIONS ON THE BOTANIC GARDENS

It is recognised that a zoo is about collections of animals, and a museum is about collections of artefacts and objects, but botanic gardens are fundamentally about collections of plants (BGCI, 2009). This explains why majority of workers in these two gardens were convinced that the presence of greenhouses, herbariums and plant houses would contribute a lot to improving their current states. The Royal Botanic Garden (Kew) which is an internationally respected centre of scientific excellence, identifies and classifies plants, researches their structure, chemistry and genetics, collects endanger species, maintains reference collections and shares all these knowledge with interested parties throughout the world (Christina, 2007). Some people have the mistaken impression that botanic gardens are parks devoid of play, something like 19th century museums where plants bear labels with unpronounceable names (AABGA, 2005). Modern botanic gardens, however, are global treasures in an age of ecological crisis. Today numbering more than 2000 gardens worldwide, they are places devoted to culture, study, and exhibition of documented collections of living plants. A description offered by the American Association of Botanical Gardens and Arboreta (AABGA, 2005) was that, botanic gardens should be committed to developing, documenting, verifying, maintaining, sharing, propagating, and disseminating their plant collections. This really explains why some of the workers suggested the inclusion of libraries, demonstration rooms and lecture theatres in the KNUST and the Legon Botanic Gardens. Majority of the workers whose expectations had not been met may be due to issues of lack of capitals/funds to run the gardens, low wages, absence of the right kind of tools and equipment, lack of refresher courses and other problems which do not encourage them to work effectively. More

over the sizes of the botanic gardens are quite big to be run by such few workers recorded during the survey.

5.1.5 FORMS OF ENTERTAINMENTS AND RESTAURANTS

Restaurants for local and some continental dishes cannot be overlooked in areas like these where a lot of energy is needed from workers to ensure the sustainability of these gardens. Documented operating systems and policies are absolutely critical to the long-term management of any garden and workers are those who ensure these are done. Food is an essential prerequisite for life and as such the primary goal of eating and drinking is to enable the body to function normally (Ryan, 2009). With food, or the lack of it, the destinies of individuals are greatly influenced, so the mere presence of a restaurant within a botanic garden may even trigger the workers to work well. Students and visitors to these botanic gardens may also not have to walk long distances away from the gardens before they find something to eat. Workers, who were interested in the introduction of music, dance and sports occasionally into the botanic gardens probably were thinking of how the gardens could generate funds from some of these activities. It will indeed be interesting to know that workers, students and even visitors are treated with some kind of Ghanaian music, folklore and other forms of entertainment at night in the botanic gardens after a hard day's work, or to some form of sports/athletics on weekends in the gardens. Funds generated from some of these activities could assist in the smooth running of the gardens. For instance such funds could be used to provide incinerators at vantage locations within the gardens. In fact, the botanic gardens could generate a lot of funds through these activities without having to consult the authorities of the universities for any form of financial assistance.

5.1.6 TYPES OF PLANTS RECOMMENDED BY WORKERS

Many botanic gardens rely heavily on plant sales to raise money to support their activities (Fernando *et al.,* 2001). In China, for instance, many of the state funded gardens are expected to raise a proportion of their annual funding through sale of plants. In addition it is a long-standing tradition in many botanic gardens to sell or distribute plants and seeds free to members of the public or friends of the gardens (Dale, 2005). These plants and seeds may be from indigenous plants held in their collections from foreign accessions, from surplus stock, or specially bred for the purpose of plant sales. The KNUST and the Legon botanic gardens have different types of plants including palms, ornamentals and medicinal among others which can be recommended and sold to visitors or friends of these gardens for use. Tropical Africa has thousands of useful plants, but lack of knowledge of the available resources means that local populations cannot make full use of them (PROTOA, 2005).

Medicinal plants emerged the most recommended plants among others in these gardens by the workers because of their importance to health and life in general. Medicinal plants play a vital role in the maintenance of human health throughout the world and notably in the tropics. They are of critical importance in poor communities where even relatively cheap western medicines remain prohibitively expensive. Medicinal plants therefore play an important cultural role as well as an important economic role. Knowledge of their use is widespread and their efficacy is trusted, based on a long history of use (WCMC, 2002). Ghana for instance has a particularly strong tradition in the use of medicinal plants and they play an important cultural and economic role in poverty alleviation, particularly through the involvement of fetish priests - people of significant status in villages throughout the country. Appreciation of the importance of medicinal plants at government level is increasing, and government policy

now promotes the integration of traditional health systems with conventional health systems (WCMC, 2002).

5.2. OVERVIEW OF DATA COLLECTED FROM STUDENTS OF THE GARDENS

5.2.1 RESIDENTIAL STATUS OF STUDENTS

Botanic gardens are often run by universities or other scientific research organizations and often have associated herbaria and research programmes in plant taxonomy or some other aspect of botanical science where students and visitors would benefit. Students visit botanic gardens depending on the resources available and the special interests pursued at each particular garden (Hilton, 1992). Both resident and non-resident students were spotted in these botanic gardens probably because of the level of inconveniences at the various halls of residences of students and the individual locations of the non-resident students' hostels. According to Hilton (1992), resident students encounter problems which occur more frequently in the social and academic areas, hall policy and maintenance and roommates' incompatibilities. Students' preparedness to deal with these problems may have to resort to conducive atmospheres like the botanic gardens where their needs and concerns would be addressed. This explains why more resident students than non-residents students were interviewed in this survey. It also explains why the majority of students interviewed defined a botanic garden as a place designated not only for the scientific study of plants, education and research but also for human relaxation and recreation.

5.2.2 THE USE OF LATIN AND LOCAL NAMES

With reference to a Wikimedia report which was last modified on 8th February 2011, botanic gardens are generally well-tended parks displaying a wide range of plants labeled with their

botanical names. Plants are known by a variety of names. They have both common names and scientific or Latin names. There is room for confusion in instances where the same plant may be called by different common names. This is obvious with different countries and languages, but the same plant may have many regional names in the same country. For example in UK, birds-foot trefoil (*Lotus corniculatus*) is also known as hen and chicken, Tom Thumb, granny's toenails, cuckoo's stockings and Dutchman's clogs. But every botanist from any part of the world knows what is meant by *Lotus corniculatus* (Arthur *et al*, 2009).

The advantage of a Latin name is that, as Latin is a dead language, it cannot change its meaning, but at the same time it is very descriptive. There are no political or nationalistic overtones in Latin, either, so it is readily accepted throughout the world (Fernando *et al.*, 2001). The majority of students who said Latin is used as means of labelling in most botanic gardens because of its acceptability worldwide were therefore not far from the truth. The very few students who preferred the use of local names to Latin names were probably considering visitors who had no educational backgrounds or so ever.

5.2.3 STUDENTS PERCEPTIONS OF THE BOTANIC GARDENS

Botanic gardens have always responded to the interests and values of the day. If a single function were to be chosen from the early literature on botanic gardens it would be their Scientific Endeavour and, flowing from this, their instructional value (BGCI, 2006). In their formative years botanic gardens were gardens for physicians and botanists but then they progressively became more associated with ornamental horticulture and the needs of the general public. It is by the publications coming out of herbaria and similar facilities that the scientific reputation of a botanic garden is now judged, not by its living collections. The interest in economic plants now has less relevance, and the concern with plant classification

systems has all but disappeared, while a fascination with the curious, beautiful and new seems unlikely to diminish (BGCI, 2006). Botanic gardens can therefore be considered to be in a poor or good state depending on its ability to meet the world's requirement. Majority of students said the botanic gardens were in a poor state probably because of what they know about other botanic gardens elsewhere. At the botanic gardens of Legon and KNUST, not much has been done in the areas of plant identification and classification as such visitors and students do not find it interesting walking in these gardens. There are no restrooms, restaurants, parking lots nor garden maps to enhance activities in the gardens. Students who visit the gardens are most often disappointed because there are no laboratories or demonstration rooms for one to even take notes.

The Legon and KNUST botanic gardens according to some of the students cannot be compared to the Braunschweig Botanic Garden in Germany, the Cornwall Botanic Garden in England and the Missouri Botanic Garden in U.S.A. in terms of general outlook, growing and conserving indigenous plants, promoting and raising environmental awareness in their locations and other places of the world.

Plate 2. Some scenes at Braunschweig Botanic Gardens

Each year, more than 750,000 tourists go to the Missouri Botanic Garden to delight in the serene beauty of the grounds and enjoy special events from a wide array of countries and cultures (BGCI, 2006).

The Legon and KNUST botanic gardens are only recognized in Ghana and some parts of Africa as the centre for tropical plants studies and collections. This explains why both students of the KNUST and Legon botanic gardens think students should be assigned special roles that will change the status of the gardens to a better one.

Plate 3. Main entrance of the Legon Botanic Garden

Plate 4. A cement stool in the Legon Botanic Garden

Plate 5. The main driveway in the Legon Botanic Garden (very dusty)

Plate 6. The main office of the Legon BG (so old and dilapidated)

Plate 7. The main entrance of the KNUST Botanic Garden

Plate 8. A driveway from the main gate into the KNUST Botanic Garden

Plate 9. Bamboo seats in the KNUST Botatnic Gardens

Plate 10. The main office of the KNUST Botanic Garden (very old and dilapidated)

The Japanese Tea Garden in San Francisco's Golden Gate Park for instance is an aorta of beauty and grace enjoyed each year by thousands of visitors round the world (Roberts, 1994).

Plate 11. The Japanese Tea Garden

5.3 OVERVIEW OF RESULTS COLLECTED FROM VISITORS TO THE GARDENS

5.3.1 SEX, AGE, EDUCATIONAL LEVEL, OCCUPATION AND PLACE OF ORIGIN OF VISITORS

The study results showed that majority of visitors to these botanic gardens were females who were either secondary or tertiary school leavers. They had come to the garden to make enquiries, pray, relax, observe quiet time or collect medicinal plants. Studies conducted by the International Association of Botanic Gardens in 2009 indicated that the availability of medicinal plants in botanic gardens particularly affects women (IABG, 2009). Women are frequently responsible for the collection of medicinal plants and have to walk increasingly greater distances to gather these as availability diminishes. Women also have a real need for medicinal plants due to the first aid role women play in the family and for the importance of these plants in treating gynecological illnesses. The few male visitors had either gone to the gardens to buy plants or to seek horticultural advice.

According to World Conservation Monitoring Centre (2008), people visit botanic gardens in their droves and a study done a few years back by some researchers in Australia indicated that over forty per cent of people above the age of fifteen visit botanic gardens at least once a year. That is second only to cinemas in terms of popularity. The results from the survey showed that more students visit the KNUST and Legon botanic gardens than outsiders and this is true for most universities botanic gardens around the world. This explains why the majority of visitors to these botanic gardens were below 30 years of age. People had come from various parts of the country to visit these botanic gardens but the highest numbers recorded were those who lived in the same locations around the botanic gardens. The research conducted by the Australian scientists (Anbg, 2010), also revealed that:

- Of the visitors to botanic gardens 36.7% visit only once a year, 26.2% visit twice, and 16.8% visit more than five times a year.
- Capital city residents visit botanic gardens at a much higher rate than people living in other parts of the country.
- Females visit at a rate about 6 percentage points higher than males and
- Overseas-born people visit botanic gardens at a rate 4 percentage points higher than home-born people.

These facts followed virtually some results observed in this study.

5.3.2 EDUCATIONAL PROGRAMMES

The Chicago Botanic Garden is one of the United States' most visited public gardens and a centre for learning and scientific research. Each year 760,000 people visit the Garden and it has a membership of 50,000, the largest of any U.S. public garden.

More than 1,000 volunteers assist with all aspects of the Garden's mission, from planting and propagating natural areas, to teaching educational programs and staffing public programs, exhibitions and funding of the gardens (Rinker, 2008).

The Legon and KNUST botanic gardens would have been better than it is now if the Government, National Tourist Board or some private entities had supported the universities be it with funds or any form of assistance.

Answers from some of the visitors revealed many educational programs and cultural activities that could be introduced into these botanic gardens to make them worth visiting. According to Botanic Gardens Conservation International (2005), the Chicago Botanic Garden is 385 acres of natural beauty with 24 gardens and three native habitat areas. It is the

second most visited public garden in the United States and has more than 2.3 million plants of 8,800 taxa, the largest collection in the Upper Midwest.

The garden, which is a recognized centre of education, research and conservation has a respected internship programme. Interns gain hands-on experience in the areas of education, horticulture, or research, and in addition, as part of their training are required to attend educational programs to broaden their general exposure to public horticulture and research. The educational component consists of lectures, field trips and workshops offered through the Joseph Regenstein, Jr. School of the Chicago Botanic Garden. The garden seeks to engage its visitors on a profound level - "to preserve and enrich life" by illuminating the importance of plants to the balance of life on Earth (BGCI, 2005).

This explains why the introduction and adaptation of certain educational programmes into the KNUST and Legon botanic gardens will attract more visitors into these gardens.

5.3.3 VISITORS SUGGESTION ON ENTERTAINMENT AND ENTRY FEES FOR THE GARDENS

While most visitors discover a heightened appreciation and understanding of the world's rich botanical heritage, few realize that beyond the floral panoramas and exhibits, there exists another realm – that is introduction of some cultural activities and entertainment types into these gardens. Ghana is noted for its richness in cultural diversity and visitors would want to see a reflection of some of these in its botanic gardens. Some gardens in the world make provisions for exhibition programmes, sporting activities and even music performances in the gardens but hardly will one witness such activities in the botanic gardens in Ghana. This goes to justify why some entertainment types such as music and dance sessions, cooking competitions on local dishes, sports, occasionally trading in made in Ghana products and

others such as ludo and oware competitions, drama and storytelling in the gardens at night, were recommended by visitors.

The International Association of Botanic Garden (2009) noted that to support its important work in the U.K and abroad, Kew Botanic Gardens generates income from a variety of sources. These range from gate receipts to commercial activities such as catering, retail and licensing. Kew enterprises also run popular public events in the Gardens, and hires out its iconic venues. Visitors believe a small fee on entrance to the Legon and KNUST Botanic gardens would attract more people to the gardens than a very expensive fee. It will be a great opportunity to have people from all walks of life in the two botanic gardens studying Ghanaian indigenous plants and their usefulness. Botanic gardens are the ideal outdoor living classroom to learn about plants and their connection to people and life on Planet Earth (IABG, 2009).

CHAPTER SIX

6.0 SUMMARY, CONCLUSION AND RECOMMENDATION

6.1 SUMMARY

In conclusion, it will be important to note that each botanic garden naturally develops its own special fields of interests depending on its personnel, location, extent, available funds, and the terms of its charter. It may include greenhouses, test grounds, a herbarium, an arboretum, and other departments. It maintains a scientific as well as a plant-growing staff, and publication is one of its major modes of expression. Standards of the botanic gardens under this study are falling and are at present more in use as prayer and funeral parks. This study has shown that there is lack of public awareness on the importance and nature of botanic gardens in Ghana. The study also showed that the several problems identified with these botanic gardens occurred due to negligence and ignorance on the part of curators, workers, students and visitors who are concerned with the management and activities of these gardens.

The prime objectives of most botanic gardens the world over, are for the purposes of education, research, conservation and biodiversity. However, botanic gardens are also expected to serve enlightened members of the public as well since it is an ideal place to relax away from stress of city life. It will therefore be sad to witness the deterioration of these two universities botanic gardens in Ghana why a lot could have been done about their present states. From the study it was realized that to resuscitate these two universities botanic gardens, it will be important to note the following :

1. Botanic gardens need to have adequate access to electronic information in order for them to function in support of education, conservation and sustainable use programmes, and the two botanic gardens would have to do the same.

2. Botanic gardens contribute to the development of national lists of threatened plant species in all countries of the world. These two universities botanic gardens should be seen as the centre for handling plant related issues in Ghana.

3. All botanic gardens promote at least one local culture and its plant-related knowledge, innovations and practices, etc. The KNUST and the Legon Botanic Gardens are lucky to be situated in a country rich in cultural diversities and should therefore not hesitate in promoting their indigenous resources.

Some botanic gardens are still being built, such as the first botanic garden in Oman, which will be one of the largest gardens in the world once it is completed, but in developed countries, many botanic gardens have closed for lack of financial support, lack of skilled personnel, a lot of illiterates employed and improper fencing of gardens among others, this being especially true of botanic gardens attached to universities.The current states of the KNUST and the University of Ghana's botanic gardens can match up to the others if the following facilities, activities and measures would be considered in the gardens:

Structural/infrastructural requirements

- Offices, parking lots, demonstration rooms, restaurants and changing rooms.
- Fountains, herbariums, libraries, access to internet/phones.
- Well-fenced structures that will prevent encroachers
- Proper illumination systems for maximum security.
- Tables, chairs and benches at various locations in the gardens
- Vehicles/tracks for conveying collections, gardening tools or equipment,
- Means of transport for visitors in and out of the gardens

Staff development

- In-service training for staff

- Employing more skilled workers and curators with botanic know-how,
- Fair wages/monthly salary for the workers
- Chemicals for controlling weeds and insects
- Maps and tip sheets.
- First aid boxes for emergencies in the gardens.

Programmes

- Seminars held on discoveries, exhibition and gallery tours
- Plants identification and classification programs
- Workshops on irrigation systems employed in these gardens,
- Lectures on diversity and distribution of plants in these gardens,
- Lectures on the cultural and management practices of workers,
- Monthly publications of activities and discoveries
- Forming botanic gardens fan clubs and
- Occasionally introducing some form of entertainment or game into these gardens which should attract some fair charges on an entry

An African Development Fund report of September 2000 estimates that Ghana has a per capital income of about US$ 405 despite her relative wealth in minerals, timber and sizeable amounts of oil and gas that were yet to be drilled. Agriculture is of prime importance, occupying 65% of the workforce but agriculture operates at only 20% of its potential because of negligence of some important sectors like the development of botanic gardens.

6.2 CONCLUSION

In conclusion, it should be noted that, in the current changing economic environment in which the world finds itself today, ecotourism sites are serious income generating ventures. And for the fact that the days of absolute financial dependency on government budget for the maintenance of certain facilities such as subsidizing petrol, agriculture, medical and school fees, to mention but a few, are gone.

The only way forward to maintain, expand and to make the botanic gardens survive and stand the test of academic and research times for today and the future is to re-engineer it into an income generation venture. This is what is done globally in most if not all the botanic gardens. There could be an era in Ghana where botanic gardens could be one of the centers of tourist attraction by the inclusion of such activities like wood carving, kente weaving, beads making restaurant for local dishes and many other interesting events aside its use for plants identification and scientific researches only. Some of those gardens we now like best probably came into existence because some imaginative gardener or landscape architect decided to use plants and other facilities in a completely unconventional way.

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APPENDICES

APPENDIX 1: QUESTIONNAIRES

Purpose of Research: Leading to an award of Master of Science (MSc) degree in Horticulture at the Kwame Nkrumah University of Science and Technology-Kumasi. This questionnaire is designed by MSc. student Ankoma Mensah George who is conducting a research on the above topic. Please every answer given will be considered very important and will be treated with confidence. The information that you provide will be used to raise awareness of the role that botanic gardens play in conservation research and other important works.

QUESTIONNAIRE FOR THE WORKERS OF THE GARDENS

(Legon and KNUST Botanic gardens - Please tick as applicable)

A. Personal information

1. Age of respondent (a) below 30 years (b) 31-41 years (c) 41-50 years (d) 51-60 (e) Above 60 years

2. Sex: (b) male (a) female

3. Educational level (a) nursery-kindergarten (b) primary (c)secondary (d)tertiary (e)illiterate (f)others (please specify) ----------

4. Marital status (a) single (b) married (c) widowed (d) divorced

5. What are your responsibilities in the garden? ----------

6. How were you appointed in the garden? ----------

7. How long have you worked in the botanic garden? (a) Less than 10years (b) 11-20years (c) 21-30years (d) 31-40years (e) above 40years

8. When do you hope to go on retirement? ----------

B. Information on the botanic gardens

9. Did you know about botanic gardens before coming here? (a) Yes (b) No

10. If yes have you met your expectations in this garden? (a) Yes (b) No

11. What kinds of improvement does the garden need? (a) renovations (b) new infrastructure systems (c) reserved places in the gardens for entertainment (music and sport) (d) Others----------

12. What do you perceive as the main problems of the gardens? ----------

13. Have you been taken through any refresher courses within the last ten years? (a) Yes (b) No

14. Who funds the garden? (a) The Government (b) the university (c) others

15. Can one buy plants from the garden? (a) Yes (b) No

16. Can one get something to eat during his visit? (a) Yes (b) No

17. Can one hold exhibition programs in the garden? (a) Yes (b) No

18. Can one hold a meeting, conference or lecture at the garden? (a) Yes (b) No

19. Can one hold a wedding in the garden? (a) Yes (b) No

20. How old is the garden? ----------

21. Can one film or take photographs of plants in the garden? (a) Yes (b) No

22. Are there animals in the botanic gardens? (a) Yes (b) No

23. Are there particular plants in this garden you would like to recommend for others? (a) Yes (b) No

24. If yes what are they? ----------

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25. Are telephones available for visitors to make calls? (a) Yes (b) No

26. Does the Tourist Board provide services or any form of assistance to the garden? (a) Yes

(b) No

27. How do guests reach the garden?----------

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28. Do entry fees and other fees attract local currency? (a) Yes (b) No

29. Do you think when given the necessary support and incentives you can work better? (a) Yes (b) No

30. What other things do you think could lead to an improvement in the operations of the garden? (Please mention them with the most important ones first). ----------

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APPENDIX 2

QUESTIONNAIRES FOR STUDENTS OF THE UNIVERSITIES.

Personal information (Please tick as applicable)

1. Sex: (a) male (b) female
2. Residential status (a) Resident (b) Non-Resident
3. Course of study ----------
4. Year. (a) 1st year (b) 2nd year (c) 3rd year (d) 4th year

General information about botanic gardens

5. What is a botanic garden? What's the difference from any other public garden? -------
   ----
   ----
6. Where are the botanic gardens in Ghana? ----------
   ----
7. How do I get there? ----------
   ----
8. Why is Latin used for plant names? What is wrong with common names?
9. Are there chairs in the garden for visitors to relax? (a) Yes (b) No
10. Are there parking lot? (a) Yes (b) No
11. Can the garden staff help visitors in the areas of plant identification and classification? (a) Yes (b) No
12. Do they raise seedlings in nurseries for sale? (a) Yes (b) No
13. Are there lecture or demonstration rooms in the garden? (a) Yes (b) No
14. Are the plants labeled? (a) Yes (b) No
15. Is there a library in the garden? (a) Yes (b) No

16. If yes, how and when can one use the library? ----------

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17. Are exhibitions organized in the gardens? (a) Yes (b) No

18. What are the visiting days and hours for the garden? ----------

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19. Is there a garden map for visitors? (a) Yes (b) No

20. Can they give one a horticultural advice? (a) Yes (b) No

21. Do you want to see an improvement in the botanic garden? (a) Yes (b) No

22. If yes what kinds of improvement do you want to see? ----------

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23. How do you assess the general outlook and maintenance of the botanic garden? (a) excellent (b) very good (c) good (d) poor (e) very poor

24. What do you perceive as the problems affecting the smooth running of the botanic garden? ----------

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25. Is Internet service available in the garden? (a) Yes (b) No

26. Can seedlings and plants be purchased in the garden? (a) Yes (b) No

27. Does the garden provide restaurant for local and continental dishes? (a) Yes (b) No

28. Do you think the university has given the necessary attention to the activities of the garden? (a) Yes (b) No

29. Do you think as a student you have a role to play in the maintenance and improvement of the botanic garden? (a) Yes (b) No

30. If yes what roles should students play to lead to an improvement in the operations of the garden? (Please mention them with the most important ones first). ----------

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APPENDIX 3

QUESTIONNAIRES FOR VISITORS OF THE GARDEN

(The information you provide will be used as a guide for planning purposes)

Personal information

I. Sex (a) male (b) female

2. Age of respondent. (a) Below 30 years (b) 31-41 years (c) 41-50 years (d) 51-60 (e) Above 60 years

3. Educational Level (a) nursery-kindergarten (b) primary (c)secondary (d)tertiary (e)illiterate (f)others (please specify)----------

4. Marital status (a) single (b) married (c) widowed (d) divorced

5. What is your occupation? ----------6.

Where have you come from? ----------

7. How often do you visit the garden? ----------

General information about the botanic gardens

8. Do you have an idea which year the garden was founded? (a) Yes (b) No

9. Have you been to any other botanic garden apart from this? (a) Yes (b) No

10. If yes, is there anything you found in those gardens that are not in this garden? (a) Yes (b) No

11. Can you list some of them if any? ----------

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11. Is a library important in this garden? (a) Yes (b) No

12. If yes,should it be opened to (please check all that apply):☑

a) ☐ general public b) ☐ students c) ☐ staff only and d) anybody?

13. Is an appointment necessary when visiting the garden? (a) Yes (b) No

14. Should the garden organize exhibitions from its permanent plant collections for touring? (a) Yes (b) No

15. Please provide a description of the types of educational programs this garden can offer. (E.g. exhibitions, teacher workshops, docent program, gallery tours, educators guide, lectures, etc) ----------

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16. Should there be any fees or other cost considerations involved in entering the garden or borrowing some educational materials? (a) Yes (b) No

17. If yes state how much fee one should pay in entering or borrowing materials from the garden. ----------

18. Should the garden link up with other institutions or gardens for information? (a)Yes (b) No

19. Should the garden issue any regular publications, such as a newsletter, annual report, etc? (a) Yes (b) No

20. Do you think there is the need for any form of entertainment in the garden for tourists, staff or students? (a) Yes (b) No

21. If yes list them and suggest their relevance to the garden. ----------

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22. Should garden maps or tip sheets be provided for any of the activities in the garden? (a) Yes (b) No

23. Should dogs and other wild animals be allowed to enter these gardens? (a) Yes (b) No

24. Should taxis be made readily available in these gardens? (a) Yes (b) No

25. Is an irrigation system relevant in this garden? (a) Yes (b) No

26. How do you assess the general outlook and maintenance of this botanic garden? (a) Excellent (b) very good (c) good (d) poor (e) very poor

27. Are you satisfied with the visiting days and hours of the garden? (a) Yes (b) No

28. Should seedlings and plants be made available for purchase in the garden? (a) Yes (b) No

29. What do you perceive as the problems affecting the smooth running of this botanic garden? ----------

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30. If you have any comments regarding this study, please write them in the space below------

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APPENDIX 4

Table 2. Workers perceptions of the botanic gardens

	YES (%)	NO (%)
LEGON	13.3	86.7
KNUST	20	8O

Table 3. Kind of improvements needed in the botanic gardens

	Renovations (%)	New infrastructure (%)	Reserved places in the garden for entertainment (%)	Others (%)
KNUST	13.3	86.7	13.3	33.3
LEGON	13.3	40	0	46.7

Table 4. Other Kinds of improvements suggested by workers of the botanic gardens

	Libraries, demonstration rooms, lecture theatre, (%)	Greenhouse, herbariums, plant house (%)	Restaurant for local dishes (%)	Introduction of music, dance and sports occasionally (%)
KNUST	26.7	40	6.7	26.7
LEGON	20	46.5	26.7	6.7

Table 5. Age of workers in the Botanic Gardens

	Below 30(yrs)	31-40 (yrs)	41 50 (yrs)	51 -60(yrs)
KNUST	13.3	20	66.7	0
LEGON	6.7	33.3	53.3	6.7

Table 6. Marital status of workers in the Botanic Gardens

	Single %	Married %	Widowed %	Divorced %
KNUST	13.3	46.7	0	20
LEGON	6.7	46.7	13.3	33.3

Table 7. Students' roles in the Botanic Gardens

	labeling and classification of spp. in the gardens %	Attend exhibitions organized by the gardens%	Visit the gardens frequently for info, relaxation, etc %	design tip sheets, websites, report encroachers ,etc %	Others %
KNUST	35	35	10	20	0
LEGON	25	30	40	5	0

Table 8. Problems as perceived by students in the Botanic Gardens

	lack of funds %	lack of skilled personnel%	illiterates employed %	improper fencing %	Others %
KNUST	50	35	10	5	0
LEGON	50	25	5	5	15

Table 9. The general outlook of the botanic gardens

	Excellent %	Very Good %	Good %	Poor %	Very poor %
KNUST	0	10	25	70	0
LEGON	0	10	40	45	0

Table 10. Definition of a Botanic Garden

	Garden for scientific study of plants %	Garden for education, recreation and research %	have no idea %	other definitions %
KNUST	45	30	0	25
LEGON	40	30	10	20

Table 11. Sex of visitors

	Male (%)	Female (%)
LEGON	30	7o
KNUST	35	65

Table 12. Educational level of visitors

	nursery-kindergarten %	Primary %	Secondary %	tertiary %	Illiterate %
KNUST	15	10	25	45	5
LEGON	5	5	30	60	0

Table 13. Some Educational programmes suggested by visitors

	exhibition and gallery tours %	in-service training for staff %	plants identification and classification programmes %	holding seminars on discoveries %	workshops on irrigation, lectures on diversity, etc. %
KNUST	20	20	15	10	35
LEGON	30	10	10	5	45

Table 14. Fees on entry

	50 Pesewas	1 Ghana Cedi	2 Ghana Cedis	5 Ghana Cedis	Take foreign currencies
KNUST	45	25	10	5	15
LEGON	20	45	15	0	20