APPLICATION OF GEOGRAPHIC INFORMATION SYSTEM (GIS)

TO

CADASTRAL SURVEY

(A CASE OF BEKAJI HOUSING ESTATE IN YOLA)

ADAMAWA STATE

BY

EZRA ENOCH

M.TECH SSSE -815-2001 -2002.

DEPARTMENT OF GEOGRAPHY

FEDERAL UNIV ERSITY OF TECHNOLOGY, MINNA

OCTOBER, 2003

APPLICATION OF GEOGRAPHIC INFORMATION SYSTEM (GIS) TO CADASTRAL SURVEY

(A CASE OF BEKAJI HOUSING ESTATE IN YOLA) ADAMAWA STATE

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EZRA ENOCH

M.TECH/SSSE/815/2001/2002

A THESIS PRESENTED TO THE DEPARTMENT OF GEOGRAPHY. F.U.T MINNA IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS DEGREE OF TECHNOLOGY (M.TECH) IN REMOTE SENSING APPLICATIONS:

DEPARTMENT OF GEOGRAPHY

SCHOOL OF SCIENCE AND SCIENCE EDUCATION (SSSE)

FEDERAL UNIVERSITY OF TECHNOLOGY MINNA NIGERIA

OCTOBER, 2003

DEDICATION

This thesis is dedicated to Blessing; Kennedy, Alhamdu, and my wife, father, mother & my brothers.

ACKNOWLEDGEMENT

I wish to express my sincere gratitude to God Almightily for giving me the strength and health to complete this study.

My sincere thanks and appreciation goes to my Daddy, Reverend Enoch Alhamdu who, inspite of his lean financial resources assisted me in no small measures.

I would ever remain grateful to my supervisor, Dr Halilu Shaba who inspired me through his lectures to write on GIS. His assistance and guidance through out the research study will ever remain in my memory.

Also not to be left out are my brother, Gaduna Enoch of F.U.T Yola, Magdalene Faruq, Solomon Aji and my dear mother, Maryamu Enoch.. I will remain grateful for all the assistance you rendered in one form on the other.

I would also remain grateful, to Mallam A.A. Musa, without whom I could not have completed my project I will not fail to mention your valuable contribution in this project. God bless you all.

CERTIFICATION BY SUPERVISOR

I, Dr. Halilu hereby certify that this project was carried out and thesis prepared by the student, Ezra Enoch (M.Tech/815/2001/2002) for the award of master of Technology (M.Tech) degree in remote sensing Application of the Federal University of Technology Minna.

Student Signature----------

Ezra Enoch Date

Supervisor Signature---------- 8/12/03

Dr. Halilu A.S Date

APPROVAL PAGE

This thesis, directed and certified by the candidate's supervisor, has been approved and accepted, by the department of Geography, Federal University of Technology, Minna in partial fulfillment of the requirement for the award of master of Technology degree in remote sensing applications:

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ABSTRACT

This research focuses on the integration of Geographic Information System (GIS) with conventional cadastral survey and comparison of the data management, storage and retrieval are made. This was achieved through the design and implementation of a database system in GIS.

A GIS was created, with the main design work adopted from Kufoniyi. The procedure entails three steps; creating spatial database, attribute database and linking the two. The attribute data was represented in tabular form, four tables were design. Arc view, version 3.2a was the software package used in the on-screen digitization of the cadastral map and the linkage of the attribute data to the cadastral land parcel.

A computer aided cadastral map was produced from three cadastral themes. A similar cadastral map was also produced when queried for identity result. Four attribute data tables of the spatial data were produced.

The results, showed that information on transaction or mode of land acquisition, registration, ownership and cadastral land parcel can be queried and results obtained. The outcome of the study shows that data can be obtained efficiently with maximum speed in GIS than the conventional cadastral system. The method of data management, storage and retrieval in GIS has proved to be effective. It enhances accuracy in the production of up

to data computer aided cadastral map. It can also cope with large volume of data. Manual cadastral system cannot cope with large volume of data generated in the process and data are destroyed in the process of storage and retrieval.

It therefore recommends the integration of GIS with cadastral survey to meet the challenges of information management, processing storage and retrieval in the present technological development. The integration of a GIS technology and the development of a sound database for cadastral survey must be ensured at all times.

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The cadastral map, of Bekaji Housing estate, which was digitized on-screen. As the main background for the formation of the three cadastral themes.

CHAPTER ONE

1.1 INTRODUCTION

1.2 BACKGROUND TO THE STUDY

Land records are maintained for deciding ownership and boundaries of land or property. The process of defining and determining land in favour of an owner is called registry of land, (Jain, et al 2002).

The collection of this record was referred to as cadastre. Thus cadastre is a register of property as a basis of taxation and also an official register of ownership of land. It can also be defined as a record system of interest in land encompassing both the nature and extent of such interest.

The professional practice of surveying has been going through unprecedented changes in the recent years. In the early times information about land was committed to memory and only old members of a community were called upon to provide information about land, often when disputes arose. With the development of writing and measuring technologies record started to be made on information relating to land, and the collection of this record for the purpose of ownership is what cadastral surveying is all about. J.B Olaleye (1998).

Historically, we keep track of our land areas as well as all the people and everything attached to them using maps and other information recorded on paper. These papers are easy but cumbersome to manage. The method of data acquisition is done by the conventional method of ground surveying, and each of the ground survey methods employed involve a number of steps such as: -

1. Reconnaissance
2. Actual data acquisition
3. Graphical representation
4. Storage
5. management
6. Retrieval

These steps deals with large volume of data and because of the personnel involve in the process, it coast time and the accuracy obtained is low.

Because of the volume of data involved in the process, management of data becomes a problem, the papers are easily destroyed in the process and data can not easily be updated. The recent development of computer technology such as GIS has created new opportunities for model development and use. GIS for instance has provided various capabilities for input, management, analysis and display of spatially reference data. It provides a frame work for

integrating spatial and non-spatial from different format and times period. More importantly GIS provides special capabilities for spatial analysis. Because of these capabilities, it is relatively easier to generate and incorporate various spatial variables in land use management. (David 1996).

Adamawa State is committed to a National Policy that ensures sustainable development based on proper land ownership information requirement and strategies in order to meet the growing need of the present and future generations.

It is observed that sufficient attention has not been given to increase the productivity of the society through the design and implementation of adequate landownership information system. The present development in computer science has brought solution to problems of the logistic of handling large volume of data and computation.

Thus surveying has found it necessary to change from traditional method to modern system of data acquisition and management. Geographical information system (GIS) consists of:

a. Data acquisition

b. Data management and storage

c. Retrieval and analysis

The study will try to apply the basic principles of cadastral surveying to develop a database in geographical information system (GIS).

1.3 STATEMENT OF THE PROBLEM

The shortage of land information system has affected development activity, landuse /landcover and environmental sectors. Lack of adequate information on natural resources and alternative management pose serious problems especially to development and planning. Cadastre of the early times were limited use to the ordinary user of land-tenure information, because only trained professionals such as surveyors, appraisers, and lawyers could gain knowledgeable access to limited and low quality information content. This results to the dearth of accurate publicly available ownership related information resulting in serious land management problems. Land related information is not readily available to the public. The data available cannot easily be up dated because of the volume of data involved, management and retrieval of information is a problem, and most of the papers are destroyed in the process.

People need information in exchange for other services; a tourist visiting a city for the first time need information about the location of hotel facilities;

while a house wife who needs a day care service wants to know the nearest care centre to her home.

Nonetheless, because of the complexity, volume and diversity of information expected from cadastre, manual procedures and methods of data processing are not able to meet the pressure of demand. Only an efficient use of a computerize database management system makes the information manageable.

To manage these complex problems requires a cadastre that is not only complete and current but also accurate.

Accurate computer aid cadastral maps can be used for administrative purpose; land disputes can be solved and completely avoided. It can also be used to check unwanted development. A good cadastral plan, can be used by the Urban Development Board, to check conformity with laid down master plan proposals.

Unwanted developmental growth in our urban centres can easily be monitored. Land litigation, overlap of landed properties and other related land disputes can be avoided with accurate cadastral maps.

1.4 AIMS AND OBJECTIVE

The aim of this study is to use the basic principles of cadastral surveying to develop a database in Geographical Information System. (GIS)

The main objectives of this project are: -

i. To produce an efficient computer aided cadastral map, of Bekaji Housing Estate with all the necessary required information on it.

ii. To create or adopt an accurate record system that will ensure security and easy accessibility.

iii. Design the database that will cope with large volume of data for easy storage, management and retrieval.

iv. Design the database, where data can be easily updated and retrieved.

v. Integrate the cadastral system with geographical information system and compare the data management and retrieval system.

1.5 SIGNIFICANCE OF THE STUDY

It is important to note that cadastral system forms the basis for property or land tax collection. Similarly, cadastral plans are needed for transfer of ownership and for the purpose of securing Certificate Of Occupancy (C of O) both customary and statutory. The outcome of this study will ensure a proper

focus for our land management. Where data storage and retrieval is greatly be improved, data would be easily updated and manipulated such that information would be readily available to general users of land information system in various fields. At the end of the study, it is hoped that, it will make the entire cadastral system more efficient and reduce the drudgery and frequent mistakes therein.

1.6 DESCRIPTION OF THE STUDY AREA.

The study area is located in Jimeta District, part of Yola North Local Government Area of Adamawa State. It is covered by Jimeta cadastral metric sheet 32 and 31.

The area is located in a medium density area designed for both residential and commercial purposes in 1979. It has an area of about 550m x 500m (275 acres). The area is located on flat topography. The vegetation is bare, except for some trees and shrubs that covered the landscape.

The climatic condition of the area is similar to what is obtained in other parts of Yola. The weather is dry and hot during the dry season and warm and humid during the rainy season. Temperature rages between 32 and 30 degrees all year round.

1.7 SCOPE OR DELIMITATION OF STUDY

The research will consider the application of geographical information system to cadastral surveying, of a part of Jimeta/Yola, Adamawa State as a case study. The data for the research was obtained from the Ministry of Land and Survey, Yola.

The following data were used for the study.

1. A current cadastral map of Bekaji Housing Estate, consisting of forty land parcels.
2. A series of land data file, containing information on the following.
    a. Ownership
    b. Registration procedure
    c. Transaction or mode of land acquisition procedure.
    d. Building permit and approval.
3. Population on each parcel of land was collected through house to house inspection and interview.

CHAPTER II

LITERATURE REVIEW.

2.1 CADASTRAL GENERAL

Human activities and development efforts are based on the land, hence a systematic record of the land and right in land are necessary for public administration, planning, land development, taxation and private transaction in land.

A system of records or inventory of ownership and interest in land parcels is called a cadastre or cadastral system. A land parcel refers to an area of land which may be identified as a unit for information recording such as a residential plot of land. A cadastre is supposed to provide statistics of all issues relating to land. According to Ndukwe (2000) the basic aim of cadastre are as follows.

1) To provide legal protection of rights in land, which in turn, becomes a useful instrument as collateral in financial and economic transactions.
2) To provide a system of property/ land tax collection which is a revenue-yielding venture.

Thus, it is clear that the totality of what can be described as interest in land is diverse and interrelated. To manage and satisfy such complex interest demands a cadastral that is not only complete and current but also accurate and reliable.

This can be achieved through proper application of geographical information system to cadastral surveying.

2.2 PREVIOUS STUDIES.

A number of studies have shown that cadastral survey and geographical information system (GIS) can be applied in various ways depending on the need and purpose of the study. Some of these studies are based on land use studies, planning and development; land record system, land parcel and information system

2.21 LAND USE DEVELOPMENT AND PLANNING.

Faris and Rains (2003) attempted to develop modeling of commercial land use development through the application of geographical information system. The proposed model was based on graphic model; it provides effective ways of simulating the process of land use changes as well as offering a means of evaluating alternative planning scenarios.

The study covered on an area of about 23, 679.6 hectares with 80,662 land parcels, only 5,823 samples was used in the study. The study showed that the accuracy of the original model was 74.60% while the same model predicted 98.6%. This development will encourage urban planners and further urban model in future. This study was only based on commercial areas. It has not

developed further models to include other spatial attributes that will benefit the general public.

Kaur, Dutta, and Chaddha (1998) observed that the complexity of urban development is so dynamic that it calls for an immediate perspective planning of cities and towns.

Geographical information system is best utilized for integration of various data sets to obtain composite land development units which helps in identifying the problem areas and suggest conversation measures. For a sustainable use of the land it is essential that proper planning and monitoring be done. Timely and accurate information on the existing land use\ land cover pattern and its spatial distribution and changes is a pre-requisite for planning, utilization and formulation of policies and programmes for making any micro and macro level developmental plan. Land use classification was effected by the extraction of information from images about ground reality. The collection of data and preparation of maps for land use planning and development was effectively carried out using GIS, in which database of spatial, non spatial and attribute information was created. Various thematic maps were scanned and a raster to vector connection was carried out. Errors were removed and each land use / land cover category was assigned a code. The theme coverage was made and analysis

for planning and development was made. According to Ghatak (2003) in adoption of geographical technology in land use planning for development authority. The basic deficiency is to visualize the gap in the information system and therefore adopt an ad-hoc plan for easy implementation. This will enhance efficiency and accuracy for planning and development purpose Adopting geographical information system can make a wise and systematic beginning to the entire planning process.

2.22 LAND RECORD SYSTEM

Vanna (2003) carried out studies on the application of geographical information system in Cambodian Land Title Department. The researcher used computer and environmental hardware and software to generate digital maps which will facilitate land management and planning and in particular land registration and insurance of land tittles in order to promote security of land tenure and reduce land disputes The main problem of the research was that, the system was new and only a few possess the required skills. By this research include some vital information, in terms of ownership, parcel by parcel information, area and road network. This problem will be given attention in the present research study.

Chem, Jie and Diohora (2000) carried out studies on generalization of cadastral maps based on graphic matching. It developed an algorithms system for automated editing of old cadastral maps. The researcher used four types of maps; all were overlapped on base maps and adjusted.

Two types of problems were encountered in the course of the study.

1) Automatic matching old local cadastral maps with road and base maps.
2) Automatic detection of conflicted lines and cadastral lines and made related adjustment. These problems were as a result of using old cadastral maps that do not reflect the current situation on ground.

The study showed that free matching is very difficult and the reliability is low, the prematching had small differences. It also showed that it was difficult to get 100% correct result from automated processing. They developed a system on windows 98/NT for automated old cadastral map editing. This study will not work on automated prematching but will develop a database system for cadastral survey application using geographical information system (GIS).

Jain, Singh and Gore (2002) in their case study of Indian land records, designed and implemented land record system (LRS) of the district of Hamirpur. Traditionally, land record system is used to store ownership information, for tax purpose. However, the same database can be used to extend information

satisfying the need of the district. The study proposed for nationwide land record system is extended further to include information about the basic amenities available in the town. The case study was implemented using access 2000 RDBMS. All queries implemented worked properly. The system will help the district administration to have a close watch on balance development of the district. The study area was purely based on cadastral record keeping the use of cadastral maps and topographic maps depicting the area was not in use.

2.23 LAND PARCEL AND INFORMATION SYSTEM.

Dr. Roots, (2000) scientific advisor to Environment Canada noted, that without accurate information about land and waters, and without up to date inventory of the country's resources and what is happening to them and to the environment, the government and the people are handicapped in controlling their own destiny: It is impossible to make the best use of the land and natural wealth or to prevent its misuse without good factual knowledge of the country and its future. (Dale and Mclanghlin, 1998). One of the first steps towards eventual computerization of land records was the introduction in Peninsular Malaysia of numerical codes whereby each parcel of land could be uniquely identified by its lot number and the area code (Dale and Mclaughlin 1998).

Kufoniyi (1998) in his database design and creation discussed the technical issues involved in the implementation of GIS for cadastral application and emphasis was on land parcel.

Ashok and Potti (2001) observed that cadastral maps can be periodically updated and other attributes like soil characteristics, agriculture patterns can be super-imposed on these maps at a micro-level to build a comprehensive land information system. MARS, is a software system design to generate cadastral maps from field measurements, and to mesh adjacent field maps to provide a map of the entire area. Here the only attributes used was that of soil characteristics, this Study will consider other related attributes to cadastral land parcel such as registration, ownership, title etc.

The demand for land for any development will always be the primary requirement and to establish a utility oriented information system about such land must be an important criterion in our policy. The general cadastral map may be available for planning and development, and to achieve this objective, there is the need to integrate cadastral surveying with geographical information system, Shyllon (1998). Although, various GIS has been design for cadastral application for various areas; this research is focused on Jimeta in Adamawa State with the intent of using the basic principles of cadastral survey to develop a database system using the GIS technology.

CHAPTER III

METHODOLOGY

3.1 INTRODUCTION

This chapter focuses on the fundamental methods and procedure adopted in this study to achieve the objectives of the research. A detail study of the conventional cadastral system was carried out in the Ministry of Land and Survey, Yola. A cadastral survey plan produced by the department of surveying, showing part of Bekaji housing estate was adopted as the cadastral map used for this study. The integration of geographical information system (GIS) and the conventional cadastral system was made through the design and implementation of a database system in GIS, for data manipulation, management, storage, retrieval and updating, such that a complete computer aided cadastral map was produced that is accurate, reliable and linked with spatial attribute data. This operation will provide access to users with information on ownership, transaction, registration and cadastral land parcel information.

3.20 CREATING A GIS

A GIS was created. This was necessary to see how the cadastral system used in this case study will work with the aid of a computer. In creating this geographical information system, the main design work was adopted from

Kufoniyi (1998) though a lot of variations had to be incorporated to fall in line with the specific objectives of the case study.

The procedure entails three major steps:

i. Creating the spatial database.

ii. The attribute database

iii. Linking the two database.

3.3 METHODOLOGY

The method involves the design of a database for cadastral surveying. Basically the entity relationship approach was used to design the database. Unlike the normalization approach; the entity relationship requires that the various entities must have been determined before the commencement of the design.

The entities involved in the design are.

i. The land parcel

ii. The owner.

For each of these entities two tables were created. For the land parcel entity there was the

a. "attribute of land cadastral table"

b. The "Registration table".

For the owner entity, there were the

a. "Ownership table"

b. The "Transaction table".

In all, there were four tables created: the cadastral land parcel tables was the theme table. (i.e the table directly linked with the spatial data)

The other tables were merely joined to the theme table using the "JOIN TOOL" Arcview, version 3.2a was the software used in joining the theme tables. Similar software, i.e Arcscan module of Arcview was used for scanning and digitizing the cadastral map to form other layers. The parcel- ID field was the key field used in joining the entire table together. It is important to note that the cadastral map of Bekaji Housing Estate consist of forty land parcel and each land parcel has an identifier number (ID), this ID was used in joining the tables together.

3.40 DESCRIPTION OF THE DATA.

The spatial data consisted of four layers. One raster and three vector layers

The raster layer was the scanned map of Bekaji, which formed the background upon which the other were digitized on – screen. The other layers were the;

i. Building layer

ii. The cadastral landparcel layer

iii. The roads layer

Since this study was about land parcels, it was only the cadastral landparcel layers that were linked with attribute data. In creating the cadastral thematic map for this study, three cadastral themes were used on the spatial data namely the landparcel, the building and the road network.

The cadastral themes were overlayed to produce a single cadastral map. The cadastral map produced, was complete and computer aided, with all the necessary information that are available on a cadastral map.

3.50 DATABASE DESIGN

The design phase for cadastral application for this study involves the

i. identification of the basic geometric and thematic components of the cadastre: i.e. parcel base information system.

ii. identification of related data set

iii. identification of other important basic components of land parcel to which attributes are attached or joined.

The entities were first determined before the commencement of the design, and two entities were initially identified for the design

i. The land parcel

ii. The owner.

The attributes attached or joined are: -

i. Parcel base information

ii. Ownership base information

iii. Registration of instrument or title

iv. Transaction

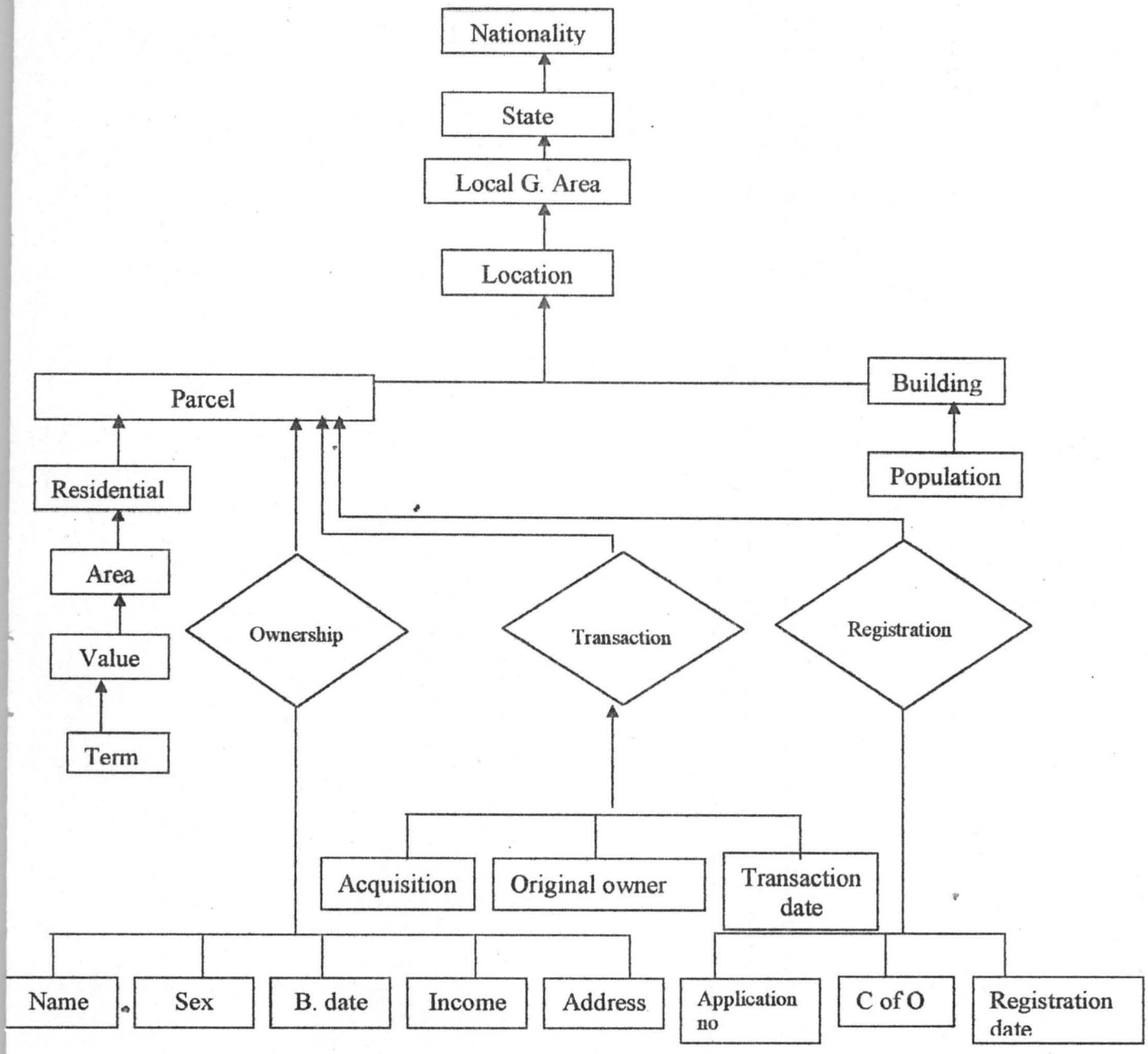


Fig. 3.1 Entity – Relationship diagram of a parcel base information system

Adopted from Kufoni (2000).

3.6 DATA STRUCTURE

The logical design was the general representation of the data model, and this reflects the recording of the data in the computer system.

Fig. 3.1 was translated into a data structure, using relational data structure; four tables were derived from the entity relationship diagram: -

i. Parcel datable (area, location, Plan No ……..Population).

ii. Transaction table (acquisition, original owner, transaction date)

iii. Registration table (app date, application No …… C. of O)

iv. Ownership table (name, sex, B. date ……..income).

3.7 CREATING AN ATTRIBUTE DATABASE

This is associated with the spatial data of the cadastre. An attribute data describes the characteristic of the parcel owner, registration, the cadastral land parcel and the transaction or mode of land acquisition was created.

The database information is represented in a tabular form, this was achieved by using the ArcView version 3.2a soft were package.

The following database was created.

i. Ownership Table: Parcel ID, Name, Sex, B. date, occupation, State, Address, L.G.A, Nationality, Income.

ii. Transaction Table: Parcel ID, Acquisition, original owner, Transaction date.

iii. Registration Table: Parcel ID, Application date, Application No, Application fee, Registration date, c. ot.o no.

iv. Cadastral landparcel Table: Parcel ID, Area. Location, plan No,Use value, Term, rent, Population.

This attribute data was linked to the cadastral land parcel.

In addition to these tables, a computer aided cadastral map was produced covering the whole area. The map was produced from three themes. The other cadastral map produced was linked with the attribute data to cover the four tables. It shows all the information on ownership transaction, registration and cadastral landparcel.

Thus four tables were produced.

i. One cadastral map, showing landparcel, buildings and road network.

ii. Another cadastral map, attached to it is all the parcel base information for a particular parcel on it.

CHAPTER IV

4.0 RESULT AND DISCUSSION

The geographical information system was queried using various criteria. This was done to ascertain the efficiency, speed and accuracy of the GIS compared with the conventional cadastral method.

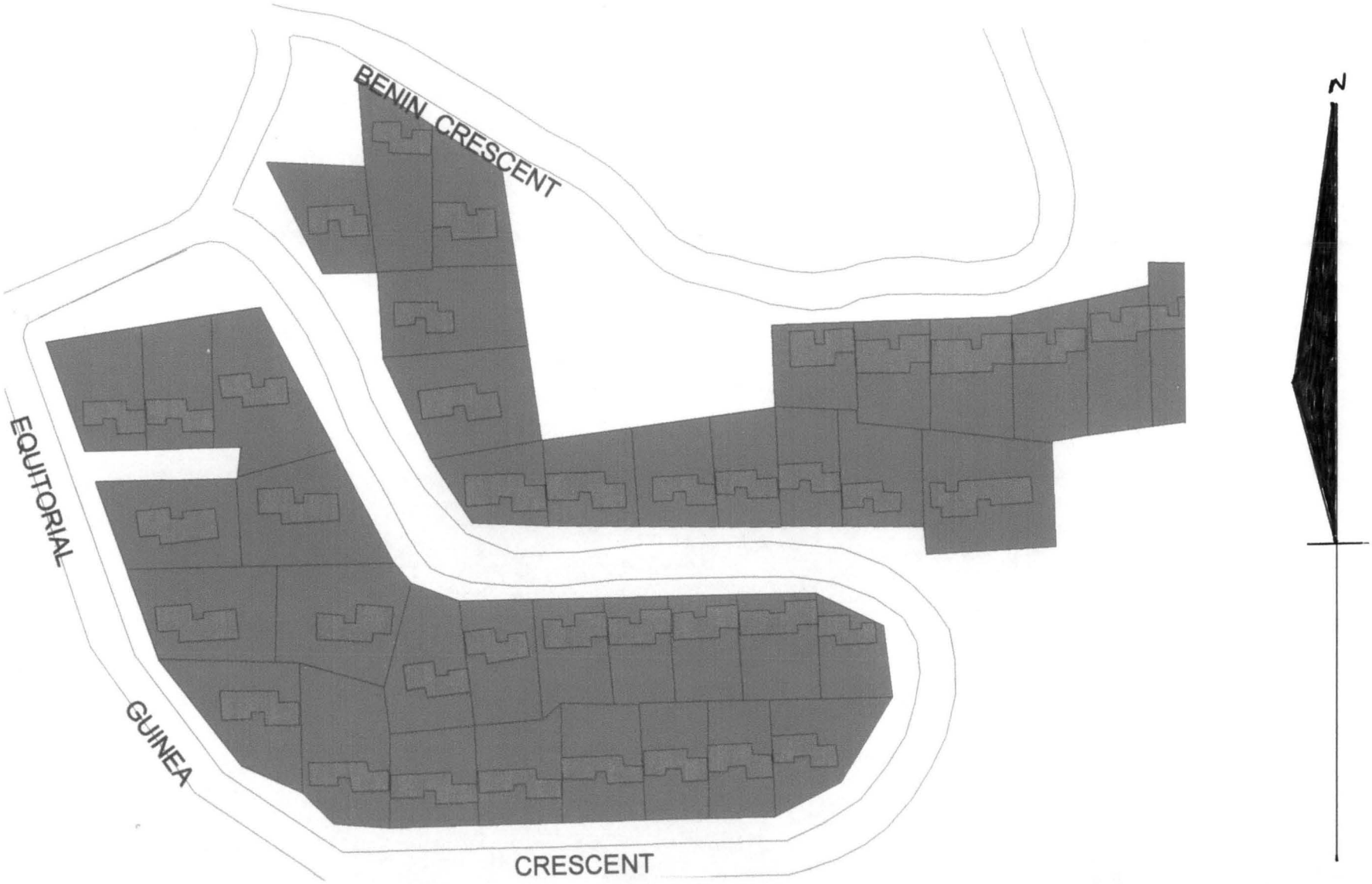
PART OF BAKAJI HOUSING ESTATE IN JIMETA YOLA (FIG. 4.1)

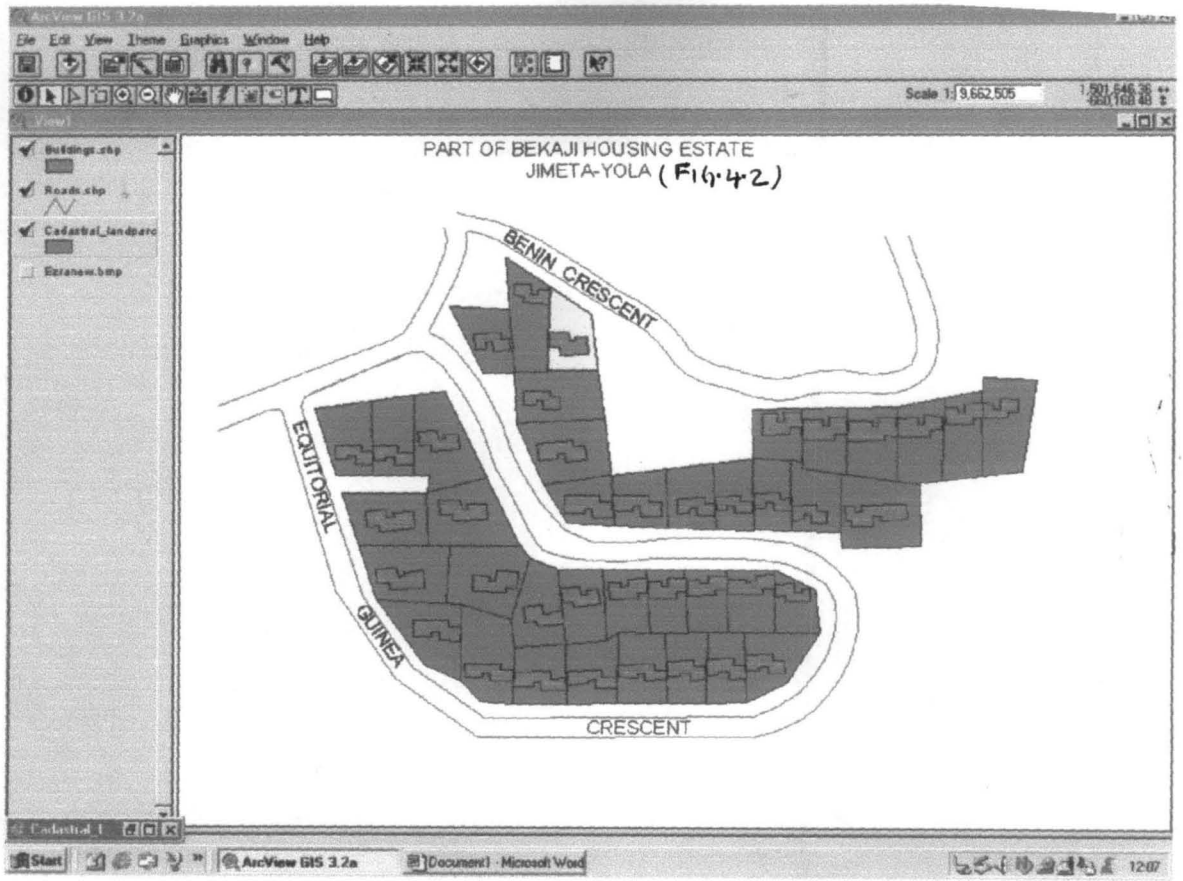
Is a cadastral thematic map of part of Bekaji Housing Estate of Jimeta-Yola. Is a computer aided cadastral map, produced from three cadastral themes. It clearly shows as all the cadastral land parcels of individual parcels of land, the buildings are clearly represented on the parcels. It also shows the entire road network in the layout, which are made up of the Equatorial Guinea crescent and the Benin crescent. The road network linked all the individual cadastral land parcels in the housing Estate providing accessibility to all the cadastral land parcels.

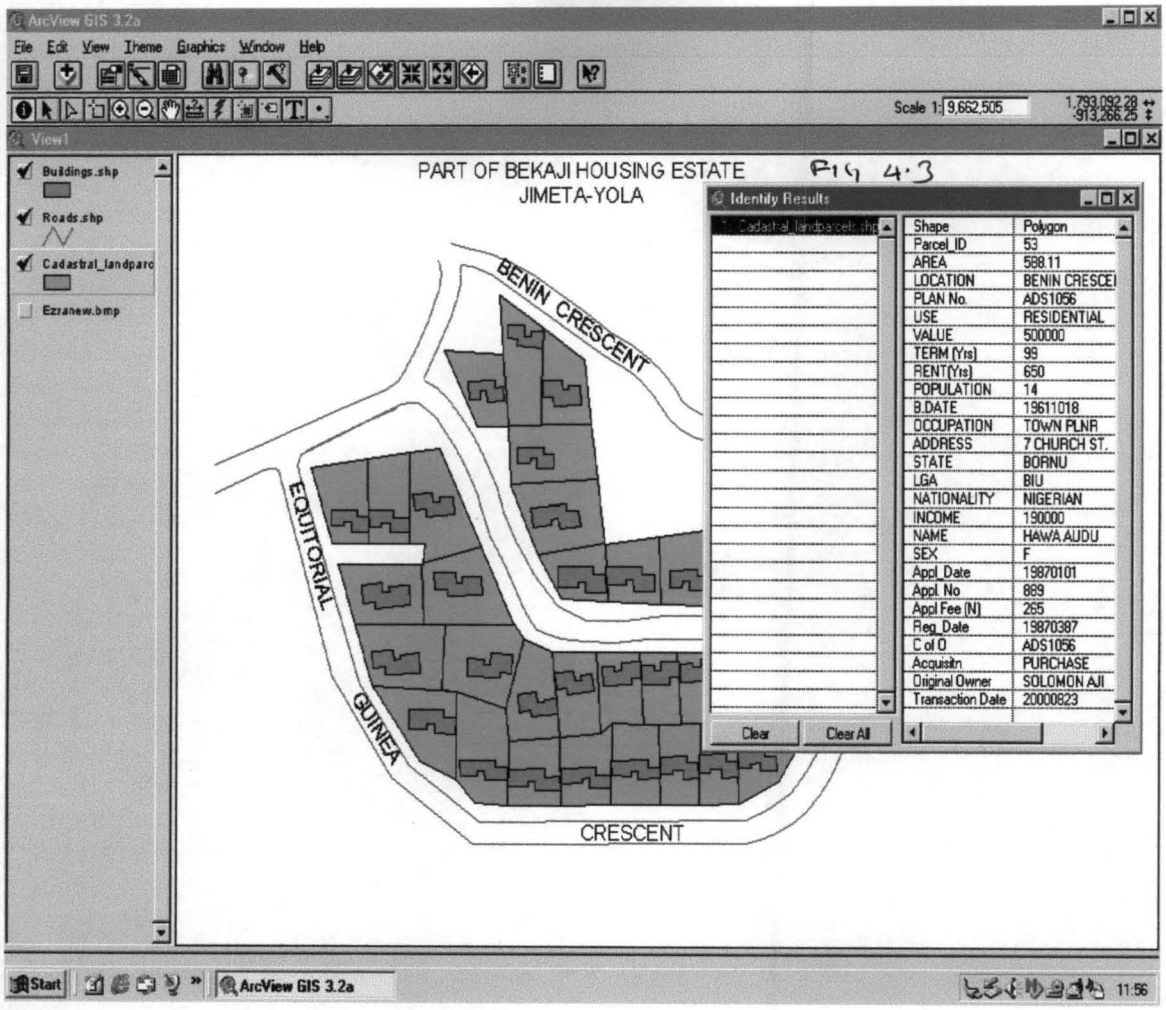
PART OF BAKAJI HOUSING ESTATE IN JIMETA YOLA (FIG. 4.2)

Is similar to the cadastral map of A. The only difference is in terms of the size. Secondly the various themes used in producing the cadastral map are indicated on the top lift had corner of the map. The building, the road and the cadastral land parcels are shown.

FIG 4.1 PART OF BEKAJI HOUSING ESTATE IN JIMETA, YOLA




ArcView GIS 3.2a
File Edit View Theme Graphics Window Help
Scale 1: 9,662,505
View1
Buildings.shp
Roads.shp
Cadastral_landparc
Ezranew.bmp
PART OF BEKAJI HOUSING ESTATE
JIMETA-YOLA (Fig.42)
BENIN CRESCENT
EQUITORIAL
GUINEA
CRESCENT
N
Cadastral 1
Start
ArcView GIS 3.2a
Document1 - Microsoft Word
12:07


ArcView GIS 3.2a
File Edit View Theme Graphics Window Help
Scale 1: 9,662,505
1,793,092.28
-913,266.25
View1
Buildings.shp
Roads.shp
Cadastral_landparc
Ezranew.bmp
PART OF BEKAJI HOUSING ESTATE
JIMETA-YOLA
Fig 4.3
BENIN CRESCENT
EQUITORIAL
GUINEA
CRESCENT
Identify Results
Cadastral_landparcels.shp
Shape Polygon
Parcel_ID 53
AREA 588.11
LOCATION BENIN CRESCEI
PLAN No. ADS1056
USE RESIDENTIAL
VALUE 500000
TERM (Yrs) 99
RENT(Yrs) 650
POPULATION 14
B.DATE 19611018
OCCUPATION TOWN PLNR
ADDRESS 7 CHURCH ST.
STATE BORNU
LGA BIU
NATIONALITY NIGERIAN
INCOME 190000
NAME HAWA AJIDU
SEX F
Appl_Date 19870101
Appl No 889
Appl Fee (N) 265
Reg_Date 19870387
C of O ADS1056
Acquisitn PURCHASE
Original Owner SOLOMON AJI
Transaction Date 20000823
Clear
Clear All
Start
ArcView GIS 3.2a
11:56


N

IDENTITY RESULT (FIGURE 4.3) From the database containing information about land parcel, a query was made for attributes on identity results. The display was the cadastral map with all the related parcel based information for any particular land parcel whose identifier number was used. For this particular map, the identifier number for parcel ID 53 was queried with the following results.

Parcel ID: 53, Area: 588.11, Location: Benin crescent, Plan No. 1056. Use, Residential, Value: 500,000. Term: (yrs) 99.

Rent: 650, Population: 14, B. date 19611018, Occupation: Town planer.

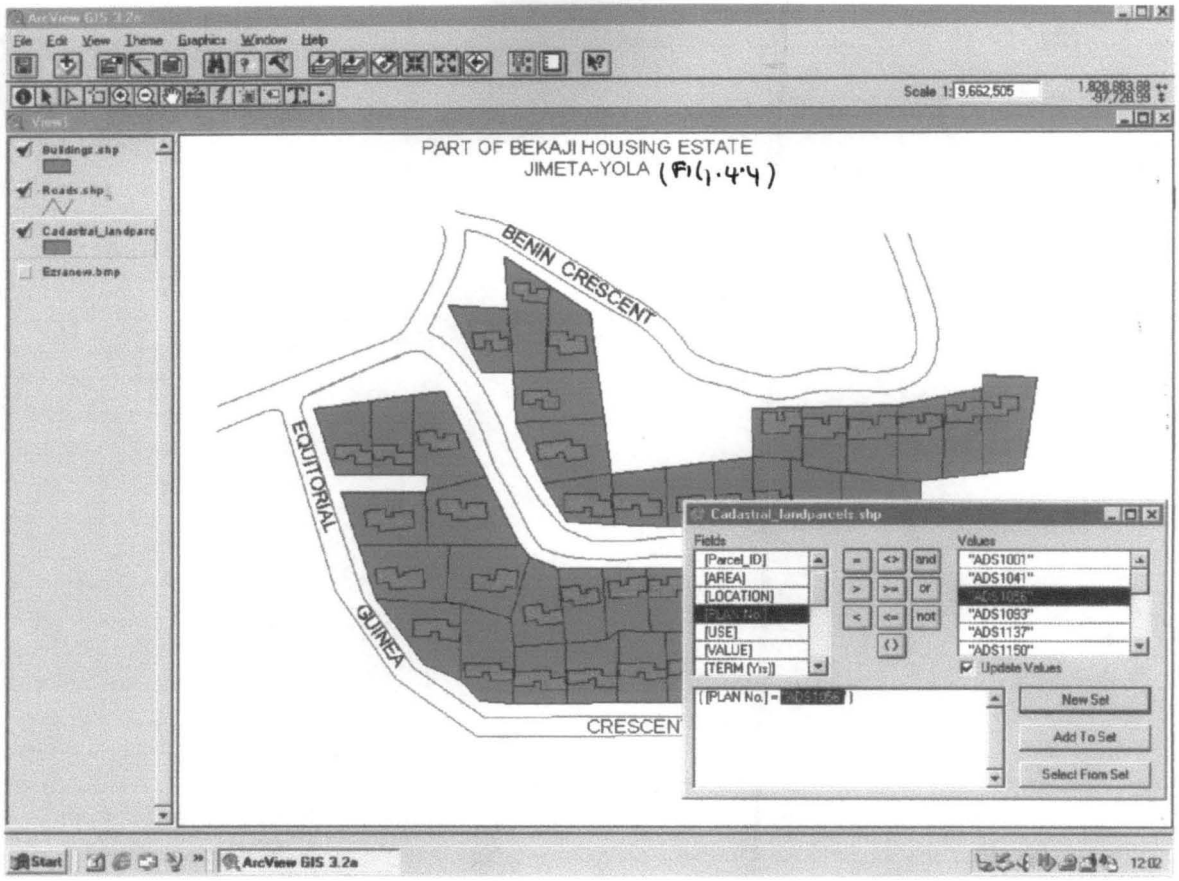
Address: 7 Church St., L. G. A: Biu, State: Bornu, Nationality: Nigeria

Income: 190000, Name: Hawa Audu, Sex: F; App. Date: 19870101; App. No. 899, App. Fee (N) 265, Reg. date: 19870317, C. of O: ADS1056.

Acquisition:. Purchase, Original owner: Solomon Aji,

Transaction date: 20000823.

The identity results shows that all the information required on any particular land parcel can be queried, and information on registration of the parcel, transaction or mode of acquisition, ownership information and cadastral land parcel informations such as location, size, and area e. t. c can be obtained.


File Edit View Theme Graphics Window Help
Scale 1: 9,662,505
Buildings.shp
Roads.shp
Cadastral_landparc
Ezranew.bmp
PART OF BEKAJI HOUSING ESTATE
JIMETA-YOLA (Fig. 4.4)
BENIN CRESCENT
EQUITORIAL
GUINEA
CRESCEN
Cadastral_landparcels.shp
Fields
[Parcel_ID]
[AREA]
[LOCATION]
[PLAN No.]
[USE]
[VALUE]
[TERM (Yrs)]
Values
"ADS1001"
"ADS1041"
"ADS1056"
"ADS1093"
"ADS1137"
"ADS1150"
Update Values
([PLAN No.] = ADS1056)
New Set
Add To Set
Select From Set
Start
ArcView GIS 3.2a
12:02


N

FOUR ATTRIBUTE TABLES.

TABLE 1 CADASTRAL LANDPARCEL

" 2 REGISTRATION.

" 3 TRANSACTION

" 4 OWNERSHIP

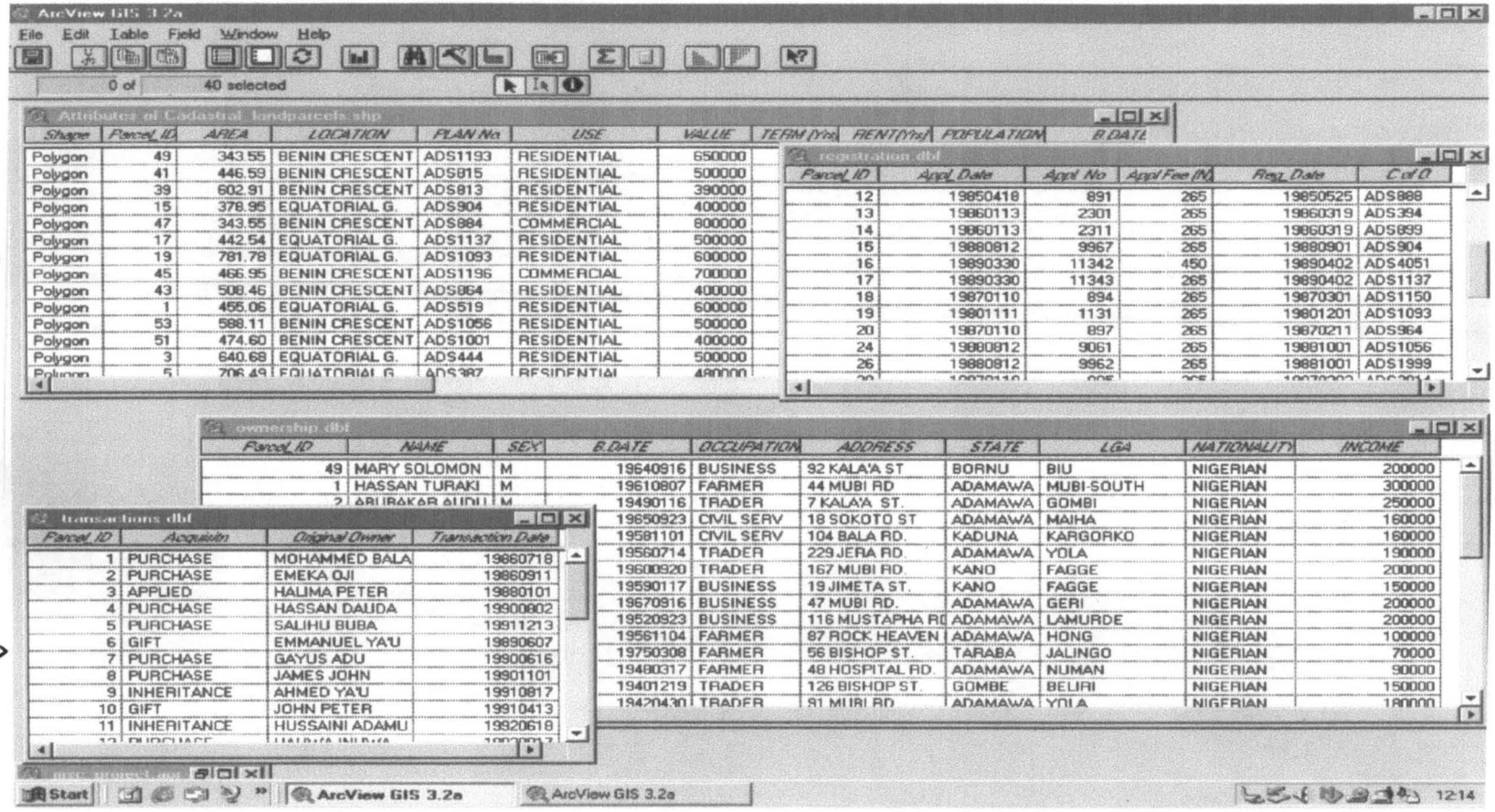


TABLE 1 →

← TABLE

← TABLE

TABLE 3 →

CADASTRAL LAND PERCELS –SHIP FIGURE 4.4: This map shows the cadastral land parcel information for a particular cadastral parcel. It shows the parcel ID, Area, location, Plan No., use, value and Term.

Four Attribute tables of the spatial data were created.

ATRIBUTE OF CADASTRAL LAND PARCEL (Table 1) This table is the attribute of cadastral land parcel. The table clearly shows the parcel ID for the forty land parcels. It shows the area of the individual land parcels. It also shows the use of the individual plots. Some are residential others are commercial plots.

The value of each plot is shown on table; other information of the table includes the term for the entire residential plot, which is 99 years, while the commercial plots have a term of 45 years. The ground rent for each plot and the population of those residing in each plot are also shown on the table.

REGISTRATION TABLE (Table 2) The second attribute of the spatial data is the registration table. This table contains information required in the registration of instrument for ownership purpose. It contains the parcel-ID of all the land parcels in the layout. The first information of the table is the application date for the various land parcels, the application No. allocated to each person, the application fee paid, for residential plot, fees paid was N 265.00 and for

commercial plots, N450.00. The date of registration and the certificate of occupancy number (C of O) are all shown on the registration table

TRANSACTION TABLE (Table 3) This is queried for transaction, and it is the transaction table. This table contain relevant information on the various method employed by individual land owners to acquire the cadastral land parcel. The table is made up to the parcel of the entire cadastral land parcel in the layout. The mode of acquisition, such as direct purchase, Gift and inheritance are shown for the individual cadastral land parcel. The names of the original land owners are also indicated against each parcel, and lastly the date which these transactions were made are indicated against each land parcel.

OWNERSHIP TABLE (Table 4) This is the ownership table, all information on the owner of the individual land parcels are shown on the table. The parcel ID of the entire cadastral land parcel is shown on the table, the names of the owner for all the plots in the layout. The sex (i.e male /female) and the date of Birth (B. date), the occupation of the individual owners and their residential or postal address are indicated. State, Local Government origin and Nationality of the owners are also shown on the ownership table. The last information on the ownership table are the various annual income of the individual land owners.

The database design for cadastral surveying in this research showed that query for any information can be designed and implemented. About five queries were made.

1) The identify result, in which A map was displayed and all information can be obtained on the combined attribute spatial data.
2) The ownership table
3) The registration table
4) The transaction table
5) The cadastral land parcel table

All these information can be queried and obtained using the identifier Number (ID). The database containing information on the four tables was queried and displayed.

This indicates that information can be obtained efficiently with maximum speed in GIS than the conventional cadastral survey method. GIS has the ability and capability of handling large volume of data, data can easily be updated. It also allows users, access to information tailored to their needs.

The conventional cadastral survey method has suffered a lot of set back in area of data management, storage and retrieval. The manual cadastral system cannot cope with large volume of data, data are easily destroyed and cannot be

up dated, hence information are not readily available to users. The method of data storage, management and retrieval in GIS has proved to be very efficient and effective. It enhances accuracy in the production of computer aided cadastral maps; it can also cope with large volume of data generated in the process. This has made the conventional cadastral survey method ineffective and Unonomical, cumbersome in both cost and time. Accessibility of information to users, using the GIS method has been easy, both maps and attribute data can be updated at anytime. Thus speed, storage and retrieval of data in GIS have proved its superiority over the conventional cadastral survey method.

CHAPTER V

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 SUMMARY

The Research study showed that geographical information system (GIS) of data storage, management and retrieval of information is very effective, efficient and more accurate than the traditional conventional cadastral survey method. The integration of GIS with cadastral survey is capable of producing on accurate computer aided cadastral map; it also showed that the GIS can cope with large volume of data and both the cadastral maps and data can be updated easily. While in the conventional cadastral system, information are disjointed, destroyed in processing and the security of data are not guaranteed. The findings showed that GIS can manage, store and retrieve data easily. The security of such data is guaranteed.

Information in the GIS are easily accessible, it also enhances accuracy in the production of maps and can cope with large volume of data generated by the system. Thus geographical information system (GIS) based on the research findings is a better method of data storage, management and retrieval than the traditional cadastral survey system, which is ineffective, non-economical, cumbersome in both cost and time thus speed, accuracy, storage capability and retrieval of information on data using the GIS is superior to the traditional cadastral system.

5.2 CONCLUSION

It has been found that the GIS method of storage, speed of retrieval of information, analysis, integrating and manipulation as well as the graphic representation of features in forms of maps is better than the conventional cadastral system. All mode of data presentation used in GIS play very crucial roles, however the most important aspect of the system particularly for data management, data analysis and for taking decision in graphic mode, in which information on spatial data on attribute data are presented in tabular and graphic form for users. It is important to note that data compatibility and accuracy are vital ingredients for a successful GIS for cadastral applications. The failure of users to use available data efficiently puts them out of touch into reality. Consequently, today's surveyors must avail themselves of constant flow of up-to date data, must observe them, process them and make appropriate decision and implement them promptly by utilizing the GIS facilities Y.E Jairousi (1999)

5.3 RECOMMENDATIONS

GIS is a relatively new information technology particularly in Nigeria, which is being widely applied in every area to handle the volume of data that is being generated. The following recommendations are therefore necessary in order to benefit from the proper implementation and design of GIS database for cadastral application. More importantly, for Adamawa State from where the study area was adopted for the research study.

1. The design and implementation of GIS to cadastral surveying will go a long way in providing accurate cadastral data that could be used for development, and planning activities.
2. Tenement rates, land taxation and serious land management problems and disputes can easily be settled with adequate and accurate cadastral map and data provided by the GIS.
3. The implementation of the system (GIS) will assist the state government in handing of land services more efficiently.
4. Revenue can be generated from users seeking information on land related matters, such as lawyers, tourist, educationist, appraisers etc.
5. The system will assist the State Government in keeping accurate land records, which can easily be updated. Information can not be destroyed;

but security of data is enhanced through proper implementation of the GIS method.

6. The implementation of the system (GIS) will help to avoid duplication of data as different information will be stored in different files and then linked together through means of common attributes.
7. The implementation of the system (GIS) will assist the State Government to develop its human resources on the use of the modern technique by acquiring and training them in computer technology.
8. It is however recommended that technical education is a necessary ingredient in the development of any nation; it requires will and determination to achieve the desired goal. Surveyors must have adequate training to meet the present challenges of information management in order to remain relevant in present technological development. The integration of GIS technology and the development of a sound database for cadastral survey must be ensured at all times.
9. Recommendation for further studies should include utilities such as power line, water, schools etc. such attributes will further enhance maximum utilization of Cadastral Land Parcel.

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APPENDIX A

RESGISTRATION TABLE

Parcel No	Application date	Application No	Application fee	Reg. date	Cert. of Occupancy
1	13/1/86	02241	265	20/3/86	ADS519
2	13/1/86	02251	265	20/3/86	ADS446
3	10/1/87	0884	265	15/2/87	ADS444
4	15/6/88	09942	265	21/7/88	ADS492
5	15/6/86	02271	265	16/6/86	ADS387
6	15/6/86	02261	265	16/6/86	ADS333
7	12/8/88	09997	265	9/9/88	ADS269
8	17/11/82	0417	265	2/12/82	ADS778
9	13/10/86	02291	265	14/1/86	ADS981
10	7/7/83	0582	265	8/7/83	ADS1041
11	16/2/84	0742	265	16/2/84	ADS822
12	18/4/85	0891	265	25/5/85	ADS888
13	13/1/86	02301	265	19/3/86	ADS394
14	13/1/86	02311	265	19/3/86	ADS899
15	12/8/88	09967	265	1/9/88	ADS904
16	30/3/89	11342	450	2/4/89	ADS4051
17	10/1/87	11343	265	2/4/89	ADS1137
18	11/11/80	0894	265	1/3/87	ADS1150
19	10/1/87	01131	265	1/12/80	ADS 1090
20	12/8/88	0897	265	11/2/87	ADS964
24	12/8/88	09961	265	1/10/88	ADS1056
26	10/1/87	09962	265	1/10/88	ADS1999
28	13/1/86	0895	265	3/2/87	ADS2014
30	13/1/86	02381	265	16/3/86	ADS1444
32	13/1/86	32391	265	16/3/86	ADS3659
34	12/12/90	6492	265	1/1/91	ADS801
36	13/8/91	7691	265	16/9/91	ADS778
38	26/9/93	80121	265	28/9/93	ADS1190
40	16/5/95	84961	450	3/7/95	ADS1211
44	16/6/95	84987	450	3/7/95	ADS1166
46	12/8/88	09051	450	18/8/88	ADS666
48	11/8/89	19812	265	1/9/89	ADS915
51	16/12/88	09913	265	21/12/88	ADS1001
53	1/1/87	0889	265	2/3/87	ADS1056
49	20/6/86	02480	265	24/6/86	ADS1193
47	22/6/86	02490	450	24/6/86	ADS884
45	31/1/86	02181	265	3/2/86	ADS1196
43	15/7/86	02396	265	20/8/86	ADS864
41	17/1/87	0890	265	23/1/87	ADS815
39	16/1/87	0989	265	23/1/87	ADS813

TRANSACTION TABLE

PARCEL NO	ACQUISITION	ORIGINAL OWNER	TRANSACTION DATE
1	PURCHASE	MOHAMMED BALA	18/7/86
2	PURCHASE	EMEKA OJI	11/9/86
3	APPLIED	HALIMA PATER	1/1/88
4	PURCHASE	HASSAN DAUDA	2/8/90
5	PURCHASE	SALIHU BUBA	13/12/1
6	GIFT	EMMANUEL YA'U	7/6/89
7	PURCHASE	GAYUS ADU	16/6/90
8	PURCHASE	JAMES JOHN	1/11/90
9	INHERITANCE	AHMED YA'U	17/8/91
10	GIFT	JOHN PETER	13/4/91
11	INHERITANCE	HUSSAINI ADAMU	18/6/92
12	PURCHASE	HAUWA INUWA	17/8/93
13	PURCHASE	ALHAJI GARBA	20/3/99
14	PURCHASE	ALHAJI AUDU	21/9/2000
15	PURCHASE	ALHAJI ABUBAKAR	30/4/92
16	PURCHASE	KENNEDY JOHN	14/3/94
17	PURCHASE	BARKINDO ALIYU	16/2/96
18	GIFT	MUSTAPHA MAI	1/1/89
19	GIFT	KWAGE TUMBA	7/10/90
20	PURCHASE	ZIRA ADAMU	15/9/91
24	PURCHASE	HAMMAN DIKKO	5/3/93
26	INHERITANCE	BAIDU HASAN	9/4/93
28	PURCHASE	MAGADALIN JOHN	15/5/200
30	PURCHASE	USMAN AJI	18/6/99
32	PURCHASE	GIDEON MOHAMMED	28/6/96
34	INHERITANCE	TONDU OJI	17/7/95
36	INHERITANCE	BARKINDO BUBA	14/11/97
38	GIFT	HALINU ZARMA	30/11/99
40	PURCHASE	GILBERT TUMBA	28/8/98
44	PURCHASE	HANNATU JAMES	14/9/96
46	PURCHASE	JAMES KADALA	9/4/97
48	PURCHASE	ZIRA DADDA	15/9/2000
51	PURCHASE	BUBA ZARMA	1/199
53	PURCHASE	SOLOMON AJI	23/8/2000
49	GIFT	HASSAN ALHAMDU	28/2/2000
47	INHERITANCE	EMMANUEL ZAKI	1/1/89
45	INHERITANCE	BULUS ANDREW	6/7/2001
43	GIFT	YOHANNA PETER	1/9/99
41	GIFT	DURKWA SUNDAY	15/6/2001
39	PURCHASE	PICKVANS AUDU	1/10/89

OWNERSHIP TABLE

PARSEL NO	NAME	SEX	B.DATE	OCCUPATION	ADDRESS	STATE	L.G.A	NATIONAL	INCOME
1	Hassan Turaki	M	7/08/61	Farmer	44 Mubi Rd	Adamawa	Mubi South	Nigeria	300,000
2	Abubakar Audu	M	16/01/49	Trader	7kala'a st	Adamawa	Gombi	Nigeria	250,000
3	Grace John	F	23/09/65	Civil /S	18sokoto st	Adamawa	Maiha	Nigeria	160,000
4	Solomon pakka	M	1/11/58	Civil /S	104, Bada Rd,	Kaduna	Kagorko	Nigeria	160,000
5	Gidado Bakari	M	14/07/56	Trader	229, Jera Rd	Adamawa	Yola	Nigeria	190,000
6	Aisha Bello	F	20/09/60	Trader	167, Mubi Rd	Adamawa	Fagge	Nigeria	200,000
7	Mohammed Ya'u	M	17/10/59	Business	19, Jimita St.	Kano	Fagge	Nigeria	150,000
8	Stalla Bitrus	F	16/09/67	Business	47, Mubi Rd.	Kano	Geri	Nigeria	200,000
9	Bello Ahmed	M	23/09/52	Business	116, Musstapha Rd.	Adamawa	Lamurde	Nigeria	200,000
10	Peter Simon	M	4/11/56	Farmer	87, Rock Heaven Rd	Adamawa	Hong	Nigeria	100,000
11	Bello Adamu	M	8/03/75	Farmer	56, Bishop St.	Taraba	Jalingo	Nigeria	70,000
12	Julius Bitrus	M	17/03/45	Farmer	48, Hospital Rd.	Adamawa	Numan	Nigeria	90,000
13	Peter Hamman	M	19/12/40	Trader	126. Bishop St.	Gombe	Beliri	Nigeria	150,000
14	Gaduan Alhamdu	M	30/04/42	Trader	91, Mubi Rd.	Adamawa	Yola	Nigeria	180,000
15	Alhamdu Mudade	M	31/08/63	Business	96, Mubi by pass	Gombe	Beliri	Nigeria	200,000
16	Elf Nig. Ltd.	-	-	Business	114, Hospital Rd.	Adamawa	Bubi North	Nigeria	200,000
17	Ngura Alhamdu	M	18/07/70	Designer	62, Church St.	Adamawa	Maiha	Nigeria	300,000
18	David Yamusa	M	20/07/68	Builder	19, Vakuna St.	Adamawa	Maiha	Nigeria	300,000
19	Hassan Kwage	M	1/06/64	Builder	82, Church St.	Adamawa	Maiha	Nigeria	250,000
20	Zira Tumba	M	16/04/68	Business	36, Humb Rd	Taraba	Zing	Nigeria	100,000
24	Shehu Hassan	M	28/10/58	Teacher	17 pella st	Adamawa	Hong	Nigeria	142,000
26	Gabriel Baidu	M	24/11/57	Teacher	56, numan Rd	Adamawa	Yola	Nigeria	170,000
28	Musa Bello	M	17/09/50	Teacher	109, Jimeta St.	Adamawa	Yola	Nigeria	160,000
30	Juta Dacvid	M	8/03/52	Farmer	4, Ma'ane St	Adamawa	Yola	Nigeria	100,000
32	Samuel Audu	M	6/07/40	Civil/S	27, Nguli St	Taraba	Jalingo	Nigeria	250,000
34	John Bakare	M	12/08/49	Farmer	98, Yola St	Taraba	Jalingo		500,000
36	Umar Buba	M	30/09/68	Surveyor	41,Ma'ane St	Adamawa	Yola		280,000

38	Haliru zarma	M	14/10/47	Civil/S	15,Mubi Rd	Adamawa	Yola	Nigeria	180,000
40	Star Ventures	-	-	Business	68, Hospital rd	Adamawa	Geri	Nigeria	1000,000
44	Kadiri and son	-	-	Business	112, Bishop st	Adamawa	Song	Nigeria	125,000
46	SAP Ventures	-	-	Business	17, pakka St	Adamawa	Maiha	Nigeria	500,000
48	Samuel Zira	M	16/04/63	Farmer	18,Gankida	Adamawa	Mubi	Nigeria	150,000
57	Usman Buba	M	7/11/70	Surveyor	61,Benue st	Adamawa	Yola	Nigeria	300,000
53	Hauwa Audu	F	18/10/61	Town planner	7, Church St	Bornu	Biu	Nigeria	190,000
49	Mary Solomon	F	16/09/64	Business	92, Kala'a st	Bornu	Biu	Nigeria	200,000
47	Gizz Nig Ltd	-	-	Business	42, Jos Rd	Bornu	Biu	Nigeria	185,000
45	Godiya Bulus	F	18/01/65	Civil/S	40, Buba St	Adamawa	Hong	Nigeria	175,000
43	Glory John	F	20/02/70	Civil/S	29, Mubi Rd	Adamawa	Fufore	Nigeria	180,000
41	Talatu Enoch	F	16/08/71	Civil/S	42, Benue st	Adamawa	Geri	Nigeria	180,000
39	Sule nugra	M	25/09/59	Trader	16, kala'a st	Adamawa	Maiha	Nigeria	250,000

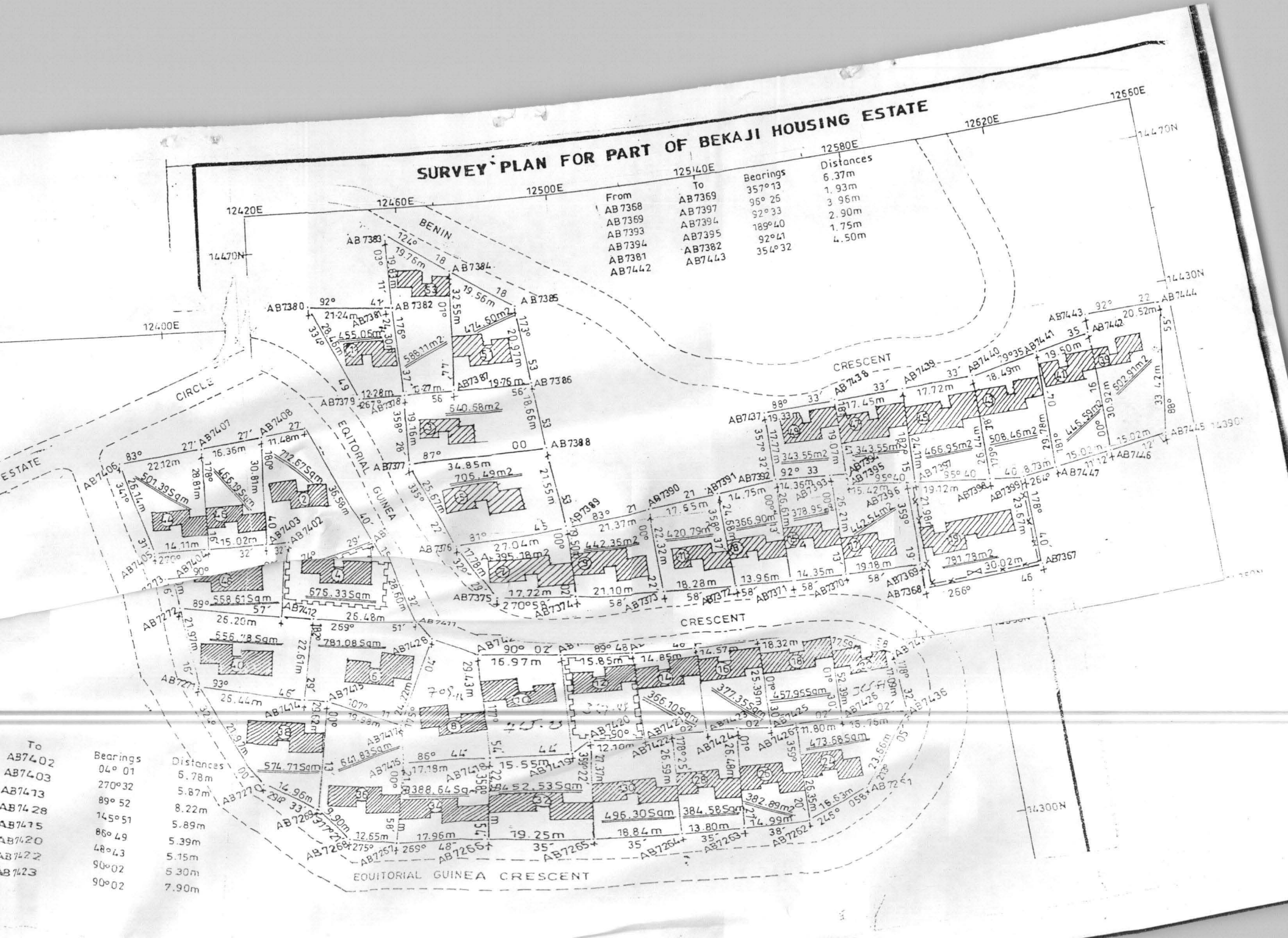
PARCEL TABLE

PANCAL NO	ARGA	LOCATION	PLAN NO	USE	VALUE	TERM	RENT	POPULATION
1	455.06	Eqitorial guinea creascent	ADS519	Residential	600,000	99yrs	1000	20
2	712.67	" "	ADS446	Residential	650,000	99yrs	1000	18
3	640.68	" "	ADS444	Residential	500,000	99yrs	1,500	17
4	676.33	" "	ADS 492	Residential	450,000	99yrs	1000	8
5	706.49	" "	ADS387	Residential	480,000	99yrs	600	11
6	781.08	" "	ADS333	Residential	500,000	99yrs	1000	17
7	395.18	" "	ADS269	Residential	700,000	45yrs	500	14
8	709.16	" "	ADS 778	Residential	500,000	99yrs	1,500	6
9	422.36	" "	ADS981	Residential	350,000	99yrs	1000	10
10	465.23	" "	ADS1041	Residential	400,000	99yrs	1000	12
11	420.79	" "	ADS822	Residential	500,000	99yrs	1000	13
12	367.48	" "	ADS888	Residential	600,000	99yrs	1,500	13
13	366.90	" "	ADS 394	Residential	600,000	99yrs	1000	15
14	366.10	" "	ADS899	Residential	400,000	99yrs	1,500	21
15	378.95	" "	ADS904	Residential	400,000	99yrs	1,500	11
16	377.35	" "	ADS 451	Commercial	700,000	45yrs	800	13
17	442.54	" "	ADS1137	Residential	500,000	99yrs	1000	12
18	457.96	" "	ADS 1150	Residential	500,000	99yrs	1000	10
19	781.78	" "	ADS1093	Commercial	600,000	99yrs	1,500	9
20	365.82	" "	ADS964	Commercial	350,000	99yrs	1000	8
24	473.68	" "	ADS 1056	Commercial	450,000	99yrs	1000	8
26	382.89	" "	ADS 1999	Residential	490,000	45yrs	1000	6
28	384.58	" "	ADS2014	Residential	600,000	99yrs	1,500	6
30	496.30	" "	ADS 1444	Residential	600,000	99yrs	1000	7
32	452.53	" "	ADS3659	Residential	700,000	99yrs	1000	6
34	488.64	" "	ADS801	Residential	600,000	99yrs	1,500	7
36	641.83	" "	ADS778	Residential	500,000	99yrs	1,500	8
38	574.71	" "	ADS1190	Residential	400,000	99yrs	700	10
40	656.71	" "	ADS 1211	Commercial	700,000	45yrs	1,500	9
44	501.36	" "	ADS1166	Commercial	600,000	99yrs	1000	11

46	466.19	" "	ADS 666	Commercial	800,000	45yrs	1,500	12
48	568.61	" "	ADS915	Residential	600,000	99yrs	1500	14
51	474.60	" "	ADS 1001	Residential	400,000	99yrs	500	13
53	588.11	" "	ADS 1056	Residential	500,000	99yrs	500	14
49	343.55	" "	ADS 1193	Residential	650,000	99yrs	650	10
47	343.55	" "	ADS 884	Commercial	800,000	45yrs	800	6
45	466.95	" "	ADS 1196	Commercial	700,000	45yrs	1500	6
43	508.46	" "	ADS 864	Residential	400,000	99yrs	500	7
41	446.59	" "	ADS 815	Residential	500,000	99yrs	500	9
39	602.91	" "	ADS 813	Residential	390,000	99yrs	1000	10

APPENDIX B

SURVEY PLAN FOR PART OF BEKAJI HOUSING ESTATE



From	To	Bearings	Distances
AB7368	AB7369	357°13	6.37m
AB7369	AB7397	95° 25	1. 93m
AB7393	AB7394	92°33	3. 96m
AB7394	AB7395	189°40	2.90m
AB7381	AB7382	92°41	1.75m
AB7442	AB7443	354°32	4.50m

To	Bearings	Distances
AB7402	04° 01	5.78m
AB7403	270°32	5.87m
AB7473	89° 52	8.22m
AB7428	145°51	5.89m
AB7475	86° 49	5.39m
AB7420	48°43	5.15m
AB7422	90°02	5.30m
AB7423	90°02	7.90m