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DEVELOPMENT OF A GEO-INFORMATICS DATABASE OF ABATTOIRS IN IBADAN, NIGERIA FOR EPIZOOTIOLOGICAL SURVEILLANCE.

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SUMMARY

Animal diseases and health problems transcend local and international borders, requiring attention to geographical, spatial and temporal considerations before effective prevention and control could be implemented. The application of geo-information technologies has been on for decades to facilitate diseases reporting, monitoring, surveillance, prediction and intervention (prevention/treatment/control) programmes. Low stock of livestock base data is one of the challenges/limitation to the adoption/application of modern geographic information technologies in the control of epizooties in Africa, including Nigeria.

Abattoris are typical foci for epizootiological studies of animal diseases, including zoonotic disease of public health importance. This paper highlights the use of Geographical Information Systems and Global Positioning System technologies for the establishment of a spatial baseline geographical data of some abattoirs in Ibadan, one of Africa's largest cities.

Such a baseline data could form a basis for the running of an effective veterinary information system for disease diagnosis, monitoring and surveillance.

INTRODUCTION

Animal diseases and health problems transcend local and international boarders, requiring attention to geographical, spatial and temporal parameters before effective prevention and control could be implemented. The application of Geo-Information technologies, especially Geographic Information System (GIS) and Global Position System GPS, to human epidemiological and Public Health studies has been on for decades to facilitate diseases reporting, monitoring, surveillance, prediction and intervention (prevention/treatment/control programmes. They led to reliable disease surveillance system for planning, implementing and evaluating disease and control programmes (7).

The use of geographical information systems (including remote sensing) and spatial analysis in public health is now widespread (8). The widespread use of powerful desktop computers and the availability of geo-referenced socio-economic and health data have ensured that Geographical Information Systems are widely recognized as powerful tools for health care research and epidemiology, and have been utilized for decades now in human epidemiology research and practice especially in the western world (9).

In contrast to the popularity of GIS in human health studies, animal health uses of GIS have gained rather slow acceptance. They are now finding increasing application to the study of the environmental factors affecting the incidence and patterns of diseases in animal populations worldwide. It has led the development of spatially based, disease detection reporting and data analysis systems (3).

Standardized GIS geo-referencing of epidemiological data, e.g. with the use of a Global Positioning System (GPS) facilitates structured approaches to epidemiological data management. With such a database available for a disease, it could be used as surveillance system for any other disease by replacing data of disease with the data of another (5). Public Health resources, specific disease and other health events can be mapped in relation to their existing health and social infrastructures, for a powerful tool of monitoring and managing epidemics/epizootics.

As a pre-requisite measure to curtail disease outbreak emergencies, a spatial data library is an invaluable resource to support GIS activities related to an outbreak (5). The types of information in a spatial data library are detailed National base map, which should include administrative boundaries at the country, township, and municipality level. Other information that should be maintained includes data on livestock and poultry populations, wildlife populations, arthropod vector distributions, weather and climate, terrain, and hydrologic features. Supplemental data should include satellite remote sensing imagery, aerial photography, and rasterized GIS maps.

In the same vein, spatial audits of first points of (animal) concentrations have been advocated (3). Spatial audits involve determining the location of facilities that are likely to receive animals for processing and entry into the food system. Spatial audits should be conducted before an emergency as a means of establishing the potential flow of livestock or poultry into facilities likely to hold animals prior to processing as food commodities. Examples of first points of concentration are feedlots, live animal markets, and slaughter facilities.

This study sought to establish a spatial geographical baseline data of some abattoirs in Ibadan. Such database will be used to run an effective Animal Health Information System for diseases surveillance, monitoring and control.

MATERIALS AND METHODS

Materials: GPS Magallan 315 hand receiver, Microsoft Word, Excel Powerpoint, SPSS10.0 and ArcGIS 9.0 software packages

Methods: Thirteen (13) abattoirs in Ibadan were visited and the various coordinates of the global positions were taken and recorded. These were converted into decimal units acceptable by Arc GIS 9.0 for data processing. Data were entered into MicroSoft Excel (ESRI) for analysis and spatial display. A digital map of Ibadan, the study area were made available by the GIS unit of the inteInternational Institute of Tropical Agriculture (IITA), Ibadan. Attribute data were got from available

meat inspection data of abattoirs in Ibadan for a six month period (October 2003 to March 2004), collected from Department of Livestock Services, Ministry of Agriculture, Ibadan, Oyo State Nigeria.

The digital map of Ibadan and the attribute data were then inputted into ArcGIS 9.0 for major analysis used to develop a Geographical Information System DataBase. Saptial classification and display of the GPS locations of the abattoir were carried out using the ArcGIS 9.0. A base map of Ibadan was finally produced from the already existing digitized maps obtained from the GIS unit of the International Institute of Tropical Agriculture (IITA).

RESULTS

Table 1 shows the geographic GPS coordinates of the 13 visited abattoirs.

Figure 1 shows a GIS spatial base map of Ibadan illustrating administrative boundaries, abattoir locations, major and minor road networks etc.

Figure 2 shows the geo-referenced point location of the 13 abattoirs.

DISCUSSION

Abattoris, officially registered approved premises for hygien: slaughtering; inspection and processing of food are of strategic importance as sources of epidemiological data and information for detection, surveillance, monitoring and control of animal and human diseases such as brucellosis, helminthiasis, anthrax and tuberculosis. They are first point of concentration of animals and are of great epizootiological and public health importance. Application of GIS and GPS geo-informatics enhances the spatial auditing of abattoirs.

The use of GPS gives greater precision to disease reporting by revealing point location of disease source, prevalence and incidence, rather than referring to mere administrative boundaries/locations. Table 1 shows the geographic GPS coordinates of the 13 Ibadan abattoirs visited.

The most important feature of a GIS is that spatial data are stored in a structured format known as spatial database. This is presented in Figure 1, which shows a GIS spatial base map of Ibadan illustrating administrative boundaries, abattoirs locations, major and minor road networks etc. More spatial data could be added to develop a spatial data library for an emergency response to disease outbreaks. Standardized geo-referenced GPS point locations of the 13 study abattoirs. Once the basic structure is ready, as shown in Figure 2, it coul be used in any surveillance study o any other disease, by replacing da of one disease with the data o another (5).

Similar projects in Delmarva Peninsula and Mississippi State University used Global Positioning Systems (GPS) and Computerized Geographic Information System (GIS) Technologies to develop detailed database for epizootiological monitoring and analyzing diseases in commercial poultry (1,6). Public Health resources, specific disease and other health events can be mapped in relation to their existing health and social infrastructures, for a powerful tool of monitoring and managing epidemics/epizooties. Thus the increasing importance of Geo-Informatics developed database in animal and human disease.

At the moment, geo-spatial data and information in Africa are under-used. Elizabeth Gavin (4) has listed a number of factors that undermine the ability of a country or a group of countries to use sparial information effectively in the planning process. These factors include lack of awareness by decision-makers, low stock of base data, uncertain data discovery, access and exchange mechanisms, lack of interoperability among datasets, and insufficient human and technical resources.

CONCLUSION

EIS-Africa position paper (10) identifies five *Spatial Data Infrastructure* (SDI) factors that determine a country's ability to use geo-information effectively: existence of core data sets; the accessibility of documentation about existing geo-information; the adherence of geo-information to accepted standards; policies and practices promoting the exchange and reuse of geo-information; and sufficient human and technical resources to collect, manipulate and distribute Geoinformation (9).

For effective and obligatory prevention of transboundary and public health epizooties/Zoonoses, Nigerian Veterinary authorities should pursue the development of Geo-informatics epizootiology database for the effective use of spatial information in the planning process and emergence response to local and transboundary disease outbreak, as highlighted in previous publications (2,3,4).

ACKNOWLEDGEMENT: The base map of Ibadan (Figure 1) was produced from the already existing digitized maps obtained from the GIS unit of the International Institute of Tropical Agriculture (IITA), Ibadan.

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Table 1: Global Positions of the 13 visited Abattoirs in Ibadan

	Geographical Coordinates						
	Latitude			Longitude			
	North			East			Altitude
Sites	Degree	Minutes	Seconds	Degree	Minutes	Seconds	Feet
BODIJA	7	25	58	3	54	59	730
BASHORUN	7	22	41	3	56	3	785
MAPO	7	19	51	3	52	22	575
MONIYA	7	32	1	3	54	29	755
SHASHA	7	29	16	3	54	44	678
OJOO	7	27	55	3	54	40	742
ALAROBO	7	25	2	3	58	0	752
IDI-AYANRE	7	19	32	3	52	2	444
AKOREDE	7	17	32	3	51	53	639
BABANLA	7	22	41	3	56	18	804
OMI-ADIO	7	23	47	3	45	28	469
DOGO APATA	7	22	55	3	49	44	754
NEW GBAGI	7	23	24	3	57	18	765

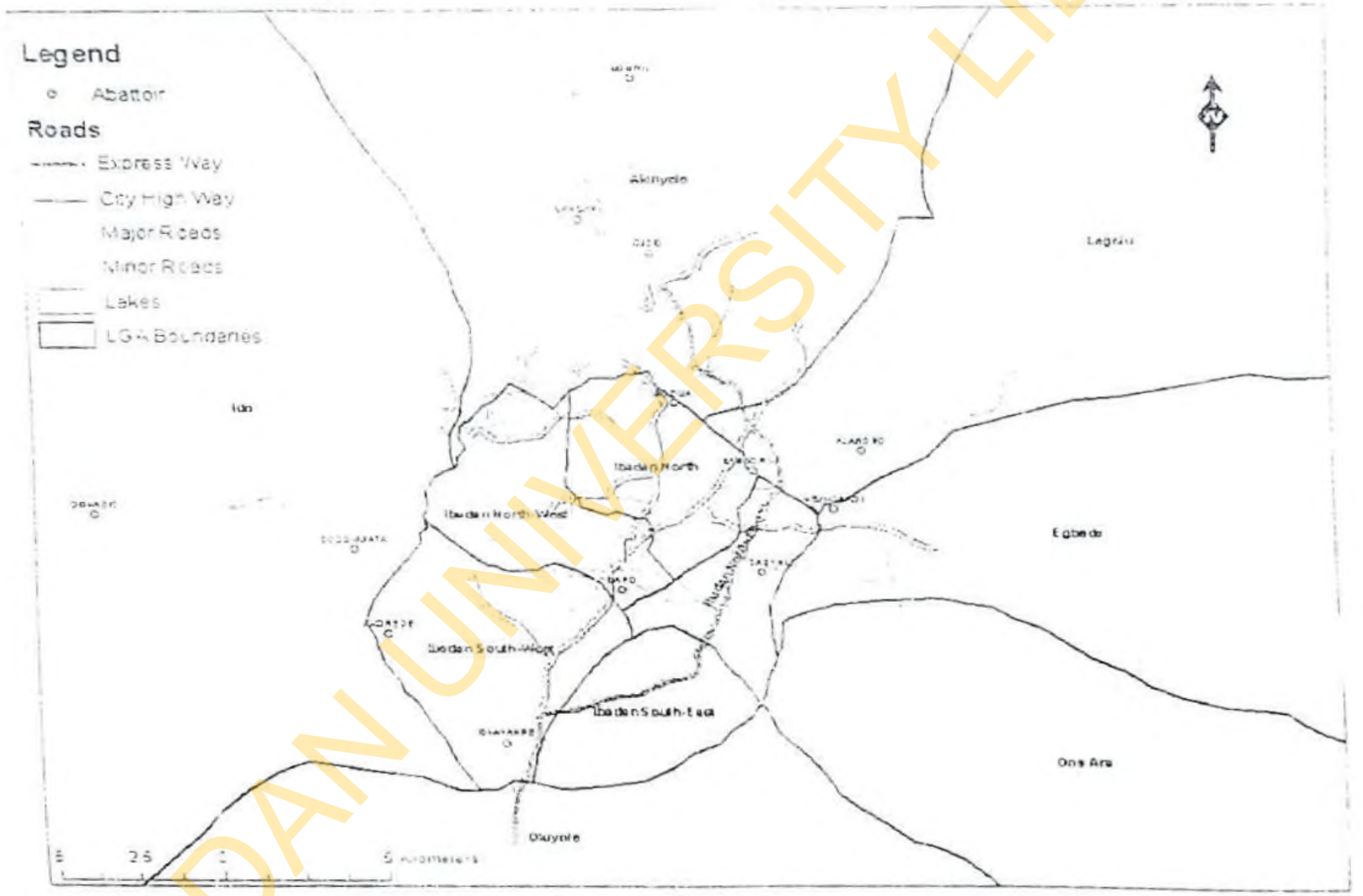

Figure 1 The base Map of Ibadan City showing Local Government Administrative boundaries and their abattoirs

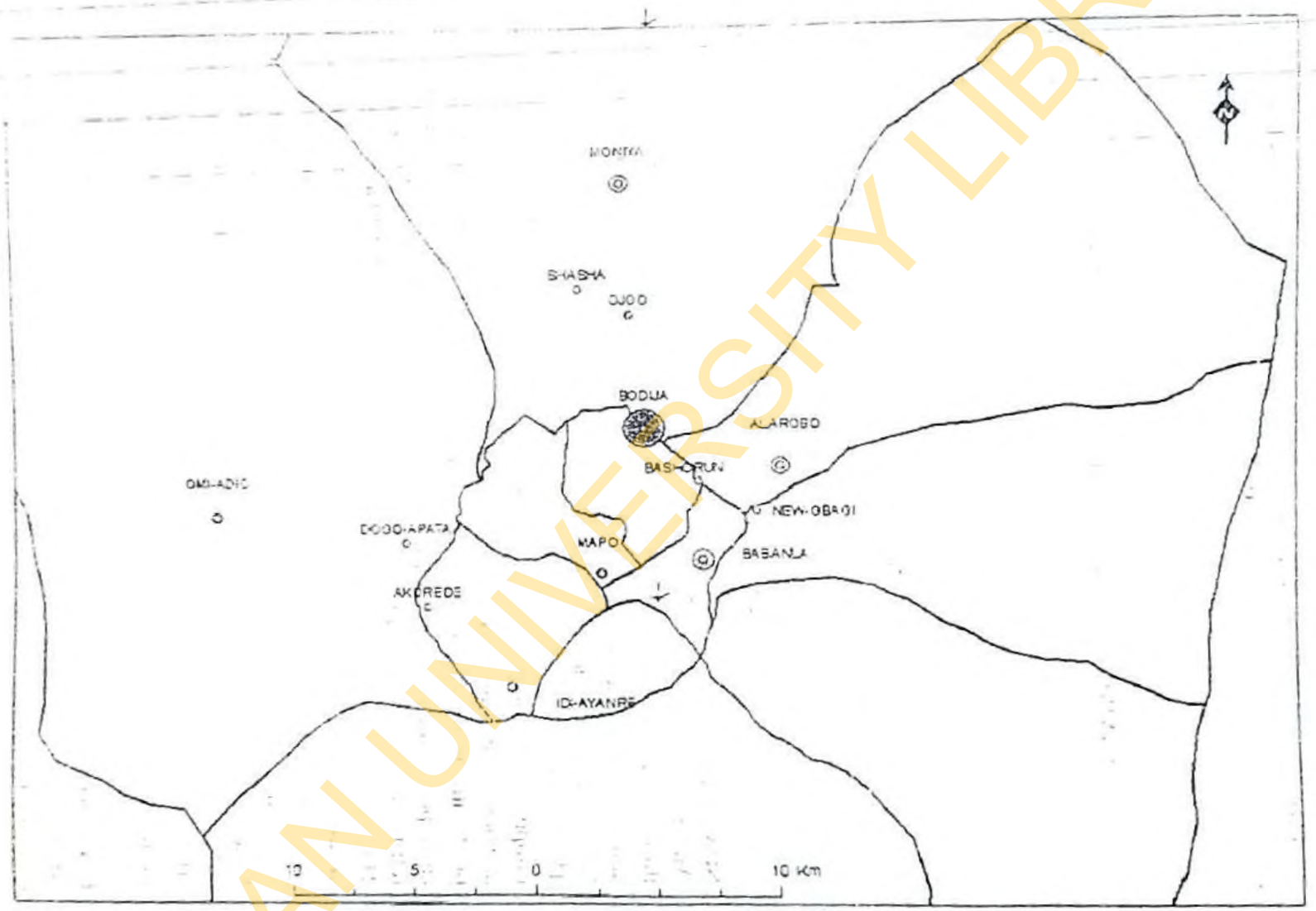

Fig. 2: Geo-reference point locations of the 13 selected Abattoirs in Ibadan.