PARTICIPATORY EPIDEMIOLOGY AND SEROPREVALENCE OF NEWCASTLE DISEASE IN LOCAL CHICKENS IN THE FEDERAL CAPITAL TERRITORY, ABUJA-NIGERIA

BY

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BY

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A THESIS SUBMITTED TO SCHOOL OF POSTGRADUATE STUDIES, AHMADU BELLO UNIVERSITY, ZARIA, NIGERIA IN PARTIAL FULFILLMENT FOR THE AWARD OF THE DEGREE OF MASTERS OF SCIENCE IN VETERINARY PUBLIC HEALTH AND PREVENTIVE MEDICINE

DEPARTMENT OF VETERINARY PUBLIC HEALTH AND PREVENTIVE MEDICINE, FACULTY OF VETERINARY MEDICINE, AHMADU BELLO UNIVERSITY, ZARIA-NIGERIA

MAY, 2013

DECLARATION

I declare that the work on the thesis titled **"PARTICIPATORY EPIDEMIOLOGY AND SEROPREVALENCE OF NEWCASTLE DISEASE IN LOCAL CHICKENS IN THE FEDERAL CAPITAL TERRITORY, ABUJA-NIGERIA"** has been carried out by me in the Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, Ahmadu Bello University, Zaria under the supervision of Professors J. U. Umoh, P. A. Abdu and Dr. J. Kabir. The information derived from the literature has been duly acknowledged in the text and a list of references provided. No part of this thesis was previously presented for another degree, diploma or certificatef at any university.

.....	.....	.....
Name of student	Signature	Date

CERTIFICATION

This thesis titled "**PARTICIPATORY EPIDEMIOLOGY AND SEROPREVALENCE OF NEWCASTLE DISEASE IN LOCAL CHICKENS IN THE FEDERAL CAPITAL TERRITORY, ABUJA-NIGERIA"** by Samuel Akawu ANZAKU meets the regulations governing the award of of the degree of Master of Science of Ahmadu Bello University, Zaria and is approved for its contribution to scientific knowledge and literary presentation,

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DEDICATION

This thesis is dedicated to my beloved wife, Mrs. Laraba M. Anzaku for her unconditional support and love, our lovely children, Oklo, Adzuayi, Oshla and Asheolu for their prayers, understanding and encouragement and my mother, Mrs. Taimako David Anzaku for her continuous prayers throughout the period of my studies.

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ABSTRACT

Newcastle Disease (ND) constitutes an impediment to poultry production and health with increasing number of cases reported yearly by private veterinarians in the Federal Capital Territory (FCT) in commercial farms, but the epidemiological status of the disease in local chickens is unknown and outbreaks are usually not reported. The objectives of the study were to determine the importance of poultry in relation to other livestock, the importance of ND in relation to other poultry diseases, the presence and levels of antibodies to ND and management constraints of rural chickens. The study was carried out between April and June, 2012. Semi-structured interviews (SSIs), proportional piling, ranking, matrix scoring, seasonal calendar, mapping and transect walk were used on 40 informant groups in 40 purposively selected villages of the FCT to determine the perception of poultry owners on the clinical signs of ND in local chickens. In addition, 400 serum samples collected from local chickens in the villages were screened for ND virus antibodies using haemagglutination inhibition test (HI) and information on husbandry and management practices was obtained from 400 selected rural poultry owners using a structured questionnaire. The participatory epidemiology (PE) data were subjected to descriptive statistics and Kendall's coefficient of concordance (W) was calculated to determine the level of agreement between the informant groups. Also, HI test results and information on husbandry and production constraints were subjected to descriptive statistics. Poultry constituted the largest population of livestock kept and ND ranked first among the five most important poultry diseases with the predominant clinical signs of high mortality, diarrhoea, nervous signs and dyspnoea. Newcastle disease outbreaks occur mostly from October to March and traditional remedies used for treatment include *red pepper* (*Capsicum frutenscens*) and *gauta kaji* (*Solanum nodiflorum).* There were good agreements based on Kendall's coefficients of concordance (W) between informant groups on the clinical signs, priority poultry diseases and livestock population. The estimated mean morbidity and case fatality

rates of ND were 71.38% and 74.5%, respectively. About 57% (228) of local chickens had antibodies to NDV. Also, information obtained from respondents indicated that local chickens constitute 77% of poultry kept and 43.5% of farmers housed their chickens at night, The major sources of breeding stock were live bird markets (62%), about 69.75% provided supplementary feeding, 51.75% kept poultry purposely for sale; 55% employed local treatment for diseases while only 26.5% sought conventional veterinary treatments. Veterinary services were unavailable to 58% of respondents and the major methods of disposal of dead birds were the use of refuse dump (48.75%) and dug pit (38.25%). It was concluded that local chickens constitute majority of poultry kept in the FCT, ND is wide spread and PE can be used to improve ND surveillance. Also, the prevalence of ND obtained indicated a low immunity against ND hence routine vaccination against ND in local chickens in the FCT is hereby recommended.

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LIST OF ABBREVIATIONS AND SYMBOLS

AMAC:	Abuja Municipal Area Council
ATA	Agricultural Transformation Agenda
AICP	Avian Influenza Control Project
CAHW:	Community-based animal health worker
CBN:	Central Bank of Nigeria
CBPP:	Contagious Bovine Pleuropneumonia
CBPR:	Community-based Participatory research
EDRSAIA:	Early detection, reporting and surveillance for avian influenza in Africa
ELISA:	Enzyme-linked immunoabsorbent assay
ESSN:	Epidemiosurveillance system of Nigeria
EVK:	Existing veterinary knowledge
FCT:	Federal Capital Territory
FCTA	Federal Capital Territory Administration
FDLPCS:	Federal Department of Livestock and Pest Control Services
FGN:	Federal Government of Nigeria
GATT	Global Agreement on Tariffs and Trade
GDP:	Gross Domestic Product
GIS:	Geographic Information System
HA:	Haemagglutination antibody
HAU	Haemagglutination antibody unit

HI:	Haemagglutination Inhibition
ILRI:	International Livestock Research Institute
LDCs:	Less developed Countries
NADIS:	National Animal Disease Information and Surveillance
NGOs:	Non Governmental Organizations
ND:	Newcastle disease
OAU/IBAR	Organization of African Unity/Interafrican Bureau for Animal Resources
OIE	Office Internationales des Epizooties (World Organization for Animal Health)
PA:	Participatory Appraisal
PARC:	Pan African Rinderpest Campaign
PDS:	Participatory Disease Searching
PE:	Participatory Epidemiology
PLA:	Participatory Learning and Action
PRA:	Participatory Rural Appraisal
PPR:	Peste de petit ruminant
RAP:	Rapid Assessments Procedure
RRA:	Rapid Rural Appraisal
RRSA:	Rapid Rural Systems Analysis
PPR:	Pestes des Petits ruminants
SPSS	Statistical Package for Social Sciences

SSI: Semi structured interview

TADs: Transboundary Animal Diseases.

CHAPTER ONE:

INTRODUCTION

1.1 Background of the Study

1.1.1 Participatory epidemiology

There is a growing understanding that rural people are knowledgeable on the many subjects that touch their lives and that they possess a creativity and analytical capacity which can greatly assist in the development of improved agricultural practices (Chambers, 1991). Sriskandarajah *et al.,* (1989) suggested that knowledge is not a commodity for transfer from the informed to the uninformed, but the outcome of a dynamic, collaborative process between co-learners. According to Mariner (1999), livestock owners are no longer seen as an inert substrate upon which development is to be practiced; they are active participants who can and must bring important intellectual contributions to development.

Schwabe (1982) and Thrusfield (1995), reported that there are many anomalies that influenced a shift towards a broader-based investigation of animal diseases that were not amenable to conventional investigation and control strategies viz complex infectious diseases (e.g. tuberculosis and brucellosis), subclinical diseases, non- infectious diseases and diseases of unknown cause. With regard to rinderpest, Plowright (1998) has indicated that 'nomadic cattle owners could give uninitiated professionals a firm diagnosis of rinderpest and had even husbanded mild strains purposely to immunize their young stock'. Also, Masiga (1997) observed that scientists' efforts at controlling trypanosomoses in Africa over many years had met with limited success due to failure of farmers' participation. According to Huhn and Baumann (1996), among the problems facing veterinary research in sub-Saharan Africa were insufficient applied researches to solve field problems contributing to development and poor working relationships between research centres

and farmers. Consequently, ideas about agricultural development are changing to incorporate new ideas on farmer participation and a range of approaches have been developed.

In many developing countries, investigating diseases and maintaining nationwide animal surveillance system is bedevilled by many challenges which principally include the need to access remote and often large areas characterized by poor infrastructure and communications and the need to conduct adequate search with limited, yet less motivated personnel and limited financial resources (Allport *et al*., 2005). One useful approach for improving disease investigation and surveillance in the remote and inaccessible communities of developing countries like Nigeria is to use participatory epidemiology (PE) techniques (Catley, 2005; Thrustfield, 2005). Participatory epidemiology is a proven technique which overcomes many of the limitations of conventional epidemiological methods, and has been used to solve a number of animal health, surveillance and research problems (Catley, 2006; Jost *et al*., 2007).

In the current era of globalisation, there is an increasing demand for animal health information. Internationally, the Sanitary and Phyto-Sanitary Agreement of the Global Agreement on Tariffs and Trade (GATT) established science-based methods as the basis for livestock and livestock products trade decision-making. Countries are now required to provide data to substantiate their national animal health status relative to trade. This presents special problems for developing countries with remote and extensive agricultural systems. Remote and marginalized livestock populations are underrepresented in service delivery and information systems (Allport *et al.,* 2005). As a result, these populations suffer from the direct lack of services and pose epidemiologic risks to the national livestock population as a whole. The absence of current surveillance information on the animal

health status of remote populations adversely affects export trade. Since no one single surveillance system can ensure the appropriateness and timeliness of intervention, a multifaceted surveillance programme is essential to ensuring the sensitivity, specificity and timeliness of the overall surveillance activity (Catley, 2005; Thrusfield, 2005). Participatory Epidemiology is a proven technique which overcomes many of the limitations of conventional epidemiological methods, and has been used to solve a number of animal health surveillance and research problems (Catley, 2006; Jost *et al*., 2007**).**

Participatory epidemiology is a branch of epidemiology that uses the principles and methods of participatory rural appraisal and was developed to gain information directly from rural communities (Catley, 2005). This is to enable the communities do the analysis and planning using the information obtained. According to Schwabe (1984), it relies on the widely accepted techniques of participatory rural appraisal, ethnoveterinary surveys and qualitative epidemiology. The information that can be obtained through PE include wealth groups, relative livestock ownership, preferred types of livestock reared, income from livestock, relative role of livestock in household economy, animal husbandry practices, veterinary services, history of livestock diseases and season of occurrences, local disease names and treatments, marketing structure and resources available for livestock rearing. Participatory rural appraisal (PRA) has three foundations: methods; behaviour and attitudes; and sharing (Chambers, 1991). Participatory learning methods enable the extension worker to gain an understanding of the communities with whom she or he is working. Changes at the village and household levels over time can be noted and she or he is able to constantly update material and provide opportunities for farmers to comment on all materials produced (Alders *et al*., 2000).

Participatory epidemiology is an emerging field that is based on the use of participatory techniques for the harvesting of qualitative epidemiological intelligence using the widely accepted methods of participatory learning and action (PLA). In some contexts, PE is used in a very similar way to PRA but focuses on animal health issues rather than taking a broad view of problems in a given community as is the case with PRA. At other times, PE is used to work with communities to study specific disease problems and identify best-bet solutions. Participatory epidemiology relies on the well-developed existing veterinary knowledge (EVK) of traditional livestock owners contained within community observations and traditional oral history (Mariner, 1999). Such information can be used to design better animal health projects and delivery systems, more successful surveillance and control strategies or as new perspectives for innovative research hypotheses in ecological epidemiology. According to Jost *et al.,* (2007), not only was Participatory disease surveillance (PDS) of prime importance to the Global Rinderpest Eradication Program in Pakistan, supplying information to support an application for OIE accreditation of freedom of the disease but it provided information on a number of important OIE reportable diseases (FMD, PPR, Haemorrhagic Septicemia) which contributed significantly to the formulation of animal health policies. The PE approach has been used to solve complex epidemiological questions including unravelling aetiology of challenging clinical syndromes and also employed in combination with quantitative techniques to develop epidemiological models of disease transmission. As such, PE can result in significant institutional changes leading to a revitalised animal health service that is customer oriented (Catley, 2006)

The participatory approach utilizes and compares all available information through a process called triangulation. Triangulation refers to the confirmation of information using multiple methods and multiple sources. Generally, participatory appraisals are based on flexible check lists, systematic and documented methodologies, detailed and specific recording of data, willingness to learn,

respect for local people and local knowledge and iterative analysis of results. Participatory epidemiology makes full use of sampling, laboratory testing and analytical techniques (Jost *et al.,* 2007). Participatory studies provide the proper background for the design of statistical studies and the contextual information that is essential to the correct interpretation of laboratory results. On several important occasions, qualitative information from PE studies has led to the re-evaluation of the quality of laboratory methods. An important example has been the reassessment of the sensitivity of ELISA tests developed for detecting rinderpest (RP) vaccinal antibody as test for antibody against lineage 2 RP (Mariner *et al.*, 2005).

Participatory epidemiology can be used to assist with the determination of disease problems and with monitoring of diseases in the field. For instance, in situations where the epidemiology of Newcastle disease (ND) is not well understood, PE may provide a cost-efficient way of obtaining qualitative data about whether or not there is a seasonal pattern to ND outbreaks (Jost *et al*., 2008). This information can be very useful when developing a ND control program.

For diseases that are of popular concern, participatory disease search is a sensitive method that should be employed as part of active surveillance. Livestock owners are relatively adept clinical diagnosticians and can readily recognise major disease problems present in their area (Masiga, 1997). Questionnaire when combined with participatory techniques are excellent methods for assessing the epidemiological risk level of an area or for tracing owner reports back to (or forward to) active outbreaks for laboratory investigation.

In apparently disease-free areas, participatory disease searches can be used to confirm the absence of disease. Information gained through participatory disease searches on husbandry systems, grazing patterns and trade practices can be used to establish epidemiological risk levels for different disease introduction scenarios. In endemic areas, data collected on livestock movement,

animal contact and service delivery can suggest mechanisms of endemicity. This information can form the basis for the design of more appropriate control strategies. Participatory investigation can also help to establish the risk levels of disease spread out of endemic areas (Mariner *et al*., 2005).

This study was designed to use participatory appraisal methods and conventional veterinary investigation methods to obtain information on ND in rural chickens in the FCT, Nigeria. The information required using participatory appraisal methods were, ND status and its priority, risk factors (husbandry, movement), seasonality of ND, and time and source of infection.

1.1.2 The poultry subsector

Rural poultry makes up a major part of the total poultry production in less developing countries (LDC) as about 80% of the rural populace in Africa keep family poultry (Sonaiya, 2007). Nigeria has the largest poultry population in Africa (Adene and Oguntade, 2006). It has been estimated that the country has about 130-150 million chickens (Ibrahim and Abdu, 1992; Lamorde, 1996). Of this number, only about 10% are of the exotic breed and village chickens account for the remaining population (Nawathe and Abegunde, 1980, Abdu *et al*., 1985). Poultry production is a key economic activity in Nigeria and contributes significantly to the family income, especially in peri-urban and poor rural communities (Obi and Ahmed, 2008). The poultry sub-sector contributes 9 – 10% to the Nigerian Agricultural Gross Domestic Product (GDP) with a net worth of $250 million (FDLPCS, 2007). Poultry is an important instrument for alleviating problems, food security and malnutrition associated with poverty in Nigeria. Rural chickens can be found in all developing countries and plays a vital role in many poor rural households.

In spite of the importance of rural poultry, mortality is one of the most important factors militating against its development in Nigeria with ND being the most important disease causing the mortality

(Nwanta, 2003). It is particularly devastating for small village farmers who usually have limited means of protecting their flocks. Newcastle disease remains the major impediment to village poultry production as there have been continued global outbreaks and is usually grossly indistinguishable from avian influenza (Wakawa *et al.*, 2008; Wakawa, 2012). Generally, the passive surveillance system presently utilized is insensitive and there is usually under-estimation of disease prevalence, poor prioritization of animal health policies and in some instances complete failure to detect important diseases (Jost *et al.*, 2008).

1.1.3 Newcastle Disease

Newcastle disease (ND) is a highly contagious viral disease caused by an avian paramyxovirus that produces pneumoencephalitis in young chickens, turkeys and other domesticated and wild birds (Al-Garib *et al*., 2003). It is characterized by respiratory symptoms, neurological symptoms, enteritis, haemorrhagic lesions and often with high mortality. The strains are also classified into highly virulent (velogenic), intermediate (mesogenic) or avirulent (lentogenic) based on their pathogenicity in chickens (Beard and Hanson, 1984). Newcastle disease v~~V~~irus (NDV) infections of poultry range from latent to rapidly fatal disease depending upon the pathotype of virus involved (Alexander, 2003). The first reported outbreak of ND in Nigeria occurred between December, 1952 and February, 1953 in and around Ibadan (Hill *et al*., 1953). Subsequently, the disease appears to be widespread in local and exotic chickens (Fatumbi and Adene, 1979; Ezeokoli *et al*., 1984; Gomwalk *et al*., 1985; Nwosu and Okeke, 1989; Baba *et al*., 1995). The disease was also reported to be more common during the harmattan (November to March) in Zaria, Nigeria (Sa'idu *et al*., 1994; Halle *et al*., 1999; Abdu *et al*., 2005). Newcastle disease has been reported in both local and exotic breeds of chickens (Hill *et al*., 1953; Fatumbi and Adene, 1979, Abdu *et al*.,

1985; Echeonwu *et al*., 1993; Baba *et al*., 1995; Oyeduntan and Durojaiye, 1999; Saidu *et al*., 2004).

Newcastle disease is generally considered the most serious poultry disease throughout the world (Adu *et al.*, 1986; Alexander, 1988a, 2001; Adene, 1990; Spradbrow, 1993/94; Adene, 1997; Kitalyi, 1998; Nwanta *et al*., 2008; Alders and Spradbrow, 2001b). It is worldwide in distribution, while many species may be infected; dramatic losses are seen most often in domestic fowls and to a lesser extent in turkeys and pheasants (Saidu *et al*., 2004). It is endemic in village poultry populations in Africa and Asia. Serological surveys indicate the presence of the virus in village poultry in countries throughout these continents, and where virus isolation has been attempted, virulent strains have been found (Spradbrow, 1993/94). In these countries, the circulating strains of NDV are capable of causing 100% mortality in unprotected birds hence discouraging rural poultry farmers from paying proper attention to the husbandry and welfare of their flocks (Alders and Spradbrow, 2001). A serological study carried out in rural chickens by Ezeokoli *et al.,* (1984) showed 73% prevalence of antibodies against NDV in traditionally managed backyard flocks in Zaria while 63% seroprevalence was reported by Orajaka *et al.,* (1999) in South Eastern Nigeria. In South Western Nigeria around Ibadan, 38% seroprevalence was reported by Oyewole *et al.* (1996). In North Central Nigeria, (Plateau State), Musa *et al.,* (2009) reported a prevalence of 51.9%.

Most developing countries record that outbreaks of Newcastle disease are frequent, and that often entire flocks die of the disease. Newcastle disease is usually spread in rural areas either by newly introduced birds, by selling or giving away sick birds, and/or by roaming chickens in search of feed (Sa'idu *et al*., 2004)**.** Because of the importance attached to ND by rural farmers, various local names have been given to the disease by the people in many countries (Alders and Spradbrow, 2001). In Northern Nigeria, ND is known in Hausa language as ''*Haukan Kaji*''(Ibrahim and Abdu,

1992), ''*Koli*''(Yoruba) in Western Nigeria (Dipeolu *et al*., 1998) and ''*Ogbunankpo*'' (Ibo) in Eastern Nigeria (Nwanta *et al*., 2006).

Vaccination has been reported as the only safeguard against endemic ND (Orajaka *et al*., 1999). In order to formulate appropriate vaccination schedule and control measures, the serological status of NDV among chickens in the FCT need to be elucidated. Also, the FCT has witnessed massive influx of people in the last few years and to meet the increased protein demand, poultry and poultry products (mostly local chickens) are being moved to live bird markets across the FCT for sales. The preference of consumers for these local chickens, its readily available markets and the little research being done on its improvement as opposed to the exotic breeds justifies the need for this study.

1. 2 Statement of Research Problem

Nigeria has the largest poultry population in Africa (Adene and Oguntade, 2006). It has been estimated that the country has about 130-150 million chickens (Ibrahim and Abdu, 1992; Lamorde, 1996). Of this, only about 10% are of the exotic breed (Nawathe and Abegunde, 1980) and village chickens account for the remaining population (Abdu *et al*., 1985). Poultry production is a key economic activity in Nigeria and contributes significantly to the family income, especially in peri-urban and poor rural communities (CBN, 2004). The poultry sub-sector contributes 9 – 10% to the Nigerian Agricultural Gross Domestic Product (GDP) with a net worth of $250 million (FDLPCS, 2007). Poultry is an important instrument for alleviating problems associated with poverty in Nigeria (food security and malnutrition). It contributes significantly to women's income and helps meet some levels of household protein need (Obi and Ahmed, 2008). Rural chickens can be found in all developing countries and plays a vital role in many poor rural households.

Newcastle disease is a highly infectious viral disease that causes very high mortality (up to 100% in severe epidemics) in poultry and wild birds around the world. It is the most important viral disease of poultry in the world including developing countries (Adu *et al*., 1986; Adene, 1990; Adene, 1997; Nwanta *et al*., 2008). It is said to be a major factor affecting the development of the poultry industry in Nigeria and Africa in general (Ambali *et al.,* 2003). Newcastle disease remains endemic in many regions and continues to severely limit poultry production in a number of developing countries. About 200-250 outbreaks of ND were reported by Okeke and Lamorde (1988) to occur annually in chicks and adult chickens in Nigeria. There have been increasing reports of ND outbreaks in commercial farms in FCT by private veterinarians but the number reported may actually not be representative of the total number of outbreaks due to under reporting in the current conventional animal disease reporting system and poor veterinary infrastructures. Newcastle disease is particularly devastating for small village farmers who usually have limited means of protecting their flocks and is usually grossly indistinguishable from avian influenza (Wakawa, 2012). Generally, the passive surveillance system presently utilized is insensitive and there is usually under-estimation of disease prevalence, poor prioritization of animal health policies and in some instances complete failure to detect important diseases (Jost *et al*., 2008).

1.3 Justification of the Study

Newcastle disease remains a constant threat to the poultry production and has a devastating effect on the productivity of commercial and rural poultry industry (Shamaki *et al.*, 1989; Nwanta *et al*., 2006). In Nigeria, food security is one of the cardinal programmes of the transformation agenda of the present Government which can only be attained through the production of healthy livestock including poultry (ATA, 2011).

For livestock health project intervention to be successful it must be based upon intimate knowledge of local conditions obtained by first hand village level assessments (Johnston and Clark, 1982). The participation by farmers in problem identification allows easier implementation and has a substantial cost-effectiveness (Farringnton and Martin, 1988). The trend towards more community-based approaches to animal health service provision could therefore be justified on both practical and ideological grounds. As such justification for this study is premised on the following:

1. The FCT is probably the fastest growing city in Africa with attendant population growth and increased establishment of commercial poultry farms; it also serves as a major route of movement for poultry and poultry products across the country.
2. The risk level of ND in the local chicken population (the state of immunity to ND) in FCT is not known, needs to be quantified and control measures instituted to protect the expanding commercial poultry industry in FCT.
3. Newcastle disease constitutes an impediment to successful poultry production with increasing number of cases reported yearly in commercial poultry farms in the FCT.
4. Many of the earlier reported/suspected cases of Highly Pathogenic Avian Influenza (HPAI) have been confirmed to be ND in the laboratory (AICP, 2008).
5. Farmers are not involved in most policy formulations in livestock diseases control.
6. The current system of disease investigation and reporting is inefficient (OIE, 2010).
7. Ethnoveterinary knowledge in animal health care delivery service and traditional remedies of livestock diseases are not presently taken into account in development of veterinary services interventions.

1.4 Aim of the Study

The aim of this study was to assess the problem of ND in local chickens in the FCT.

1.5 Objectives of the Study

The objectives of the study were to:

1. determine the importance of poultry in relation to other livestock and the relative population of local chickens in the FCT.
2. determine the importance of ND in relation to other poultry diseases in terms of (a) frequency (b) economic importance (c) relative morbidity and mortality (d) seasonal distribution (patterns) as reported by villagers in the FCT.
3. assess the most common clinical signs of ND in local chickens in the FCT.
4. to determine the presence and levels of antibodies to ND and associated factors in local chickens in the FCT.
5. determine the remedies being employed by farmers for ND management in the FCT.
6. determine the production constraints of rural chickens and assess the availability of conventional veterinary services to the rural farmers in the FCT.

1.6 Research Questions

1. What are the major poultry diseases and health problems of epidemiological importance in order of priority in the FCT from the livestock-keepers' perspective?
2. What are the historical as well as seasonal occurrences of ND in the FCT?
3. What local remedies are available and used for the treatment of ND in the FCT?
4. What is the prevalence of ND in local chickens in the FCT?
5. Are veterinary services available and accessible to the rural communities of the FCT?
6. What are the constraints to local chicken production in the FCT?

CHAPTER TWO:

LITERATURE REVIEW

2.1 History of Participatory Epidemiology

Simply stated, PE is the application of PRA techniques to the collection of epidemiologic information. It is the systematic use of participatory approaches and methods to improve understanding of diseases and options for animal disease control (Catley *et al.,* 2011).

In the late 1970s various methods and ideas from the disciplines and systems of inquiry were transferred between professionals who were becoming increasingly frustrated with formal survey methods and development approaches. As such, experimentation began with less formal survey tools such as those used in social anthropology and agro-system analysis, and experience of indigenous knowledge systems began to merge with the field testing of informal interviewing, visualisation and other methods and this culminated in a landmark conference on rapid rural appraisal (RRA) in Thailand in 1985 (Chambers, 1994). Some key features of RRA outlined according to a training manual by McCracken *et al.* (1988) include:

(a) Attitude and behaviour of rapid rural appraisal (RRA) practitioners: RRA practitioners are expected to be genuinely willing to learn from the local people and patiently listen thereby ensuring respect for local knowledge and culture.

(b) The RRA toolkit-informal interviews and visualisation-these are semi-structured but guided interviews that are not straight jacketed, with use of appropriate body language, gestures, open-ended questions to lead the discussions.

(c) Managing groups in RRA-Attention should be paid to group dynamics to ensure that everybody participates and contribute their views without being dominant and over bearing.

(d) The use of key informants in RRA: Certain persons within communities are recognised as possessing particular knowledge and skills and they need to be identified by asking people or use of a key informant.

(e) Triangulation: It is a way of cross-checking information obtained by taking the results of one method and comparing them to results of a different method or existing data.

These systems of inquiry which are commonly called RRA, participatory rural appraisal (PRA) or similar names have been developed in the last 15 years. Generally, PRA and associated methods are being referred to as Participatory appraisal (PA). Rapid rural appraisal or participatory rural appraisal are used as general project design and monitoring tools and have been shown to be timely, accurate and cost effective means of collecting essential information for project formulation. Rapid rural appraisal is an effective technique for researcher to collect data at the community level. Participatory rural appraisal evolved out of rapid rural appraisal and places more emphasis on the empowerment of the community to process and utilize the information on their own behalf. The development of PA was influenced by two main bodies of experience which can be summarised as negative and positive experiences. Negative experiences included decades of poor success in rural development in non-industrialised countries and the wide spread failure of aid programmes to improve the lives of poor people (Chambers, 1983, cited from Catley, 1999). The positive experiences which contributed towards PA development included lessons from a diverse group of

disciplines and professional experiences. But the main influences were drawn from social sciences and novel systems approaches in agricultural and ecological researches such as, Freirian-style adult education in Latin America; the methods of agro-ecosystem analysis developed at the University of Chiang Mai in Thailand; the value of indigenous knowledge from applied social anthropology (Catley, 1999).

Participatory appraisal methods have been used by veterinarians in Africa since the late 1980s. The methods can be categorized as interviews, ranking and scoring method, and visualization methods (Alders and Spradbrow*,* 2001*)*. Though veterinarians in Africa have been using participatory approaches and methods since the late 1980s, initial experiences were largely derived from community-based animal health projects where PRA-type methods were used during project design. Soon after, 'participatory disease searching' evolved in the Pan African Rinderpest Campaign (PARC) as a means to trace rinderpest foci in remote areas. In the course of the rinderpest eradication effort, the need for alternative animal health delivery systems for remote, marginalized communities became apparent. This led to a programme of action research on community-based animal health delivery systems that included rinderpest control in a variety of communities in East and Central Africa. As part of the process of designing these community-based programmes, participatory rural appraisal techniques were used to conduct needs assessments on animal health issues. The needs assessments focused on the following areas:

• Animal health problems and priorities

Local veterinary knowledge and concepts

- Disease vectors, reservoirs, epidemiologic understanding
- Treatment

• Appropriate interventions

• Community structure, decision making and entry points

This information was used to formulate projects that directly addressed the perceived needs of the community through an appropriate combination of conventional approaches, local knowledge and community institutions. In the process, all those involved developed a tremendous respect for the extent of existing veterinary knowledge on the presentation and patterns of disease. This led to the identification of participatory epidemiology (PE) as an area of qualitative inquiry for further methodological development and promotion as an appropriate technique for the rapid, effective, and economic collection of epidemiologic information (Catley, 1999).

Several years before the emergence of PE, veterinarians and social scientists began to use participatory approaches in two related areas. First, the early development of community-based animal health worker (CAHW) systems in India (Hadrill, 1989), Afghanistan (Leyland, 1997) and Africa (Maranga, 1992; Leyland, 1996) was based on participatory inquiry with livestock keepers. Second, research on 'ethnoveterinary knowledge' became popular as a means to document local understanding of livestock and wildlife diseases, and related terminology (Mathias-Mundy and McCorkle, 1989). However, as community-based, participatory approaches became more widely applied, diversity in interpretations and uses followed a similar pattern to that reported in rural development and health projects (Catley, 2005).

Over time, participatory methods have attracted increasing interest from veterinarians and are now used by a wide range of organizations. They were useful for developing good relationships with communities, understanding local knowledge and priorities, and were relatively inexpensive and flexible. The participatory disease surveillance (PDS) approach was developed in East Africa as an

accurate and rapid method to understand the distribution and dynamics of RP in pastoral areas (Mariner and Roeder, 2003). The PDS programmes were established in Ethiopia, Kenya, Sudan, Uganda and Pakistan as well as the Somali ecosystem within the context of rinderpest programmes coordinated by the Food and Agriculture Organization (FAO) and the Inter-African Bureau for Animal Resources of the African Union (AU-IBAR). In Nigeria, PDS was established in 2009 under the programme tagged 'Early Detection, Reporting, Surveillance for Avian Influenza in Africa' (EDRSAIA) project of AU-IBAR. Participatory Disease Surveillance (PDS) relies on traditional livestock owner's knowledge of the clinical, gross pathological and epidemiological features of diseases that occur locally. The PDS approach has gained respect for its ability to understand disease patterns, identify effective intervention strategies and the verification of rinderpest eradication for the purpose of accreditation by the Office International des Epizooties (Mariner *et al.*, 2005).

Anzaku (2009) reported that PDS was introduced into Nigeria in 2008 and the results of a pilot study on the implementation of PE in the investigation of HPAI in selected villages in five states including the FCT in 2008 which was jointly organized and coordinated by EDRSAIA, ILRI and FGN indicated that PE can play a major role in determining diseases priorities, decision making and control/prevention/eradication options, greater interaction especially with rural farmers who showed willingness to cooperate in all Government disease control interventions and improvement in farmers' knowledge on various channels of disease reporting. Also, PE is logistically inexpensive, flexible, can lead to timely control of diseases, can be integrated into the existing Epidemio-surveillance systems of Nigeria (ESSN) and when combined with conventional medical and veterinary diagnoses can assist both professionals gain a better understanding of Veterinary/Public health issues and dynamics.

2.2 Participation Concept and Livestock Development

The role of people in developing society has been a feature of literature since Aristole analyzed Greek city-states in order to define those factors which contributed towards human happiness and good life' (Uphoff, 1985). In the late 1940s and 1950s, industrialised countries associated underdevelopment with lack of technology (Cohen and Uphoff, 1986). As such, in the early history of the provision of aid to poorer countries, development theory was based on a western perception of technology and resource gaps and the notion that poor people would become more developed by adopting new technologies. The implication of this was that majority of the people in poor countries played a passive role and had technological innovations delivered to them by a relatively small number of highly trained technicians or resource managers or compelled by Government to contribute to national resource flows

In the 1950s and 1960s, a community development approach was introduced and this was popularised by the United Nations as decolonisation spread in LDCs (Conway, 1987). This was linked to Government policy and was associated with five main principles:

1. Integrated development involving community plans and cooperation with all technical sectors;
2. Planning based on a community's felt needs' rather than those of technical experts
3. Emphasis of self-help efforts;
4. Concern for identifying and training local leadership
5. Technical assistance from industrialised nations

The first substantial review of the development of participatory approaches and methods and their potential applications in livestock development was conducted by Leyland (1991). This review

described the conceptual basis for community participation in livestock development in relation to conventional development activities and outlined PA tools for use in surveys and community-based livestock programmes. The ideas put forward in the review were applied in an animal health project in Daye Chopan district in South east Afghanistan from 1991 to 1992. This project was community-based and aimed to involve local people in analysis of problems and design of a service using basic veterinary workers.

A similar approach to service delivery was used soon afterwards in a large-scale animal health programme coordinated by UNICEF in Southern Sudan (Leyland, 1996). In the late 1990s, a number of NGOs in Kenya, Uganda, Ethiopia, Southern Sudan and Somalia use PA routinely in animal health project. These systems were designed to overcome some of the limitations of conventional survey and research methods in developing countries and ultimately, aimed to increase the involvement of local people in development activities from which they were supposed to benefit. Consequently, the advent and use of RRA and PRA has been closely associated with the concept of community participation. Although community participation has various meanings, the term usually convey some form of interaction between local people and outsiders in which the former play a role in identifying, implementing or even controlling development activities. To a large extent, PA originated from the social sciences and was characterized by interviewing and visualization tools which produced qualitative data in relatively short time-frames. Among the factors which influenced methodology development were dissatisfaction with participant observation studies and questionnaire surveys when used in remote rural areas. When using PA the aim was not to generate detailed information on specific topics, but rather to identify key issues and problems from the local perspective and consider what action needed to be taken to improve a

situation. Participatory appraisal methods were not fixed and could be adapted by researchers in the field according to what worked well and local systems of communication.

A degree of ignorance was acceptable and initially, statistical analysis of data was avoided. Despite the informality of PA it was soon widely used by development professionals in sectors such as human health, agriculture, education, water supply and natural resource management (Catley, 1999). In line with the flexible and adaptive philosophy behind PA, sector-specific modifications of participatory approaches and methods began to emerge with some workers combining PA with formal data collection methods and others adapting PA tools to produce quantitative data that are suitable for statistical analysis. The emergence of PA was influenced by a diverse group of experiences including field-level project implementation in various technical sectors, social science methods, agricultural research, ecological theory and systems analysis (Chambers, 1994). Prior to and during its development, PA was also influenced by wider social and political ideologies concerning issues of power, equity, social organization and poverty alleviation in institutions ranging from Non-Governmental Organizations (NGOs) to agencies such as the United Nations and World Bank. Consequently, development contexts and institutional aims and behaviour have been important in determining how and why methods such as PA have evolved (Biggs and Smith, 1998).

To a certain extent, the advent of PA was a response to unsuccessful development initiatives in less developed countries (LDCs) over more than two decades. The technology transfer development paradigm in the 1960s and 1970s did not deliver long- term benefits to poor rural people and the notion that western science per se could solve the problems of LDCs was found to be seriously flawed. Poor results in livestock development were one group of negative experiences which led to a reassessment of top-down technical approaches in LDCs and prompted discussion on alternative, more people-centred ways of working. Chambers (1983) noted a professional fixation among livestock workers with the promotion of exotic cattle in tropical countries in preference to research

on local breeds and other types of livestock. Other notable failures were attempts to develop animal-drawn wheeled tool carriers (Starkey, 1988) or improve pastoral production systems in dry land areas of Africa by the introduction of ranching schemes (Scones, 1994). By mid 1990s a diverse range of participatory approaches and methods have been developed by practitioners working in different technical sectors and operational contexts. The PA is premised on six principles:-a defined methodology and systemic learning process, multiple perspectives, group learning process, context specific, facilitating experts and stakeholders and leading to change. In animal health service delivery, most experience with PA methods probably resides with NGOs and particularly their field staff who interact on a day-to-day basis with livestock keepers. Generally, there is a growing and influential body of literature concerning participatory methods and approaches but accounts of their application in veterinary medicine are still relatively few.

2.3 Participatory Appraisal Methods

Participatory methods evolved mainly from social sciences, especially social and medical anthropology, and agro-ecosystem analysis. From social anthropology came various informal interviewing methods, such as group interviews and semi-structured interviews (SSIs). Rather than using structured, pre-set questions as in a questionnaire, a SSI was more like a guided conversation (Slim and Thomson, 1994; Pretty *et al*., 1995). With a mental note of the key research themes, the interviewer could phrase and rephrase questions, and follow-up interesting and unexpected responses. The use of open rather than closed questions was central to the method.

The successful use of PE requires attention to the attitude and communication skills of practitioners, plus the correct application of specific PE methods. It is increasingly being recognised that when using PE, the way we interact with the livestock rearing communities is more important than our

knowledge of methods. As such, the type of epidemiological information contributed by informants and action to be taken from PE is highly dependent on the relationship established between them and the practitioner. Participatory epidemiology utilizes the PRA toolkit of methods. These methods may be grouped as secondary sources, direct observation, interview techniques, visualization techniques and methods of ranking and scoring.

2.3.1 Secondary sources

Secondary sources refer to existing literature, reports, maps and databases on the communities and issues under study. All good PRA studies begin with an inventory of secondary sources and a review of these sources (Catley, 2006).

2.3.2 Direct observation

The techniques of direct observation refer to observing the environment and daily activities of livestock owners (Catley *et al*., 2002b). One of the simplest starting points is to get out and walk through the village, observe the condition of the people, livestock, housing and pasture. Note what plants are present. In the farmer's (pastoralists') settings, one may need to be present during production activities like milking and note who is carrying-out the tasks and how they are completed.

2.3.3 Semi-structured interviews

One of the main tools of participatory epidemiology is the semi-structured interview (SSI). In SSI, a checklist of subjects to be covered is used as a point of reference rather than a questionnaire (Catley, 2006). The interview team makes use of open-ended questions to allow participants the opportunity to introduce topics and issues. For example, after introductions, an opening question

might be “What are the problems with your livestock?” As the participants introduce topics, probing questions are asked to obtain more details and check information for internal consistency.

2.3.4 Visualisation techniques

Visualization methods, derived from approaches such as agro-ecosystem analysis recognize that certain types of information could not easily be expressed verbally or in writing (Conway, 1987). The visualisation techniques include approaches such as participatory mapping, Venn diagram, timelines and seasonal calendar construction. Mapping usually involves clearing an area of sand and sketching with sticks or using cardboard papers and indicating the relative location of key resource and strategies used by the community. This includes things such as grazing areas, cultivation areas, water sources (rivers, streams, boreholes, etc), livestock markets, veterinary clinics, woodlands, wildlife, and habitat of insect vectors of disease, neighbouring communities, trade routes, seasonal movements, and emergency movements. Using this approach, the appraisal team can very quickly obtain an overview of the area and the spatial distribution of key resources. In epidemiology, the spatial relationship between communities, their social relations and movement patterns go a long way towards determining livestock contact patterns and are key to understanding the epidemiology of infectious diseases. Timelines and seasonal calendars are very powerful tools for describing the temporal patterns of disease in a location. Proportional piling and some types of seasonal calendars use piles of counters (such as seeds or stones) and can thus result in numerical recordings. When standardized and repeated with individual informants or groups of informants, data can be summarized and analyzed using conventional statistical tests (Alders and Spradbrow, 2001; Catley *et al*., 2002a, 2002b; Barasa *et al*., 2008; Jost *et al*., 2010).

2.3.5 Ranking and scoring methods

Ranking and scoring refers to a group of techniques used to prioritise information or provide semi-quantitative estimates of the relative size or impact of categories as perceived by the participants (Catley, 2006). This usually requires informants to compare different variables using either ranks or scores. Typically, piles of counters such as seeds or stones are used for ranking and scoring, and as in interviewing and visualization methods, illiterate informants could participate. Scoring methods are more sensitive than ranking, allowing a weighting of responses. In ranking, the respondents are asked to place items in their order of priority. For example, if five diseases have been mentioned as problems, the interviewer requests that they be listed in order of importance. A more systematic alternative is pair-wise ranking where the respondents are asked to identify which is the more important disease of each possible combination of two diseases from the list. Proportional piling is very flexible technique in which respondents are asked to divide 100 objects such as seeds or stones into piles of sizes representing the relative size or importance of different categories. The number of objects in each pile is then counted to give a score. These exercises can be repeated in subsequent interviews and the results analysed.

2.4 Existing Veterinary Knowledge

An integral feature of the development of participatory approaches and methods has been the acknowledgement of local knowledge systems, often termed existing veterinary knowledge (EVK) or rural people's knowledge. Participatory appraisal has facilitated this process by assisting local analysis of animal health problems, existing services and resources and opportunities for improving services. It was noted that local technical knowledge was intrinsically linked to other types of knowledge, social norms and behaviour. However Martin (1996), in a study seemed not to

recognize that rural people's knowledge and PA approaches and methods are inseparable from evolutionary perspective when he investigated the role of PA methods in ethnoveterinary medicine.

Participatory appraisal methods have been used in various combinations with conventional methods in veterinary research. Sonaiya (1992) used RRA and a questionnaire to study poultry problems in Nigeria and Nurhadi and Harlion (1994) conducted an economic assessment of losses of Malignant Catarrhal Fever (MCF) in Indonseia using abattoir survey followed by RRA. In South Africa, PA methods were used as a component of methodology termed 'Veterinary Needs Analysis' to assess community health requirements using conventional questionnaire and RRA (McCrindle *et al*., 1996). Finally, PA methods have been used in diverse situations by veterinarians and livestock workers, including: Community-based disease control programmes (e.g Global rinderpest eradication programme (GREP) in East Africa) and scientific research).

CHAPTER THREE:

MATERIALS AND METHODS

3.1 Study Area

The study was carried out in four Area Councils of the FCT, Abuja-Nigeria. The territory was formed in 1976 and is bordered to the West and North by Niger State, North-east by Kaduna State, Nasarawa State in the East and South East and Kogi State to the South-West. It lies between latitude 8 25' and 9 20'N, and Longitude 6 45' and 7 39'E. It has an approximate land mass of 7,315 km^2 and is situated on the Northern Guinea Savannah zone with moderate climatic conditions with a population of 1,405,201 people (according to NPC, 2006). According to the records of the Nigerian poultry population, there is a total of 3,812,288 poultry in FCT out of which 84% (3,465,000) are local and 16% (347,288) are exotic (FDLPCS, 2003). The territory is made up of six Area Councils namely: Abuja Municipal, Kuje, Gwagwalada, Bwari, Kwali and Abaji (NPC, 2006).

The FCT experiences three weather conditions annually. These include a warm humid rainy season and a blistering dry season. In between the two seasons, there is a brief interlude of harmattan occasioned by the North East Trade Wind, with the main feature of dust haze, intensified coldness and dryness. The rainy season begins from April and ends in October, when daytime temperatures reach 28-30^oC and night time lows hover around 22-23^oC. In the dry season, daytime temperatures can dip to 12^oC, resulting in chilly evenings. Even the chilliest nights can be followed by daytime temperatures well above 30^oC (NIMET, 2010). The high altitudes and undulating terrain of the FCT act as moderating influence on the weather of the territory. Rainfall in the FCT reflects the territory's location on the windward side of the Jos Plateau and the zone of rising air masses. The annual total rainfall is in the range of 1100 mm to 1600 mm (NIMET, 2010).

The area now designated the FCT falls within the savannah zone vegetation of the West African sub-region. Patches of rain forest, however, occur in the Gwagwa plains, especially in the gullied train to the south and the rugged south-eastern parts of the territory. These areas of the FCT form one of the surviving occurrences of the mature forest vegetation in Nigeria. The dominant vegetation of the territory is, however, classified into three savannah types.

The following veterinary infrastructures are available in the FCT-Bwari: has two abattoirs at Kubwa and Deidei, twelve veterinary clinics (1 Government and 11 private); Gwagwalada: one abattoir and eleven veterinary clinics/drug shops; Kuje: five veterinary clinics/drug shops; Abuja Municipal: one abattoir, one Government veterinary clinic and eleven private veterinary clinics; Abaji: one abattoir.

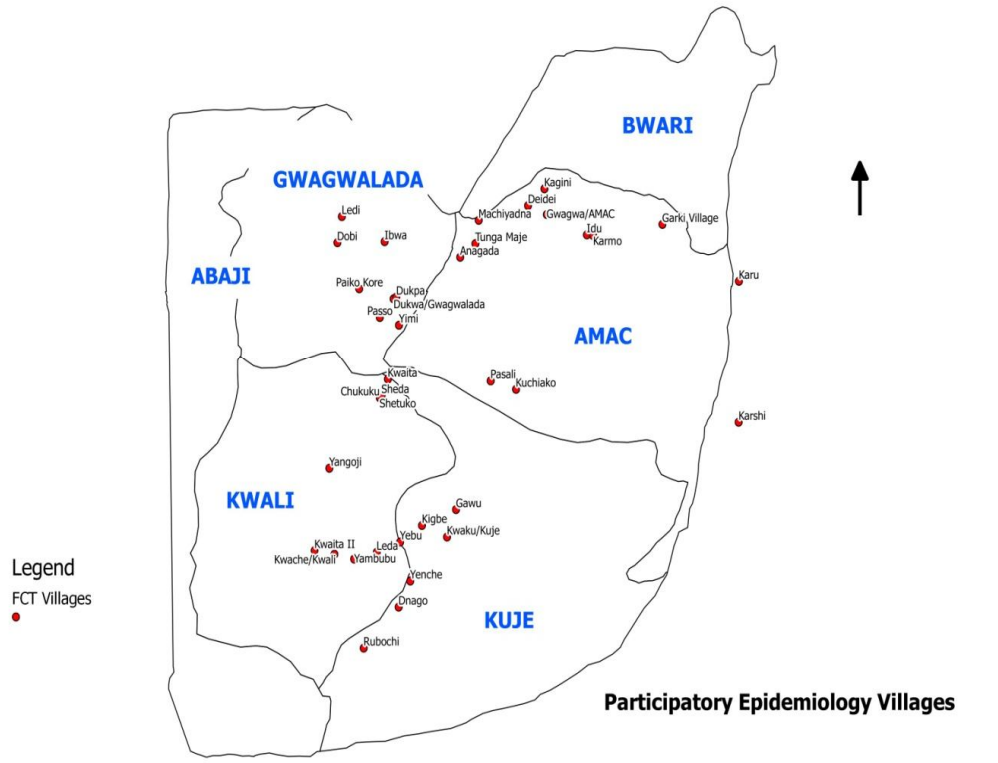


Figure I: Map of Federal Capital Territory showing Area Councils and Geographic positioning systems coordinates of villages where the study was carried out (QGIS 1.6 Software)

3.2. Study Population

The study population for PE and information on management and production constraints comprised of rural farmers and villages purposively selected in consultation with the veterinary staff of area councils to include those that are at least 3 km from the municipality, far away from major roads/highways or have livestock markets. Commercial poultry farmers were excluded from participation while farmers who had exotic breeds managed under extensive conditions with local chickens were included.

For serology, the study population consisted mostly of free ranging (extensively managed) family poultry that have the possibility to mix with other birds and animals. Each village was considered as one epidemiological unit assuming that the chickens in each village were kept as free ranging and had the possibility to mix with other poultry species and livestock. Commercial farmers and poultry were excluded from participation while farmers who had exotic breeds managed under extensive conditions with local chickens were included.

3.3. Study Design

A cross sectional study was carried out using participatory epidemiological approach for data collection, semi-structured interviews, simple ranking, proportional piling for livestock population, morbidity and mortality, matrix scoring, mapping, seasonal calendar and transect walk. A checklist and structured questionnaire were used to assess knowledge of common poultry diseases with emphasis on ND, associated risk factors, clinical presentations, treatment seeking and appropriate risk communication channels (Catley, 2005). Focus group discussions with participants were held at either primary schools, town halls or village squares and information was also

obtained from key informants (e.g village heads, livestock/veterinary staff). Global Positioning System (GPS) was used to obtain the coordinates of all the villages visited.

3.4 Data Collection

3.3.1 Participatory epidemiology

3.3.1.1*: Preparation*

Background data on the different communities were collected from secondary sources: Agriculture and Rural Development Secretariat (FCTA), Department of Agriculture of the respective area councils, Avian Influenza Desk Officer (FCT) and key informants. Initial sensitization visits were undertaken to the communities where strategies for the interview were discussed and agreed including date, time and place for the interviews. Also, a checklist (not questionnaire) as in appendix 2 which was developed and pretested in three villages was carried along for each of the village visited and was modified as the situation in each village warranted.

3.3.1.2 *Selection of participatory epidemiology participants*

The participatory epidemiological studies consisted of focal group discussions with rural livestock farmers, for which villages were the unit of analysis, and key informant interviews. The focal group discussions took place in the 40 villages which consisted of between 10 and 25 people, comprising, men, women and youths, all of whom were predominantly ethnically Gbagyi, Gede and Hausa. Livestock production system and socio-economic conditions were similar in the four Area Councils. The focal group participants relied primarily on crop cultivation for their livelihoods, supplemented with livestock rearing.

During the focal group discussions, a variety of participatory epidemiological tools, previously described in the literature were utilized to encourage participation of each member in the groups

(Catley, 2005, 2006; Mariner and Paskin, 2003). As a matter of fact and in view of the fact that it was farming period, not all tools were applied in every village. However, these PE tools used which were earlier pretested were complimented by direct observation of the livestock/poultry and their environment.

3.3.1.3 *Semi-structured interviews*

Semi structured interviews (SSI) were employed at every stage of PA methods as previously described (Catley, 1999). The SSIs were used to gain some insights into the local perception of major poultry diseases in general and ND in particular. The informants were asked to name the five most important poultry diseases that affect the productivity and health of their local chickens and where ND featured in the list, further questions were asked on the clinical signs, period of occurrence, treatment and control of ND (Catley *et al*., 2002b). Forty informant groups comprised of between 10 and 25 persons per group were used for the exercises.

During the SSIs, other general information collected from the livestock owners included types of livestock kept, use of livestock and poultry diseases encountered. Interviews were conducted using English and interpreted in the language of the community as appropriate.

3.3.1.4 *Pair-wise ranking*

The pair-wise comparison method was used to generate disease indicators/signs of the five most important poultry diseases obtained through SSIs and these were written on separate cards (Catley *et al*., 2002b). The respondent was then asked to compare the diseases in pairs in order to obtain the disease signs as well as their differences and this was then related to modern veterinary thinking. The method was conducted on 40 groups comprising 10-25 persons per group.

3.3.1.5 *Proportional piling*

This tool was used to rank livestock species by numbers, important poultry diseases and clinical signs using the method described in the literature (Catley, 2006). For this, participants first listed the livestock species kept. A circle was drawn on the cardboard representing each species. Participants allocated 100 counters (beans) to the circles according to the relative numbers of each species. The exercise was then repeated, except this time participants were asked to allocate the counters in proportion to the important poultry diseases and clinical signs.

3.3.1.6 *Relative annual incidence of Newcastle disease*

The relative annual incidence of ND was assessed using two methods adapted from the method described in the literature (Catley, 2005, 2006). First, participants were asked to list all the diseases that had affected chickens in the past year (April, 2011 to March, 2012). Discussions were then initiated on the clinical signs of ND, as well as its incidence relative to other diseases. Participants were then asked to focus on one ND outbreak and to divide the individual piles of counters previously used to rank the livestock species by numbers into two sub-groups: those that developed ND and those that did not. For those that had ND, the counters were further subdivided into the proportion that died and the proportion that recovered. This method provided an estimate of the incidence of ND, as well as estimate of the outbreak case fatality rate.

To assess the relative incidence of ND compared to that of other poultry diseases, participants were asked to consider each disease in turn. Taking 100 counters, they were asked to allocate these into two groups (sick and healthy categories); the proportion that got sick in the past one year (between April, 2011 and March, 2012), and the proportion that remained healthy. For the counters allocated to the 'got sick' category, participants next subdivided the counters amongst the various diseases

that they had listed earlier. For each disease, the counters were finally subdivided in proportion to those animals that survived and those that died.

3.3.1.7 *Perceived association between diseases and clinical signs and risk factors*

Informal interviews with farmers and pair wise ranking were used to identify five most important poultry diseases to be used in the matrix scoring along with ND (local names-*Apesiguma* or *Apesiyusan* (Gbagyi)', *Ciwon murar* kaji (Hausa), using the proportional piling technique (Catley, 2006). The five poultry diseases were ND, coccidiosis (*zawo da jinni)*, fowl pox (*kurajen kaji)*, fowl typhoid (*zawo da ruwa ganye*) and ectoparasitism (*kwarkwatan kaji*).

3.3.1.8 *Identification and scoring of livestock species by number and the prevalence of poultry diseases in terms of frequency, morbidity/mortality and impact*

The participants were asked at the beginning of the interviews to give a list of livestock species kept in the village and score them based on number and importance to the family using:

(i) **Ranking technique**: The facilitator recited the list of animals kept, poultry problems and then asked the participants which is the most important, second most important, etc. The result of each count was announced to the hearing of participants and their agreement with the results obtained.

(ii) Proportional piling: The respondents were then asked to pile one hundred beans in proportion to the problems- morbidity, mortality and prevalence. The appraisal team then counts the number of beans placed on the symbol for each problem/item. In some cases where necessary, pictures, charts and banners for the identification of different livestock and/or diseases were used.

3.3.1.9 *Ranking of poultry diseases and clinical signs using disease matrix scoring*

The matrix is a two dimensional grid that was used to rank poultry diseases and their associated clinical signs. The participants were asked to list the important and common poultry diseases and their respective clinical signs. A matrix was then drawn on the card board paper with poultry diseases being put as titles along the top and the clinical signs as titles along the left side of the matrix. The five diseases identified through SSI were placed on top x-axis (horizontal axis) of the matrix drawn on a cardboard paper and their signs (indicators) illustrated along the Y-axis. The informant groups were asked to score the signs one by one using a total of 30 seeds (beans) for each clinical sign with the most important clinical sign getting the highest proportion of beans and the results triangulated. This exercise was conducted on 40 groups of key informants comprising 10-25 persons per group.

3.3.1.10 *Determination of seasonal distribution of Newcastle disease*

The onset of ND in poultry in the particular area was probed through open ended questions to the farmers or key informants during the meetings/interviews. Participants were asked to name the months in order and thereafter asked to indicate the relative rainfall during different months by dividing the line into different seasons and discussing the severity of the problem at each season. The relative significance of the problem at different seasons was indicated along the line using ranking tools. This activity was carried out in twenty villages of the four area councils.

3.3.1.11 *Participatory mapping*

Participatory mapping is a tool for collecting spatial data of a community and was used to identify natural resources and infrastructures such as streams/rivers, livestock markets, village wells, veterinary clinics, adjourning villages, forests, etc (Lelo *et al*., 1995). Respondents were asked to

indicate the locations and describe the sequence of events, which reflects how diseases spread in communities and population. The maps were sketched on a large sheet of paper.

3.3.1.12 *Transect walk*

Information of a representative cross-section of each village was obtained by walking in a straight line (or as straight as possible) right across the area. A key informant and/or livestock keeper always accompanied the appraisal team on the transect walk where the team directly observed and noted production systems and community life. Also, the key informant or livestock keeper was interviewed informally as we undertook the walk.

3.3.2 Serology

3.3.3.1 *Sampling frame and sample size determination*

The sampling frame consisted of a list of area councils and village areas obtained from the Agriculture and Rural Development Secretariat, FCT. The villages were selected purposively based on the presence of livestock markets, or villages that have had previous reports of ND outbreaks. Also, risk factors were identified based on the retrospective data obtained from the FCT Avian Influenza Control Project Desk Officer and Area Councils. According to FDLPCS (2003), there are about 3,465,000 local chickens in FCT and 400 chickens were thus sampled.

3.3.2.2 *Collection of samples*

Two millilitres of blood were collected from the chickens through the brachial vein using 21 gauge needle and 5 ml syringe after carefully observing asepsis to avoid contamination of the blood. The blood was allowed to clot in a cool place to allow the serum to separate. The serum was then decanted into another tube, stored in the refrigerator at -4^{o}C and transported to the Viral Zoonoses

Laboratory of the Department of Veterinary Public Health and Preventive Medicine, Faculty of Veterinary Medicine, A.B.U Zaria for haemaglutination inhibition tests to detect antibodies to ND virus.

3.3.2.3 *Preparation of chicken red blood cell suspension*

A total of 5 ml of chicken blood was collected aseptically in a disposable syringe containing 1 ml of sodium citrate (4% solution) as anticoagulant. The blood was centrifuged at 1,500 rpm for 15 minutes and the plasma and buffy coat were removed with a pipette. After washing three times with phosphate buffered saline (PBS), 1% suspension in PBS was prepared for HI test.

3.3.2.4 *Haemagglutination inhibition test*

Sera collected from rural chickens were tested for NDV specific antibody by the haemagglutination inhibition test (HI) as described by Allan and Gough (1974) and done according to the procedure of OIE (2002). The HI test was performed using beta technique (constant virus and varying serum) against 4 HA units of the virus computed from the HI titration. Two fold serial dilution of 25 µl serum was made with phosphate buffer saline (PBS) in V-bottomed microtitre plates up to 10th well. Twenty five microlitres of 4 haemagglutinating (HA) units of NDV virus or antigen (La Sota) was added up to 11^{th} well. The plates were kept at room temperature for more than 30 minutes to facilitate antigen-antibody reaction. Then 50 µl of 1% (v/v) chicken RBC suspension was added to each well. The 11^{th} well contains antigen and RBCs as the positive control and the 12^{th} well contains only RBCs as the negative control. After gentle mixing, the RBCs were allowed to settle at room temperature for 40 minutes and agglutination was assessed by tilting the plates. The samples showing peculiar central button shaped settling of RBCs were recorded as positive and maximum dilution of each sample causing haemagglutination inhibition was considered as the end point,

which was used to estimate the HI titre. The HI titre of each serum sample was expressed as reciprocal of the serum dilution and most conveniently expressed as the logarithm to the base 2.

The HI test is based on the principle that the haemagglutinin on the viral envelope can bring about the agglutination of chicken red blood cells and that this can be inhibited by specific antibodies. In the absence of any antibody against the virus, haemagglutination occurs, appearing as a diffuse red colour at the bottom of the well. In the wells where the antibody against the virus is of a sufficient level, haemagglutination is inhibited and the red blood cells sediment and appear as a small pellet at the bottom of the well (OIE, 2002). The presence or absence of agglutination is accurately assessed by tilting the plates. Only those wells in which the RBCs stream at the same rate as the control wells (containing RBCs and PBS only) should be considered to show inhibition (OIE, 2002).

3.3.3 Local chickens production and management constraints

Information on husbandry and biosecurity practices was obtained using a structured questionnaire that was pretested (Appendix 1).

3.5 Data Analysis

The PE data that was obtained was entered into and stored in Microsoft Excel 2000 and thereafter exported to SPSS 2002 version 16.0 where descriptive analyses were carried out. Agreement between the informant groups on the results obtained was assessed using Kendall's coefficient of concordance (W) (SPSS, 2002). This non-parametric test measures the association between sets of ranks assigned to objects by judges (or groups of judges) and computes a W value between 0 and 1. A high or significant W value (nearer to 1) means that the judges are ranking the objects using a similar standard. The test is particularly useful for determining inter-judge reliability (Seigel and Castellan, 1994; Mochabo *et al.,* 2004). Agreement was termed weak, moderate and good if W-

values were less than 0.26, between 0.26 and 0.38 ($p < 0.05$) and greater than 0.38 ($p < 0.01$ to 0.001) respectively (Seigal and Castellan, 1994).

Results obtained from HI test were subjected~~Chi-square (X^2) was calculated to compare if there was any significant difference in the d~~ to descriptive statistics to determine the frequency and distribution of NDV antibody titre ~~of~~ in the four area councils~~(P<0.05)~~. Also, information obtained from the structured questionnaire were entered into SPSS (16.0) and subjected to descriptive statistics to find out the frequency of most of the variables

CHAPTER FOUR:

RESULTS

4.1 Participatory Epidemiology

4.1.1 Characteristics of study areas

All of the inhabitants of the visited villages consisted mostly of the natives (Gbagyi, Gede, Hausa) who are predominantly farmers and non-natives (Ibo, Eggon, Yoruba) who engage mostly in business activities. The livestock production system and socioeconomic conditions of these inhabitants are similar as most of them engage in farming supplemented by livestock rearing.

Information obtained from focus group discussions (FGDs) and SSIs revealed that several traditional remedies exist for the treatment of ND though with varying degrees of success. These include the use of grounded 'red pepper' called *barkono* in Hausa (*Capsicum frutenscens*), *gauta kaji* in Hausa (*Solanum nodiflorum).* In addition to the traditional remedies, oxytetracycline capsules were administered in drinking water. Also, ND outbreaks occur mostly during the dry months of October-March and initial outbreaks in some communities were attributed to the consumption of fresh guinea corn that is yet to be harvested. There is very limited to non-availability of veterinary (public and private) services in these communities.

4.1.2 Relative population of livestock species

Poultry constitute the largest proportion/population of livestock species kept in the study area as shown in Tables 4.1 and 4.2. This is followed by sheep and goats, cattle, others (dogs and fish) and pigs. Kendall's Coefficient of Concordance (W) among the 40 informant groups was 0.91 indicating a good agreement amongst them on this ranking.

Table 4.1: Median scores (95% CI) of the relative populations of the livestock species kept in the Federal Capital Territory, Nigeria as determined through proportional piling.

S/N	Area Council	Relative livestock Population				
		Poultry	Sheep/Goats	Cattle	Pigs	Others[a]
1.	Kwali	55 (52-58)	39 (3-40)	3 (2-5)	1 (0-1)	2 (2-3)
2.	Municipal	60 (58-66)	32 (28-35)	3.5 (3-5)	0.5 (0-2)	2.5 (2-3)
3.	Gwagwalada	60.5 (58-65)	34 (30-37)	3 (2-3)	0.5 (0-1)	2 (2-3)
4.	Kuje	55.5 (53-59)	38.5 (37-40)	3.5 (2-5)	2 (1-2)	2.5 (1-3)
	Mean	57.5	35.9	3.3	1.0	2.3

a- Other livestock species mentioned by respondents were dogs, fish

Table 4.2: Mean proportions (%) of the livestock species kept in the Federal Capital Territory, Nigeria as determined through proportional piling exercise.

Livestock Species	Kwali	Municipal	Gwagwalada	Kuje
	Mean proportion±SD			
Poultry	54.7±3.44	61.3±5.16	60.7±3.71	55.6±3.49
Sheep/Goats	38.7±5.01	31.5±5.04	34.0±4.00	37.5±2.88
Cattle	3.1±1.60	3.5±1.90	2.5±1.35	3.2±1.62
Pigs	0.9±0.74	0.9±1.10	0.5±0.53	1.5±0.71
Others	2.6±1.43	2.8±1.75	2.3±0.95	2.2±1.14

SD: Standard deviation

4.1.3 Important poultry diseases

From the result of proportional piling (Table 4.3), the most important poultry disease was ND with mean score of 67.6%, followed by fowl typhoid (18.8%), coccidiosis (8.8%), ectoparasitism (2.5%) and fowl pox (2.1%). Also, Pair wise ranking and SSIs indicated that ND ranked first among the poultry diseases with a mean rank of 5.0 followed by coccidiosis (3.62), fowl typhoid (3.28), fowl pox (1.82) and ectoparasitism (1.28). The level of agreement (W) on the pair wise ranking between the twenty informant groups was good (0.887) (Table 4.4).

4.1.4 Clinical signs of major poultry diseases

The most important clinical signs of the five important poultry diseases as shown in Table 4.5 were high mortality, greenish diarrhoea, bloody diarrhoea, nervous signs/incoordination and dyspnoea. There was good agreement between the 40 informant groups on all the clinical signs observed as W-values obtained varied between 0.51 and 0.90. Through SSIs, additional clinical signs enumerated by respondents of ND were ruffled feathers, loss of appetite, loss of weight, nasal and oral discharges and swollen eyes.

4.1.5 Relative annual morbidity and case fatality of Newcastle Disease

The result of relative morbidity and case fatality rates of ND explored through proportional piling to ascertain the perceived morbidity and mortality associated with the disease as in table 4.6 indicates relative mean annual morbidity and case fatality rates for Kwali, AMAC, Gwagwalada and Kuje as 68.8% & 75.93%, 66.4% & 73.01, 77.6% & 82.75% and 74.0% & 77.46% respectively. Also, the overall mean morbidity and case fatality rates of ND in the study area were 71.7% and 77.29%, respectively.

Table 4.3: Ranking of the important diseases of poultry in the Federal Capital Territory, Nigeria as mentioned by respondents based on proportional piling (Median scores and 95% CI).

Area Council	Number of villages[a]	Median scores of diseases[b]				
		Newcastle Disease	Coccidiosis	Fowl typhoid	Fowl pox	Ectoparasitism
Kwali	10	69 (65-72)	8 (6-10)	18.5 (15-20)	2.5(1-5)	2 (2-2)
Municipal	10	67 (64-71)	8 (5-11)	20 (18-21)	2.5 (1-3)	2 (0-3)
Gwagwalada	10	65 (60-68)	11.5 (10-13)	21 (19-22)	1.5 (0-2)	3 (2-5)
Kuje	10	72.5 69-4)	6.5 (5-8)	18 (17-19)	1 (1-2)	1.5 (1-4)
Overall median		68.5(65-1)	8 (7-10)	19 (18-21)	1 (1-2)	2 (2-3)
Overall mean (%)		67.6	8.8	18.8	2.1	2.5

[a]Number of informant groups/Area Council = 10

[b]The figures represent median scores. The minimum and maximum are shown in parentheses

Table 4.4: Pair-wise ranking of important poultry diseases (Kendall's W test) among informant groups in the Federal Capital Territory.

Disease	Ranks		Test statistics
	Mean rank		
Newcastle disease	5.0	N	20
Coccidiosis	3.62	Kendall's	0.887
Fowl typhoid	3.28	Chi Square	70.935
Ectoparasitism	1.28	Df	4
Fowl pox	1.82	Asymp.sig.	0.000

Table 4.5: Summarized matrix scores of major poultry diseases versus the clinical signs as reported by rural poultry farmers in the Federal Capital Territory, Nigeria.

Clinical signs	**Disease**[b]				
	Newcastle disease	Coccidiosis	Fowl typhoid	Fowl pox	Ectoparasitism
High mortality (W=0.83***)	23 (20-28)	2 (0-7)	1 (0-2)	4 (0-6)	0.5 (0-3)
Greenish diarrhoea (W=0.90***)	19 (13-25)	10 (2-17)	0 (0-8)	0 (0-0)	0 (0-2)
Dyspnoea (W=0.83***)	26 (20-28)	0 (0-1)	3 (0-6)	0 (0-0)	2 (0-5)
Nervous signs (W=0.51**)	30 (28-30)	0 (0-0)	0 (0-0)	0 (0-0)	0 (0-2)
Bloody diarrhoea (W=0.54**)	0 (0-3)	0 (0-2)	0 (0-2)	28 (26-30)	0 (0-2)

Number of informant groups = 40; *W*: Kendall's Coefficient of Concordance (* p<0 .05; **p< 0.01; ***p<0 .001).

[b]The figures represent median scores. The minimum and maximum are shown in parentheses

Table 4.6: Mean relative morbidity and case fatality rates due to Newcastle disease in local chickens as reported by respondents in four Area Councils of the Federal Capital Territory, Nigeria.

Area Council	Number of villages	Morbidity (%)±SD	Case fatality (%)±SD
Kwali	5	68.8±7.362	75.9±7.969
Municipal	5	66.4±8.735	73.01±3.224
Gwagwalada	5	77.6±5.683	82.75±8.578
Kuje	5	74.0±8.246	77.46±7.999
Mean		71.7±7.51	77.46±7.999

n: number of villages involved in the proportional piling exercise

SD: Standard deviation

4.1.6 Seasonal distribution of poultry diseases

A summarized seasonal calendar for poultry diseases against three local seasons is shown in Table 4.7. Results indicate that ND is most prevalent during the dry season, followed by the harmattan season with only few cases during the rainy season. The other diseases are most prevalent during the rainy season but occur all year round. The Kendall's coefficients of concordance (W) indicate that there was moderate agreement among the informant groups on scoring of seasons for ectoparasitism and good for fowl pox, fowl typhoid, coccidiosis and ND with values of 0.63, 0.87, 0.77 and 0.4 respectively.

4.1.7 Participatory mapping

Twelve maps were sketched on card board papers by 12 informant groups. The maps show natural features such as streams, village wells, fadama and markets.

Table 4.7: Seasonal calendar of the important diseases of poultry in the Federal Capital Territory as mentioned by respondents based on proportional piling (Median scores and 95% CI).

	Season[b]		
	Dry (Oct-Dec)	Harmattan (Jan-March)	Rainy (Apr-Sept)
		Median score	
Newcastle disease W=0.84***	16 (12-23)	12 (6-16)	2 (0-4)
Coccidiosis W=0.77***	4 (0-9)	5 (2-9)	19.5 (15-28)
Fowl typhoid W=0.87***	6 (0-8)	6 (0-11)	21 (13-28)
Fowl pox W=0.63**	7 (3-10)	8 (0-12)	15 (8-27)
Ectoparasitism W=0.50**	7.5 (2-10)	9.5 (6-19)	13.5 (2-22)

[a]Number of informant groups=20; *W*: Kendall's Coefficient of Concordance (* p <0 05; **p < 0.01; ***p<0 .001).

[b]The figures represent median scores. The minimum and maximum are shown in parentheses

4.2 Serology

Among the positive serum samples, 85 (21.25%) had titres between $1/_{16}$ and $1/_{128;}$ 51 (13.5%) had titres between $^{1}/_{256}$ and$^{1}/_{1024}$ and 92 (23%) had titres $\geq^{1}/_{2048}$ (Table 4.8). The overall ND seroprevalence as indicated in table 4.9 was 57% while prevalence in the four area councils were: Municipal (37%), Kuje (44%), Gwagwalada (79%) and Kwali (68%).

4.8: Newcastle disease antibody titre levels in sera collected from local chickens in the Federal Capital Territory, Nigeria

Area Council	≤1:2	1:4	1:8	1:16	1:32	1:64	1:128	1:256	1:512	1:1024	1:2048	Total
Gwagwalada	21	0	0	5	5	13	6	7	4	4	35	100
Municipal	54	4	5	5	2	4	2	6	4	3	11	100
Kwali	29	1	2	13	4	8	5	5	3	2	28	100
Kuje	53	1	2	4	4	2	3	3	5	5	18	100
Total	157	6	9	27	15	27	6	21	16	14	92	100
%	39.25	1.5	2.25	6.75	3.75	6.75	4	5.25	4	3.5	23	100

Table 4.9: Summarized Newcastle disease titre levels in the four Area Councils of the Federal Capital Territory, Nigeria.

Area council	Antibody titre	
	<1:16 (%)	≥1:16 (%)
Gwagwalada	21 (21)	79 (79)
Municipal	63 (63)	37 (37)
Kwali	32 (32)	68 (68)
Kuje	56 (56)	44 (44)
Total	**172 (43)**	**228 (57)**

4.3 Local Chickens Production and Management Constraints

The response rate to the questionnaires was 100% comprising farmers from the forty villages. About 55.5% of the respondents were females and 44.5% were males. Also, 23.5% of the respondents were housewives who were also farmers, 43.25% were full-time farmers, 8.5% were students, 8.25% were civil servants, 14.25% engaged in business/trading and a majority (44%) have up to primary education (Table 4.10). The respondents (22.5%) allowed only scavenging for their chickens while 69.75% provided supplementary feeds of guinea corn, millet, maize and ground nuts (Table 4.11*).* The most common poultry disease is ND (66.25%) as shown in table 4.12 occurring mostly in the periods of October to December (57.25%) and January to March (32.75%) as in table 4.13. During an outbreak of ND, infected birds exhibit the following major clinical signs high mortality (31.75%), distressed breathing/dyspnoea (18.0%) and diarrhoea (10.25%) (Table 4.13).

When there is an outbreak of a disease among village chickens, the farmers either intervene by slaughtering (9.25%), selling (1.5%) or they do not intervene at all (7.75%) but most (55%) employed local (ethnoveterinary therapy) management to sick birds (Table 4.14). Also, veterinary services were unavailable to 58% of the respondents as indicated in Table 4.15 and 36.5% of the available veterinary services were provided by the private sector (Table 4.16). The major methods of disposal of dead birds were refuse dump (48.75%) and dug pit (38.25%) as shown in Table 4.17 and the frequencies of cleaning/disinfection of poultry houses where available by respondents were weekly cleaning (46%), monthly (22%) and 24.5% did no cleaning at all (Table 4.18).

This study showed that local chickens constituted constitute 77% of poultry kept (Table 4.19) and the major sources of breeding stock as indicated in table 4.20 were open market (34.5%), trader (27.5%)

and combination of open market, trader and self breeding (14.75%). Also, 43.5% of farmers housed their chickens in the night and allowed them roam freely in the day while 39.5% provided no housing as shown in table 4.21; sources of drinking water for the chickens as in table 4.22 shows village well accounted for 23.5%, individual wells (28.75%) and rivers/streams (30.25%). Local chickens were raised mostly for sales (51.75%), 36.25% for both sales and consumption, ceremonies (3.5%) and consumption only (3.5%) as in table 4.23. The respondents predominantly sell their birds at weekly markets/poultry trader (33.75%), permanent market (21.75%), weekly market (24.75%) and individual poultry trader (15%) as indicated in table 4.24.

Table 4.10: Distribution of rural poultry farmers by gender, occupation and educational status of four Area Councils of the Federal Capital Territory, Nigeria.

Factor	Frequency (n-400)	(%)
Gender		
Male	222	55.5
Female	178	44.5
Occupation		
Full time farmer	173	43.5
Business/Trading	57	14.25
Civil servant	33	8.25
Student	34	8.5
House wife	94	23.5
Others	9	2.25
Educational status		
Primary	176	44
Secondary	87	21.75
Tertiary	45	11.25
Others	19	4.75
None	73	18.25

5.5

Table 4.11: Percentage of rural poultry farmers providing different kinds of feed supplementation for local chickens as reported by respondents in the Federal Capital Territory, Nigeria.

Type of feed	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada	23	5.75
Commercial feed	18	1	2	2		
Scavenge only	18	35	20	17	90	22.5
Scavenge with supplementation	58	64	78	79	279	69.75
Commercial feed and scavenge	6	0	0	1	7	1.75
All	0	0	0	1	1	0.25
Total	**100**	**100**	**100**	**100**	**400**	**100**

Legend:

G/lada: Gwagwalada

Table 4.12: Common poultry diseases of local chickens as reported by respondents in the Federal Capital Territory, Nigeria.

Diseases	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada		
Newcastle disease	58	76	79	52	265	66.25
Fowl pox	1	0	3	1	5	1.25
Coccidiosis	2	0	0	0	2	0.50
ND, FP, IBD and coccidiosis	8	11	12	23	54	13.50
ND, IBD and Fowl typhoid	11	3	2	6	22	5.50
All diseases	20	10	4	18	52	13.0
Total	**100**	**100**	**100**	**100**	**400**	**100**

ND: Newcastle disease

IBD: Infectious bursal disease ; FP: Fowl pox

G/lada: Gwagwalada

Table 4.13: Percentages of the common clinical signs of Newcastle disease in local chickens as reported by respondents in the Federal Capital Territory, Nigeria.

Clinical signs	Number of respondents				Total	
	Municipal	Kuje	Kwali	G/Lada		%
High mortality	25	2	63	11	127	31.75
Dyspnoea only	10	7	14	41	72	18.00
Nervous signs only	3	0	9	0	12	3.00
Diarrhoea only	13	3	13	12	41	10.25
Ruffled feathers only	3	1	1	3	8	2.00
Mortality, dyspnoea and diarrhoea	18	12	0	12	42	10.50
Dyspnoea and diarrhoea	16	15	0	8	39	9.75
Dyspnoea and nervous signs	3	1	0	3	7	1.75
All signs	9	33	0	10	52	13.00
Total	**100**	**100**	**100**	**100**	**400**	**100**

Table 4.14: Season of occurrence of Newcastle disease as reported by respondents in the Federal Capital Territory, Nigeria.

Season	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada		
January-March	39	20	43	29	131	32.75
April-June	9	1	4	2	16	4.00
July-Sept	8	9	0	7	24	6.00
Oct-Dec	44	70	53	62	229	57.25
Total	**100**	**100**	**100**	**100**	**400**	**100**

Table 4.15: Methods of handling sick local chickens as reported by respondents in the Federal Capital Territory, Nigeria, 2012

Methods of handling sick chickens	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada	106	
Veterinary treatment	29	10	16	51		26.50
Local treatment	40	65	75	40	220	55.00
Slaughter	15	8	7	7	37	9.25
Nothing	12	16	1	2	31	7.75
Sale	4	1	1	0	6	1.50
Total	**100**	**100**	**100**	**100**	**400**	**100**

Table 4.16: Percentage of available veterinary services as reported by respondents in the Federal Capital Territory, Nigeria

Availability and type of veterinary services	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada		
Available					168	
Yes	53	20	20	75	232	42.00
No	47	80	80	25		58.00
Type						
Public	7	1	0	11	19	4.75
Private	47	21	20	58	146	36.50
Not available	46	78	80	31	235	58.75
Total	**100**	**100**	**100**	**100**	**400**	**100**

Table 4.17: Methods of disposal of dead birds as reported by respondents in the Federal Capital Territory, Nigeria.

Method of disposal of dead birds	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada		
Refuse dump only	31	71	47	34	183	45.75
Dug pit only	50	23	33	47	153	38.75
Burial only	10	1	17	11	39	9.75
Burning	9	2	3	8	22	5.50
Consumption	0	2	0	0	2	0.50
Others	0	1	0	0	1	0.25
Total	**100**	**100**	**100**	**100**	**100**	**100**

Table 4.18: Frequency of cleaning/disinfection of poultry houses/sheds as reported by respondents in the Federal Capital Territory, Nigeria.

Frequency of cleaning/disinfection	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada		
Daily	22	4	0	4	30	7.50
Weekly	47	26	38	73	184	46.00
Monthly	18	36	29	5	88	22.00
Never	13	34	33	18	98	24.50
Total	**100**	**100**	**100**	**100**	**400**	**100**

Table 4.19: Percentage of the different poultry kept as reported by respondents in the Federal Capital Territory, Nigeria.

Type of poultry	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada		
Local chickens only	57	72	95	84	308	77.00
Commercial poultry only	18	5	2	5	30	7.50
Turkeys	2	0	0	0	2	0.50
Ducks	1	0	1	0	2	0.20
Guinea fowls	4	0	2	0	6	
Local chickens and commercial poultry	3	0	0	0	3	0.75
Local chickens, Guinea fowls, Turkeys and Ducks	12	22	0	8	42	10.50
Local chickens, Commercial poultry and Turkeys	1	1	0	0	2	0.50
Others	2	0	0	3	5	1.25
Total	**100**	**100**	**100**	**100**	**400**	**100**

Table 4.20: Percentages of different sources of breeding stock of local chickens as reported by respondents in the Federal Capital Territory, Nigeria.

Sources of breeding stock	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada		
Open market	27	18	47	46	138	34.50
Trader	40	33	27	10	110	27.50
Self breeding	4	13	19	6	42	10.50
House in same village	4	2	7	12	25	6.25
Open market and Trader	8	4	0	1	13	3.25
Open market, Trader and Self breeding	14	20	0	25	59	14.75
All	8	10	0	9	13	3.25
Total	**100**	**100**	**100**	**100**	**400**	**100**

Table 4.21: Percentage of types of housing provided for local chickens as reported by respondents in the Federal Capital Territory, Nigeria.

Type of housing	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada		
Cages	12	1	2	3	18	4.50
Shed	6	1	0	0	7	1.75
Free/Roam	22	34	65	37	158	39.50
Roam (day)/Shed (Night)	47	36	33	58	174	43.50
Cage and Shed	6	3	0	0	9	2.25
Shed and Free (roam)	7	25	0	0	32	8.00
All	0	0	0	2	2	0.50
Total	**100**	**100**	**100**	**100**	**400**	**100**

Table 4.22: Sources of drinking water for local chickens as reported by rural poultry farmers in the Federal Capital Territory, Nigeria.

Sources of drinking water	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada		
Village well	18	44	18	14	94	23.50
Own well	27	20	38	30	115	28.75
River/Stream	26	19	42	34	121	30.25
Tap	27	2	2	22	53	13.25
Collected rain	1	1	0	0	2	0.50
Village well and River/Stream	0	1	0	0	1	0.25
All	1	13	0	0	14	3.50
Total	**100**	**100**	**100**	**100**	**400**	**100**

Table 4.23: Reasons for keeping local chickens as reported by rural poultry farmers in the Federal Capital Territory, Nigeria.

Reason for keeping local chickens	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada		
Eating only	11	1	2	0	14	3.50
Selling only	44	48	66	49	207	51.75
Ceremony only	2	2	5	5	14	3.50
Eating and selling	41	38	27	39	145	36.25
Others	0	1	0	1	2	0.50
All	2	10	0	6	18	4.50
Total	**100**	**100**	**100**	**100**	**400**	**100**

Table 4.24: Places/points of sale of local chickens as reported by rural poultry farmers in the Federal Capital Territory, Nigeria

Place/Point of Sale	Number of respondents				Total	%
	Municipal	Kuje	Kwali	G/lada		
Weekly market	30	42	11	16	99	24.75
Permanent market	5	20	54	8	87	21.75
Poultry trader	6	12	18	24	60	15.00
Weekly market and poultry trader	55	23	17	40	135	33.75
Individual and poultry trader	2	3	0	7	12	3
Individual only	0	0	0	5	5	1.25
All	2	0	0	0	2	0.50
Total	**100**	**100**	**100**	**100**	**400**	**100**

DISCUSSION

The participatory epidemiological study showed that PRA technique can be used to collect useful information on estimated livestock population, diseases, seasonality of occurrence and existing traditional remedies of diseases. Livestock keepers in the study area fully participated in the PE technique, were very keen to discuss their animal health problems and described the clinical and epidemiological features of ND according to the typical descriptions of the disease in conventional veterinary literature and textbooks. The application of the PE tools encouraged the farmers to re-evaluate their own knowledge of livestock diseases, scoring of symptoms relative to each disease and enable them to rank the diseases. The farmers distinguished between the important poultry diseases and they possessed a good knowledge of local diseases, their symptoms, period (s) of their occurrences and the relative environmental conditions. Their perceptions of clinical signs and other epidemiological features of ND were consistent with veterinary thinking (Radositis *et al.,* 1994; Catley and Mariner, 2002; Kwaghe and Ndahi, 2011). The good agreement between the informant groups indicated that the ranking and matrix scoring methods were valuable in expressing or evaluating animal health problems. Also, ND occurs most during the dry season (Oct-March) and this is in agreement with similar studies carried out by other researcher (Musa *et al.,* 2009). Initial ND outbreaks as reported by informants were attributed to the consumption of fresh guinea corn that is yet to be harvested. This may have some epidemiological significance because unharvested guinea corn fields are common grounds where domestic and wild birds congregate for feeding hence resulting in disease outbreaks and subsequent spread.

The overall relative annual morbidity and case fatality estimates indicates that ND is endemic in FCT and this is in agreement with results obtained from the serological studies of ND in North Central Nigeria (Musa *et al.,* 2009). However, both morbidity and case fatality rates were higher in

Gwagwalada and Kuje than in Kwali and Abuja Municipal Councils. Newcastle disease was ranked first among the important poultry diseases.

Based on results of participatory survey obtained, it is clear that there is very little or no accessibility of most of these communities to modern veterinary health care services thereby leading to their adoption of age long traditional treatment practices for disease problems with limited success. There is little awareness on the need and channel of disease reporting of major (reportable) livestock diseases by livestock keepers in the study area. Therefore, public awareness programmes are very essential by application of extensive extension services to livestock owners with regard to the importance of transboundary animal diseases (TADs) and the economic benefit of prevention programmes. This must be directed at all levels of the public-producers, consumers, traders, transporters, processors, wholesalers, retailers and travellers, and it must include decision-makers from all levels of government, private industry and livestock organizations (FAO, 1999).

This study has clearly demonstrated that ND constitutes a real problem to poultry productivity and health in the study area. Also, the occurrence of detectable ND haemagglutinating (HI) antibodies in sampled local chickens in all the four Area Councils of the FCT with an overall seroprevalence of 57% is an indication of the endemicity of ND in the study area. The antibodies detected may be as a result of natural infection since vaccination of the village poultry is rarely undertaken in Nigeria (Abdu *et al.,* 1987; Dipeolu *et al.,* 1998). The variable seroprevalence rates ranging from 37% to 79 % in this study agrees with the findings of various workers in Africa and elsewhere. In similar studies, Tariq *et al*. (2010) reported a prevalence of 34.4% in Iraq, Yongolo (1996) reported a variable sero prevalence of 25-81.5% in Tanzania, in Ethiopia, 43.68 % sero positive rate of NDV was reported in the cool central highlands (Ashenafi, 2000) while Aschalew (2005) reported 19.78%, Japiot *et al*. (1990) reported 14 % sero prevalence in non-vaccinated village chickens in Niger and Hadipour (2009) reported a prevalence of 37.56% in backyard chickens in Iran.

Ezeokoli (1984) has reported a 72% sero-prevalence of antibodies to NDV in traditionally managed, non vaccinated village chickens in Nigeria. El-Yuguda *et al.,* (2007) reported a prevalence of 46% in village chickens in Borno State, Salihu *et al.,* (2012) reported an ND prevalence of 54.67% in neighbouring Nasarawa State. The findings of other similar studies carried out in Nigeria include Iroegbu and Echeonwu (1997), Mai *et al.*(2004), Musa *et al.*(2009) and Nwanta *et al.*(2006), Ezeokoli *et al.*(1985), Abdu *et al.*(1985), Nwanta (2003), Saidu *et al.*(2006) and Olabode *et al.*(2006). This finding of NDV sero prevalence in these apparently healthy birds suggests that the birds have either recovered from clinical ND or are having subclinical infections (Bell and Mouloudi, 1988; Olabode *et al.*, 1992 and Orajaka *et al.*, 1999). The significant sero positive rate of ND in village chickens in the present investigation is indicative of the continuous infection pressure which might be because of the free ranging management system that allows the uninterrupted cycle of infection as the virus passes from one bird to the other. The slightly higher ND prevalence recorded in the FCT generally and in Gwagwalada and Kwali area councils specifically may be attributable to the role that road networks plays in the spread of diseases as they serve as epicentres of disease spread (Rivas *et al*., 2010). Also, commercial farms may play a role in ND spread and maintenance in the poultry population (Snoeck *et al*., 2008). The chickens are prone to acquire infection from wild birds and the local open markets where large numbers of chickens are usually gathered thereby serving as continuous foci of infection.

The similarity and wide distribution of NDV antibodies in the four area councils may be attributed to the similarity in the climatic and ecological conditions in these areas. Although ND viral isolation was not attempted in this study, detection of antibodies in this category of birds is suggestive of the presence and continuous circulation of NDV among them and their role in maintaining and spread

of the ND. This could pose a serious threat to commercial poultry production in the FCT. It is hereby suggested that attempts be made to control NDV infection among village and scavenging birds through food-borne thermostable ND vaccine, which have been demonstrated to be efficacious and easy to administer by rural people (Echeonwu *et al.*, 2007; Echeonwu *et al.,* 2008). Also, the role of commercial farms in ND spread and maintenance need to be investigated.

The majority of the respondents were females (55.5%) and 44.5% were males. This is because most men were more involved in owning small ruminants and other livestock. This is consistent with the works from Morocco (Benabdeljelil and Arfaoui, 2000) and Botswana (Moreki and Masupu, 2001) where women dominate village poultry farming and village chicken production was observed to be an overall family affair with the women owning 52% and the ones most responsible for the care and management of the birds. In Nigeria, various reports have shown that the poultry industry in the rural areas is largely in the hands of women and children as they own or manage the rural poultry (Kitalyi, 1998; Nwanta *et al*., 2006; Sonaiya, 2007). However, Musa *et al.,* (2009) reported 65.3% male and 34.7% female ownership of local chickens.

The major occupation of the respondents were full time farming (43.25%), 8.5% were students, 8.25% were civil servants. The involvement of students and civil servants in rural poultry keeping is very much expected as this provides additional source of income to meet their needs and in most cases, these categories of people are from these villages with their parents still resident in these areas.

The result obtained from this study indicated that majority of farmers (69.75%) supplemented scavenging with feeding on cereals. This is in agreement with Mavale (2001) who stated that improved feeding as part of husbandry management system for poultry improves the resistance of

birds to diseases and infections. Also, Gondwe *et al.,* (2007) reported that majority (77.6%) of farmers supplemented their chickens erratically with energy-rich feeds, mostly maize bran mostly during the cold-dry season; Ekue *et al.,* (2002) stated that village chickens scavenge for most of their nutritional needs with occasional feed supplements from home-grown cereals and household refuse and they may or may not have shelter and have little or no regular health control programme thereby leading to low production and reduced chances of survival. However, Musa *et al.,* (2009) reported that 39.42% provide supplementary feed. Generally, feed supplementation is an indication of the importance of village chickens in the rural livelihood.

The most common poultry disease identified by farmers was ND with the major clinical signs of high mortality, in coordination, distressed breathing/dyspnoea and diarrhoea and occurs yearly from October to March. The above clinical signs are in agreement with reports of Alexander (1997) that clinical signs and the speed at which the signs appear vary widely and depend upon infectivity and dose of virus, the species, age and immune status of the host, environmental conditions and the route of exposure. The seasonality of ND occurrence in this study corresponded with the report of Sa'idu *et al.,* (1994), which revealed that ND occurs between October and March (with the incidence being highest between January and March), which is the harmattan period when there is extreme cold and wind. They also opined that the high incidence of ND in these months may be due to the influence of high wind velocity, high amounts of dust, cold and stress worsening the outcome of the infection. Abdu *et al*., (1985) and Nwanta (2006) reported that increased movement of sick and healthy chickens to markets in anticipation of various festivities particularly during Sallah, Christmas and New Year festivities have been responsible for the peaks of ND outbreaks in November to March. Also, Halle *et al.,* (1999), Manchang *et al.,* (2004) and Nwanta *et al.,* (2008) stated that the incidence of ND was higher during the dry months of the year possibly because of

the harmattan, cold, stress and high wind velocity. The significance of this result is that vaccination against ND should be intensified in the months preceding the beginning of the dry season, which is between August and September; later doses could be administered in the dry season (January to March).

Local chickens constituted majority (77%) of poultry kept. This finding agrees with the previous works on village chicken production systems in Nigeria (Ekue *et al*., 2002; Ambali, 2003; El-Yuguda, 2007) and in other African countries such as Mali (Kuit *et al*., 1986), Ghana (Van Veluw, 1987), Burkina Faso (Bourzat and Saunder, 1990), Togo (Aklobessi, 1990) and Niger (Abdou and Bell, 1992). As such, improving the village chicken production will have significant positive impact on the development of the rural areas.

The provision of houses by rural farmers for chickens protects the chickens and chicks from predators, disease contamination and warmth during cold weather thereby reducing the stress of the extreme cold which could aggravate ND being incubated by chickens (Harun and Massango, 2000; Nwanta *et al*., 2006). Also, Moreki and Masupu (2001) stated that housing, where provided, is for night shelter only and is mostly made of mud with thatched roofs, old or uncompleted buildings, tree branches, mud pots, baskets, roof tops and the owner's bedroom. Musa *et al.,* (2009) reported that 75.3% provided housing for local chickens which is slightly higher than the over 60% recorded in this study.

Majority of the birds in this study are reared mainly for sales. This agrees with the findings of Maho *et al.,* (2000) that birds are reared mainly for cash income and to a lesser extent for consumption, sacrifice, gift, etc. and that the proceeds from the sales of village chickens are used for the purchase

of clothes, drugs, soap, kitchen salt, etc. Also, Halima (2007) stated that smallholder village chicken owners sell chicken and eggs to purchase food items, to pay school fees, to get cash for grain milling services, to purchase improved seeds and to adjust flock size. This strongly emphasises the fact that poultry is a poverty alleviation tool of commercial value and this is in accordance with previous work by Sonaiya and Swan (2004) citing income generation as the primary goals of poultry keeping.

The results of this study revealed that when birds are sick, conventional veterinary services are unavailable and as such, most farmers use traditional remedies. This agrees with the works of Abdu *et al.,* (2000) that traditional remedies are reported to be much easily and readily obtained and affordable by rural livestock farmers. Also, Musa *et al.,* (2009) stated that majority of the rural chicken farmers (53.2 %) used ethnoveterinary medicines for the management of chickens suffering from ND, Chabeuf (1990) and Ambali *et al.,* (2003) stated that ethnoveterinary therapy featured as the most frequent method of disease control, in conjunction with slaughter (eating) and selling among rural poultry in Cameroon and Nigeria where the principal cause of chicken loss has been attributed to disease and predation. Ekue *et al.,* (2002) reported that ethnoveterinary practices were common in rural poultry production because of the almost complete absence of assistance from extension services and the ease and low cost of acquiring ethnoveterinary substances though such method of therapy is associated with very little success and their efficacy requires further investigation. The practice of sourcing for medicament through the use of traditional method of medicare for treatment of birds is not enough to ensure good health of the birds due to poor knowledge and understanding of the aetiology and pathology of poultry diseases by poultry farmers (Nwanta, 2003). They may therefore succeed in treating the observable symptoms of the disease without dealing with the actual cause. As such, it is pertinent that veterinary services are made

more easily accessible and extension workers undertake the task of educating rural farmers on matters relating to the use of appropriate medicaments including the adoption of new technologies for improving rural chicken production and disease control. However, there is the need for more research to be carried out on the traditional medicaments being used with a view to determining their chemical properties, concentrations and routes of application. Also, the slaughtering of sick birds for consumption constitutes significant public health challenge as many zoonotic diseases (e.g. HPAI) can be contracted and farmers should be educated on this inherent danger.

Majority of farmers sell their chickens in the open market. This finding does not agree with the report of Ekue *et al*., (2002) that buyers usually go to the farmers to buy birds although at prices far lower than what the birds would fetch in the urban markets. While it is common practice in villages to have exchange of live birds in the form of sale, gifts and slaughter, movement of live birds has been implicated as the major factor in the spread of disease. The major sources of drinking water are wells and rivers/streams. The sharing of water among different flocks enhances the spread of disease. When a sick bird is introduced or if a carrier is present, disease could be easily spread to birds scavenging in the same area or sharing the same water source. This finding of village wells and rivers/stream being the major sources of drinking water for village chickens agrees with the report by Musa *et al.,* (2009).

Most of the rural poultry farmers dispose of dead birds at refuse dumps. The implication of this is that infected dead birds may be fed upon by wild birds, domestic free roaming birds, cats and dogs thereby encouraging the spread of infections to both human and animals. This disposal method and its associated risk factors has earlier been highlighted by Cardona and Kuney (2002). About 24.5% of respondents did not clean/disinfect their poultry houses/sheds. During the dry season, dust can be

a problem due to accumulated dry faeces and fine dust aerosols could easily transmit airborne respiratory diseases or cause stress to the respiratory mucosa of birds housed in such premises. Lack of cleaning and hygiene could predispose birds to external parasites, which cause harm, discomfort, stress and act as intermediate hosts for various diseases (Wakawa, 2012). On the other hand, accumulated faeces in unclean premises with a lack of ventilation could result in ammonium toxicity during the humid wet season, causing impairment of the respiratory system and predisposing birds to infectious respiratory diseases like ND, infectious laryngotracheitis, infectious bronchitis, infectious coryza and *Mycoplasma* infections. Furthermore, *E. coli* could gain entry through the damaged respiratory mucosa. Such lack of proper management could contribute to the fact that ND is endemic and persistent in village poultry.

Majority of the farmers obtained their breeding stock from the open market (34.5%), trader (27.5%) and combination of open market, self breeding (10.5%), trader and self breeding (14.75%). The low percentage from self breeding could be as a result of the yearly devastating effects of ND which decimates the household poultry population. This finding of open market being the predominant source of breeding stock is consistent with the findings of Musa *et al.* (2009) who reported that 62.5% foundation stock were obtained from open live bird markets. Also, Hassan *et al.* (1989) reported that small unit cost of the stock makes acquisition by buying from the live bird market affordable and most popular. This practice of sourcing birds from open markets is risky as many reports have shown that outbreak of diseases, for example, avian influenza, ND and fowl cholera have been known to occur locally either through live bird markets or contaminated materials and surfaces (Martin, 1992; Nwanta *et al*., 2006)

CHAPTER SIX:
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary

Local chickens constitute the majority of livestock including poultry reared in the FCT and is bedevilled by many productivity and health constraints; the most important being ND. Newcastle

disease is very prevalent in the FCT with an overall seroprevalence of 57%, estimated mean morbidity and case fatality rates of 71.38% and 74.5%, respectively recorded in the local chickens population, occurring mostly during the dry months of October-March. The predominant clinical signs of ND as recognised by rural farmers include high mortality, greenish diarrhoea, bloody diarrhoea, nervous signs and dyspnoea. The traditional remedies used for treatment though with limited success include *red pepper* (*Capsicum frutenscens*) and *gauta kaji* (*Solanum nodiflorum).*

It was also found that 43.5% of farmers housed their chickens in the night and allowed them to roam freely during day time, while 39.5% provide no housing; sources of drinking water were mainly village wells (23.5%), individual wells (28.75%) and rivers and streams (30.25%). The sources of breeding stock were: open market (34.5%), trader (27.5%) and combination of open market, trader and self breeding (14.75%); about 69.75% provided supplementary feeding for their birds with scavenging, while 22% allowed scavenging only; 51.75% kept poultry purposely for sales with 33.75% having weekly market and trader as sales points; 55% employed local treatment for diseases, while only 26.5% sought conventional veterinary treatments though veterinary services were unavailable to 58% of respondents and where available, 36.5% was provided by the private sector. The major methods of disposal of dead birds were refuse dump (48.75%) and dug pit (38.25%).

6.2 Conclusions

In conclusion on the PE study, poultry constitutes over 50% of the entire livestock being reared in the Federal Capital Territory. Newcastle disease was identified and perceived to be the most important poultry disease, usually manifest in form of high mortality, dyspnoea, digestive and nervous signs. It is widely spread (endemic) and exerts heavy losses (morbidity and case fatality) on

local chickens. Traditional plants are used in the treatment of ND outbreaks but there are no preventive strategies in place. Most farmers employ local treatment for poultry diseases management and there is limited access by farmers to conventional veterinary services. Participatory epidemiology when used in collaboration with laboratory support could assist in the design of disease surveillance programmes including prompt reporting in the inaccessible rural livestock farming communities. Also, ND is prevalent in local chickens in the FCT as revealed in the serological results.

The study revealed that in the FCT, local chickens constitute majority of poultry kept, majority are being provided supplementary feeding and housing; breeding stock are being purchased from open markets, sources of drinking water were mainly wells and rivers/streams. A majority of farmers kept poultry purposely for sales. The most important disease which constituted production constraint in the study area is ND which occurs mostly during the dry months (October-March) and the major disposal methods of dead birds are refuse dump and dug pit. It was concluded that the productivity of local chickens in the FCT is likely to improve through adequate provision of veterinary services and improvement of management practices such as housing, sourcing of foundation stock, disease control and supplementary feeding.

6.3 Recommendations

Therefore, based on this study the following recommendations are suggested:

1. Veterinary extension services should be undertaken to rural poultry farmers to embrace vaccination programmes for rural poultry especially prior to outbreak periods.

2. Routine annual vaccination of especially local chickens against ND should be undertaken by the FCT veterinary authorities.
3. There should be improvement in both public and private veterinary services including extension services to these communities.
4. There should be routine and sustained surveillance of ND in the FCT using participatory epidemiology tools complimented by laboratory support.
5. Further serological investigation needs to be carried out on other free ranging poultry species to determine their NDV antibody levels.
~~5.~~6. Since, the highest suspected incidences of ND occur in the dry season, vaccination should be instituted by veterinary officials of the Area Councils and FCT Administration prior to that period so that in case of outbreaks, the mortality will be lower. Also, in controlling ND efforts should also be made towards controlling other diseases, such as Gumboro disease, helminthosis, salmonellosis, ectoparasitism, etc., because of the issue of concurrent infections.

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APPENDICES

Appendix 1: Questionnaire on awareness on the risk factors of ND in the Federal Capital Territory

PERSONAL INFORMATION

1. Identity----------
2. Name of Village/Area Council..... 3. Longitude/Latitude.....
3. Sex..... 5. Age.....
4. Interviewer (optional).....
5. Educational Status of main decision maker in keeping, buying and selling poultry
   a. Primary [ ] b. Secondary [ ] c. Tertiary [ ] d.Others [ ] e. None [ ]
6. Occupation of Respondent
   a. Full time farmer [ ] b. Business/Trading [ ] c. Civil servant [ ] d. Student [ ]
   e. House wife [ ] f. Others[ ]
7. Type of poultry kept
   a. Local chickens [ ] b. Commercial poultry [ ] c. Turkeys [ ] d. Ducks
   e. Guinea fowls [ ] f. Others [ ]
8. What are your source (s) of Poultry/Breeding stock

Chickens [ ]	Commercial poultry [ ]	Turkeys [ ]	Ducks [ ]	G/Fowls [ ]	Others [ ]
Market [ ]	Market [ ]	Market [ ]	Market [ ]	Market [ ]	Market [ ]
Trader [ ]	Trader [ ]	Trader [ ]	Trader [ ]	Trader [ ]	Trader [ ]
Breed myself [ ]	Breed myself [ ]	Breed myself [ ]	Breed myself [ ]	Breed myself [ ]	Breed myself [ ]
House in same village [ ]	House in same village [ ]	House in same village [ ]	House in same village [ ]	House in same village [ ]	House in same village [ ]

House in another village [ ]	House in another village [ ]	House in another village [ ]	House in another village [ ]	House in another village [ ]	House in another village [ ]

9. Type of housing (tick appropriately)

Chickens [ ]	Commercial poultry [ ]	Turkeys [ ]	Ducks [ ]	G/Fowls [ ]	Others [ ]
Cages [ ]	Cages [ ]	Cages [ ]	Cages [ ]	Cages [ ]	Cages [ ]
Shed [ ]	Shed [ ]	Shed [ ]	Shed [ ]	Shed [ ]	Shed [ ]
Free/roam [ ]	Free/roam [ ]	Free/roam [ ]	Free/roam [ ]	Free/roam [ ]	Free/roam [ ]
Room(day), Shed (Night) [ ]	Room(day), Shed (Night) [ ]	Room(day), Shed (Night)[ ]	Room(day), Shed (Night)[ ]	Room(day), Shed (Night)[ ]	Room(day), Shed (Night)[ ]

10. What is the source of drinking water for your poultry?

a. Village well [ ] b. Own well [ ] c. River/Stream [ ] d. Tap [ ] e. Collected rain water [ ]

11. Why do you keep poultry?

a). Eating [ ] b).Selling [ ] c).Others

12. If 7.b above, where do you sell your birds (construct a table-always, sometimes)

a).Weekly market [ ] (where).....b).Permanent market [ ] c). Poultry trader [ ]

d).Others (specify)

13. What do you feed your poultry with?

a). Commercial feed [ ] b). Scavenge only [ ] (c) Scavenge with supplementation [ ]

d.) Others.

14. What are the names of the most common poultry diseases in your village/ List-------

SN	Disease	Other names/description
a		
B		
C		
D		
E		

15. Have your birds had any of the diseases in the last few years?

What is the pattern of the disease (s) in your household

SN	Disease	<3months ago	3-6months	6-1yr

SN	Disease	<3months ago	3-6months	6-1yr

a).Newcastle disease [ ] b). Other diseases, if known, please specify------

c).No disease observed [ ] d) Dont know [ ]

16. If (a) or (b) above, please what are the signs observed

a. High mortality [ ] b. Distressed breathing [ ] c. Incoordination/CNS signs [ ]

d. Diarrhoea [ ] e. Ruffled feathers [ ]

17. Which year and month do the birds get sick?----------

18. Which birds were affected e.g.chickens, pigeons etc?----------

19. a).How many were sick------b).Died------c).Recovered-------

20. What did you do with sick the birds

a. seek veterinary treatment [ ] b. Treat locally [ ] c. Slaughtered [ ] d. Nothing [ ]

21. How is the disposal of dead birds?

a. Refuse dump [ ] b. Dug pit [ ] c. Burial [ ] d.Burning [ ] Others (specify)----------

22. How often are poultry cages or sheds in your household cleaned or washed?

a).Every day [ ] b).Weekly [ ] c). Monthly [ ] d) Never [ ]

23. Which period of the year do the birds come down with the disease?

a. Jan-March [ ] b. Apr-Jun [ ] c. Jul-Sept [ ] d. Oct-Dec [ ]

24. Pattern of vaccination of birds against ND?: a).Routinely [ ] b).Sometimes[ ]

c). Never[ ]

25. What are the nature p Are veterinary services available in the village: a.Yes [ ] b. No [ ]

26. If yes, who provides the services? a).Government [ ] b). Private [ ]

27. How frequently are these services provided?

a) Daily [ ] b) Weekly [ ] c) Montly [ ] d) Others, specify----------

Appendix 2: Sample Participatory rural appraisal checklist

1. Introduction of the appraisal team
2. Identification of the respondents and establish if they own livestock of interest to the PDS.

3. Establish the main livestock/poultry species kept by the community and management system and their relative economic importance within the context of the communities production system.
4. Establish the husbandry system and movement patterns (mapping)
5. Prioritization of livestock/poultry species kept
6. What are the current disease problems in the area? What local names does the community call these diseases ? Are there traditional treatments for these diseases?. Identify and define any new terms introduced by the respondents. Are disease problems seasonal? Are the diseases zoonotic? Any historical information on their occurrences?
7. When was the last time their animals were affected? Where? Where did it come from?
8. Mapping exercise (markets, fadama, schools, rivers etc)
9. Proportional piling, simple ranking on disease importance, morbidity and mortality
10. How effective is Veterinary services in the area?
11. What solution do the community members recommend?
12. Direct observations (transects and clinical examinations)

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Plate i: Semi-structured interview at Yangoji. Kwali Area Council



Plate ii: Matrix scoring of clinical signs in shetuko, Kuje Area council



Plate iii: Villager undertaking participatory mapping in Kwaku village

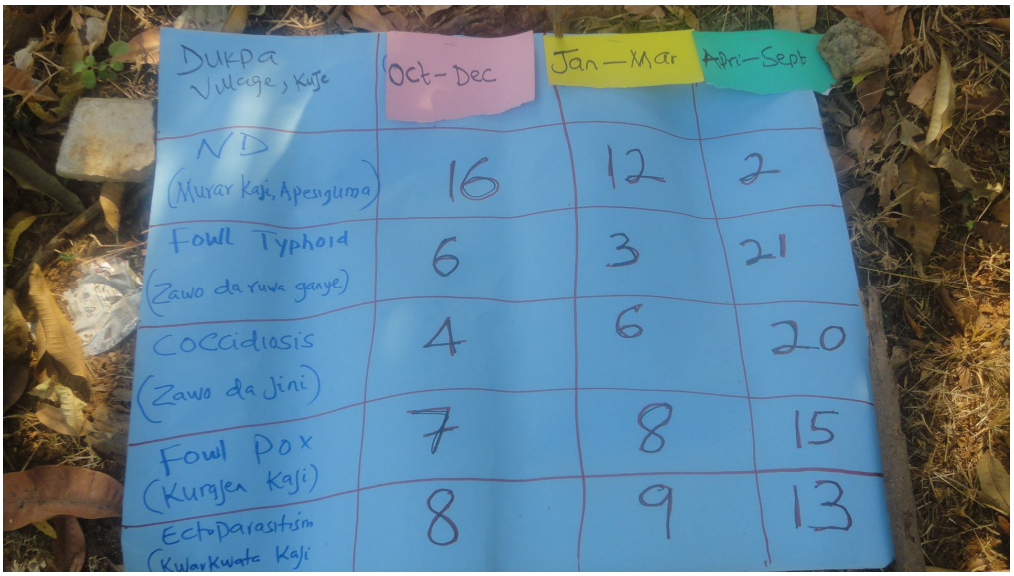


Plate iv: Seasonal calendar constructed at Dukpa village, Gwagwalada Area Council

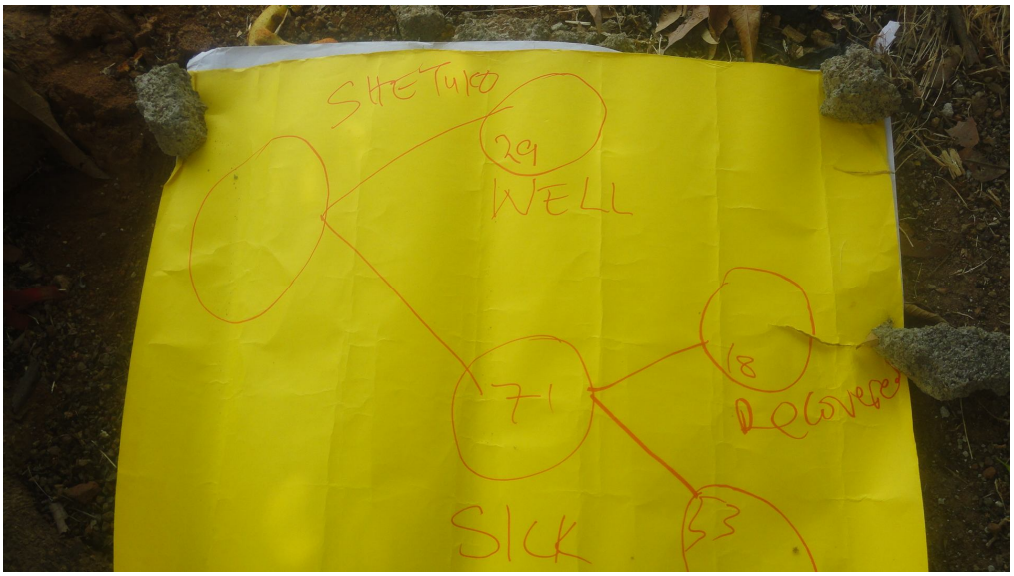


Plate v: Proportional piling result for morbidity and case fatality of Newcastle disease in Shetuko village

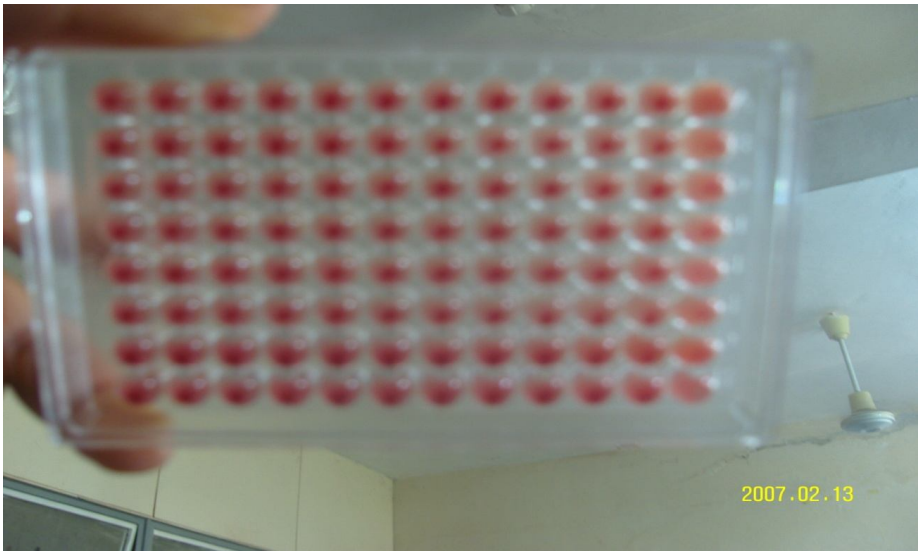


Plate vi: Positive sera samples by HI test (8Nos) from Gwagwalada area council

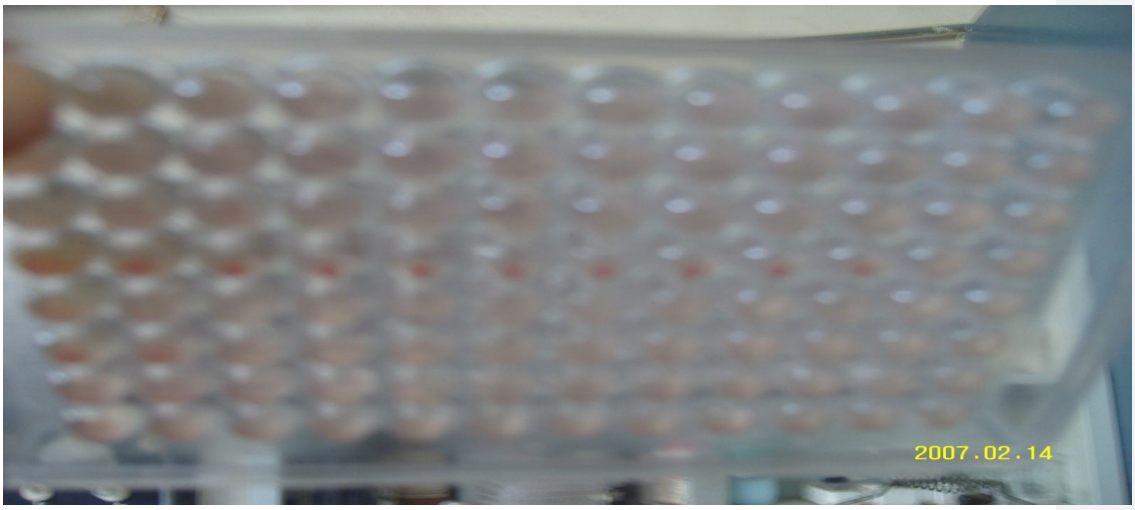


Plate vii: positive and negative sera samples by HI test

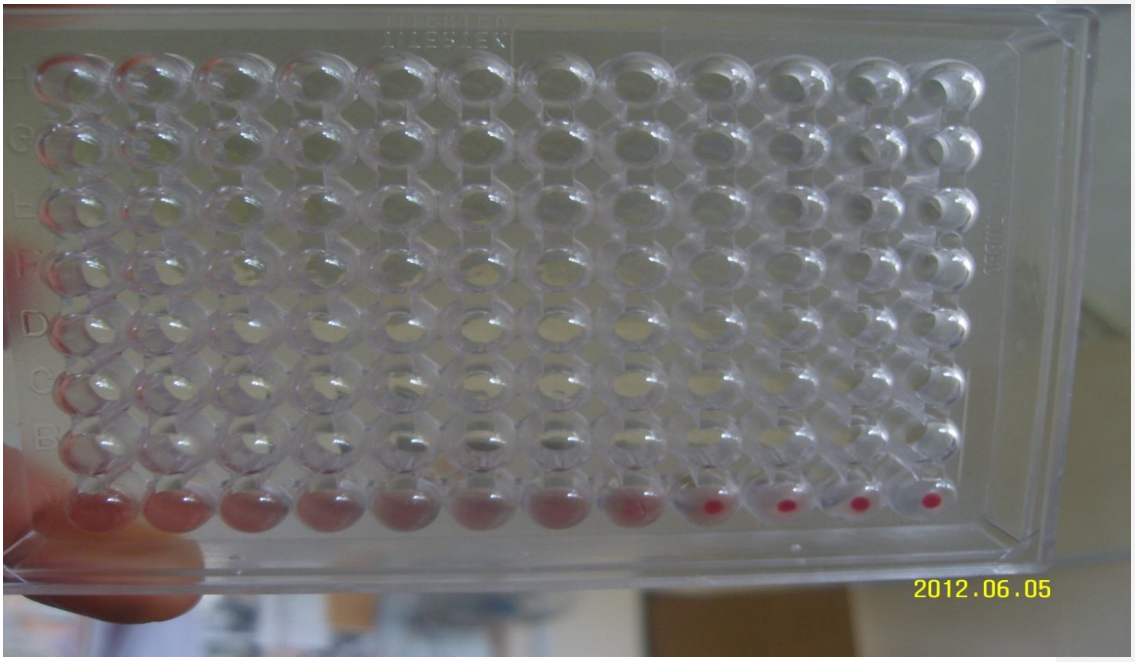


Plate viii: 1no sample positive with titre of $1/_{16}$