

## Research



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## A review of the avian influenza control strategies in Nigeria: a case study of the epidemiological unit of the Federal Ministry of Agriculture Enugu State, 2015-2017

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## Abstract

**Introduction:** avian influenza, (AI) is a disease with economic importance and zoonotic potentials. Outbreak of Highly pathogenic avian influenza, H5N1 in Nigeria, in 2006 and its resurgence 2015, about 4.7 million poultry chicken was affected with over \$9billion paid in compensation. The control policy for AI in Nigeria, has been applied in containment of AI, however, there was paucity of information on its scientific application as a control strategy. The purpose of this study was to describe the AI control policy, its challenges, with a view to providing information necessary for public health action. **Methods:** we reviewed policies on the control of avian influenza by the food and agricultural organization, (FAO) and Office of international epizootics, (OIE), case reports on control of avian influenza in Enugu State. We defined the case definition for avian influenza, described specific AI control strategies, challenges encountered in the control of AI in Enugu State, Nigeria. **Results:** outbreak of AI was reported in 3 local government areas (LGA) in Enugu State, between 2015-2017, (Igbo Etiti, Nkanu West, and Udi). Strategies employed in the control of AI was Quarantine measures, depopulation of infected poultry, disinfections of farms premises, equipment's, contact tracing, and compensation of affected farmers. In all 127,493 poultry chicken was affected by outbreak of avian influenza, of these 29,429(23%) poultry chicken died due to the outbreak, 98,064(76.9%), was humanely slaughtered (depopulated), and over \$167,000 paid in compensation. **Conclusion:** the AI control strategy was applied in containment of avian influenza in Enugu state Nigeria, between 2015-2017. However, this study reported that compensation of poultry farmers may contribute to attempts to inflate poultry flock size affected during outbreak as a mean to get more compensation claims, we also found out that compensating affected farmer's does not necessarily prevent sale of infected poultry to unsuspecting poultry farmers. Consequently, we recommend that the compensation policy for avian influenza should be

discontinued. Alternatively, the poultry value chain in Nigeria should re-direct its focus on prevention of outbreak rather than control. Enforce strict regulation on transport of poultry and poultry products, maintenance of biosecurity routine and structures on the farms should be made a pre-requisite for registration and operation of poultry farm in Nigeria. A structured and dedicated live bird market should be constructed in each state to separate poultry business from other market activities, this may reduce risk of outbreak of poultry disease, Zoonoses and emergence of reassortants influenza strains.

## Introduction

One of the major challenges militating against the growth of the poultry subsector in Nigeria is the outbreak of avian influenza (AI). When outbreak occurs concerted efforts are geared towards containment, preventing spread to contiguous farms, thus ensuring public health safety. In 2006, the population of poultry chicken in Nigeria was estimated at over 65 million, [1]. Emergence of avian influenza in the poultry subsector in 2006-2013 [2-4], resulted in the loss of over 1.2 million Poultry chicken, with over \$1.8 million paid in compensation to affected farmers, [5]. The Federal department of Veterinary services instituted the "modified AI Control policy" which consist of four distinct measures "depopulation, disinfection decontamination of farms, equipment and compensation of affected farmers", [6], these measures were targeted at containment of outbreak and reduction in burden of loses on affected farmers. However, in 2015 through 2018, re-emergence of highly pathogenic avian influenza (HPAI), H5N1 and the emergence of a reassortant HPAI H5N8 strain in Kano State Nigeria, accounted for the loss of over 3.7 million poultry chicken with compensation paid to the tune of \$7.2 million, [6,7]. The huge economic loses in the poultry subsector and the dwindling national reserve may have once again re-echoed the urgent need for a comprehensive review of the avian influenza surveillance system in Nigeria, with a view

to ensuring early detection of diseases and prevent outbreaks. To this end the Federal ministry of Agriculture conducted a targeted surveillance in selected live bird markets (LBM) across 18 States in Nigeria, 2019. Three subtypes of Avian influenza virus (AIV), (two homologous (H5N8, H5N6), and one heterologous (H9N2) strain was found to be co-circulating within the LBM in referenced states, [8]. The poultry value chain in Nigeria is poorly regulated [1,6], coupled with an unstructured live birds markets, (LBM) may have played a major role in the resurgence of avian influenza in Nigeria 2015. The purpose of this study is to describe the avian influenza control policy in Nigeria, identifying its challenges with a view to providing information necessary for action.

## Methods

We reviewed policy documents on the control of avian influenza by the food and agricultural organization,(FAO) and Office of international epizootics,(OIE), [9-12], case reports on control of avian influenza in 3 local government Areas in Enugu State. We defined the case definition of avian influenza, identified specific avian influenza control measures and described challenges encountered in the control of avian influenza in Enugu State, Nigeria during the period under review.

**Case definition for avian influenza:** there is no pathognomonic lesions to avian influenza since, clinical signs mirrors most enzootic viral infections in poultry. However, acute mortality in poultry flocks, swollen head, pink coloured wattle, ecchymotic haemorrhages on the shank, [13], may be a presumptive diagnosis for avian influenza.

**Differential diagnosis to avian influenza:** Newcastle disease, fowl cholera, acute poisoning, infectious laryngotrachitis

**Study area:** Enugu State is located on the in the tropical savannah zone of Nigeria between latitude 6° 30N and 7° 30E south east. Its bordered Abia and Imo to the south, Ebonyi State, Benue State to the

East and North east, with Kogi State bordering the North West. It has 17 local government areas. Enugu State has an estimated population of 3.8 million [6], with a poultry population of about 230,000 based on 2006 estimate, [1].

## Results

**An overview of one health in avian influenza control:**the control policy for avian influenza in Nigeria include: quarantine measures, Depopulation of exposed/infected birds, Disinfections of affected farms premises, equipment, contact tracing, and compensation of affected farmers.

**Quarantine measure:** outbreak response to avian influenza in Enugu State was carried by one health team. They include the avian influenza desk officer of the state, the disease notification officers of the ministry of agriculture, health, and environmental health officers. The Veterinary component of the one health team collects samples (whole poultry carcass), which would be neatly packaged in a leak proof nylon bag. Sample is accompanied by diseases suspicion forms, Figure 1. Then transported to the avian influenza reference laboratory in a Giostyle, with ice pack maintained at temperature 4°-6° C. Care was also taken to ensure that samples were taken directly to the laboratory without any intermediate stops, to ensure that the qualities of sample are maintained. Statistics of moribund, dead chickens are recorded by the Veterinary epidemiologist. Farms with suspected cases a quarantine notice, Figure 2, would be placed on the entrance of the farm prohibiting movement of poultry and poultry products within and out of the farm pending the outcome of laboratory investigation. Similarly, human samples (Nasal Swab) are collected from all farm workers and individuals who may have direct or indirect contacts with the poultry chickens or her products during this period for laboratory screening. When laboratory results confirm avian influenza (in poultry), containment and eradication measures are activated, Figure 3. A Protection zone

(PZ) (an area established surrounding an infected zone to prevent spread of infection to surrounding area) of 3km is established spanning from the focus of outbreak, to the buffer zone (BZ), (an area of the farm with no contamination) between the PZ and surveillance zones (SZ). A SZ of 10km is established from the primary focus outbreak to surrounding areas, (farms, and settlements), for contact tracing.

**Depopulation of poultry:** is carried out in accordance with EU guideline 93/119/EC on depopulation of infected poultry flocks, procedure may include Electrocution by water dipping, decapitation and dislocation of the neck, Gassing with carbon dioxide, Vacuum tank, [9]. However, in Enugu State Nigeria, decapitation and dislocation of the neck is the preferred method of humane slaughter.

**Disposal of birds:** following the confirmation of avian influenza a pit of at least 6 feet in deep is dug, Figure 4. All non-biodegradable, disinfectable material (wood, straws, cardboard) used on the poultry farm must be buried with animal. The carcass must be covered with a layer of calcium hydroxide, and then layer of filled up to earth to ground level.

**Decontamination/ disinfection of farm and equipment:** decontamination of farm equipment's and tools are integral towards ensuring biosecurity on the farm. It involves physical removal of diseases causing agents contaminated organic, inorganic material from farm equipment's and tools used on the farm to allow permeation of disinfectants, [11]. Decontamination is dependent on the type of surface involved, (earthen floor, and broken concrete floor) and the type of poultry housing (bamboo or wire cages). As a rule the solution to this is improved surface type and cleaning equipment. Cleaning may be dry cleaning (scraping, sweeping, or scrubbing), wet cleaning, involves use of detergents, scrubbing and pressure washers. Routine cleaning focuses on those surfaces that are more likely to come in contact with poultry and production processes within the farms. Liquid detergent (Dawn) is ideal for use because it

specifically cut through lipid and its nontoxic, Table 1.

**Checklist for disinfection of infected farms:** all units involved in production (hatchery, egg storage room, packaging room, trolley rack ), transportation of live animals, eggs, feed should be disinfected; walls, floors ceilings should be disinfected while metal cages and structures are decontaminated and disinfected by hot water treatment; drinkers, food hoppers must be washed and disinfected for at least 24hrs; reservoirs for water should be emptied and disinfected; silos should be washed with an hot water jet and fumigated.

**Compensation of poultry farmers:** the last strategic policy of avian influenza control in Nigeria, following depopulation of affected poultry flocks decontamination of poultry farms and equipment's, [14]. Compensation is based on a number of parameters and information obtained from the poultry farm involved see Table 2. Poultry farmers are compensated based on the number of flocks depopulated, types of flocks (layers, broilers, chicks), poultry products and consumables, (eggs, trays), [15]. However, before compensation is paid the farm must be left fallow without re-stocking for a minimum of three months post decontamination, subject to review by the Director of Veterinary services (DVS) of the State or other designated officer.

**Challenges of effective control of avian influenza in Enugu state, 2015-2017:** early disease reporting is germane for effective disease control. Retrospective reviews of average disease notification time of veterinary authorities by affected poultry farmers was 2-3 weeks post suspicion of outbreaks. This may follow farmer's unsuccessful attempt to manage suspected outbreak with cocktails of veterinary of antimicrobials which most often has a therapeutic range of between 1-2weeks. Similarly, the response time of veterinary authorities post notification of outbreak was 1-2 days. As a consequent, instituting control measures on affected farms may take a

further, 3-4 days, including (preliminary investigation, collection, transportation of sample to the reference laboratory and laboratory confirmation) Figure 5 describes flow chart showing sequence of events following outbreak of avian influenza and critical point that may predispose to potential zoonoses. In general effective control of an outbreak of avian influenza by the Federal ministry of Agriculture in Enugu takes between 3-5 weeks. Considering the maximum incubation period of avian influenza viruses of 3 weeks (21 days). Farmers, may record more poultry mortality this period with the attendant risk of spread of infection to contiguous farms and live bird market.

## Discussion

Poultry industry in Nigeria is the most capitalized of the Agricultural subsector in Nigeria. It accounts for about \$22 million per annum, and 25% of the Agricultural domestic product. Fifty million Nigerians are directly or indirectly employed in the subsector, [1]. Outbreak of highly pathogenic avian influenza H5N1 in 2006 and its re-emergence in 2015, plagued the poultry subsectors with massive job losses, [7], with over \$100 million dollars lost in revenue. To stem the tide of the pandemic, the World Animal Health Organization developed the "OIE terrestrial animal code" to present a common strategy in control of avian influenza worldwide, [16]. This strategy was adopted and adapted locally by member nations during outbreaks. In Mexico outbreak of avian influenza H5N2 in 1995 was controlled within one year, [17] similar fit was reported in Italy 1999-2000, Netherland 2003, and Canada in 2004, [18], control strategies employed were immediate stamping out policy of affected flocks, disinfection of affected premises, quarantine measures, strict movement controls on poultry and their products and vaccination, [17], this was in contrast to avian influenza control strategies employed in Nigeria between 2006-2008, and 2015-18. Control strategies employed in Nigeria includes, quarantine, stamping out/depopulation, disinfection, and compensation of affected

farmer, [7] Nigeria practiced a "No vaccination policy" for control of avian influenza, however, Fashina disagreed with the policy in his study were he posited that vaccination of poultry chicken against avian influenza combined with other control measures may be cost effective and reduces risk of zoonoses especially in developing economies [19]. However, Simons and his team in a related study conducted in Indonesia to assess the duration of vaccine induced immunity against H5N1, concluded that vaccination against H5N1 was largely ineffective in providing long lasting protective immunity with poultry flock requiring seven vaccination regime, [20], such may not be cost effective in developing nation. Compensation of poultry farmers affected by outbreak of avian influenza was a deliberate effort by the Federal government of Nigeria, through the Ministry of Agriculture to reduce the burden of losses incurred by poultry farmers during outbreak of avian influenza, [6].

## Conclusion

This study concluded that compensation of poultry farmers may contribute to attempts to influence poultry flock size affected during outbreak. Based on reports on attempt by farmers to sell moribund chicken from farms with confirmed cases of avian influenza despite certainty of compensation claims. We recommend that the compensation policy for avian influenza should be discontinued. Alternatively, the poultry value chain in Nigeria should be strictly regulated; movement of poultry and poultry products should be supervised by the agricultural quarantine services. Strict biosecurity routine and structures on the farms should be made a pre-requisite for registration and operation of poultry farm in Nigeria. Funds earmarked for compensation could be used to improve the capacity of the epidemiology units, with a renewed vigor geared toward, surveillance, prevention of outbreak rather than the current focus on control. A structured and dedicated live bird market should be constructed in each state to separate poultry business from other market activities, this may

reduce outbreak of poultry disease and reduce the risk of emergence of reassortant influenza strains and ensure public safety.

### What is known about this topic

- *The AI control strategy was developed in 2006 primarily in response to outbreak of highly pathogenic AI, H5N1. It's basically donor driven, the system was developed to function in State with reported cases of HPAI; Its control strategies consist of quarantine measures, depopulation of affected farm, disinfection of farm and compensation of farmer. Over 3.7 million poultry chicken was humanely slaughtered in 779 farms, 13 live bird markets, across 122 local government areas, in 26 States of Nigeria.*

### What this study adds

- *The AI control strategies has been effective in containment of outbreaks of avian influenza in Nigeria since 2006, however, the policy on compensation of affected farmers may be counterproductive. This study has found that poultry farmers may be tempted to inflate the flock size of poultry affected during outbreak. Similarly, this strategies does not actually prevent sales of infected flocks by farms with confirms cases. Hence should be discontinued, alternatively, emphasis should be preventive strategies, strict biosecurity, structured poultry production as a prerequisite for establishment of poultry farms in Nigeria.*

## Competing interests

The authors declare competing interests.

## Authors' contributions

Dr Moses read the manuscript and made useful contribution, Dr Salima Garba read the manuscript made useful contributions and designed the flow chats. All the authors contributed to the conduct of

this work. All the authors have read and agreed to the final manuscript.

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**Figure 3:** poultry chicken buried in six foot pit

**Figure 4:** avian influenza surveillance and contact tracing zones

**Figure 5:** flow chart showing sequence of events following outbreak of avian influenza, critical points that may lead to spread and potential zoonoses

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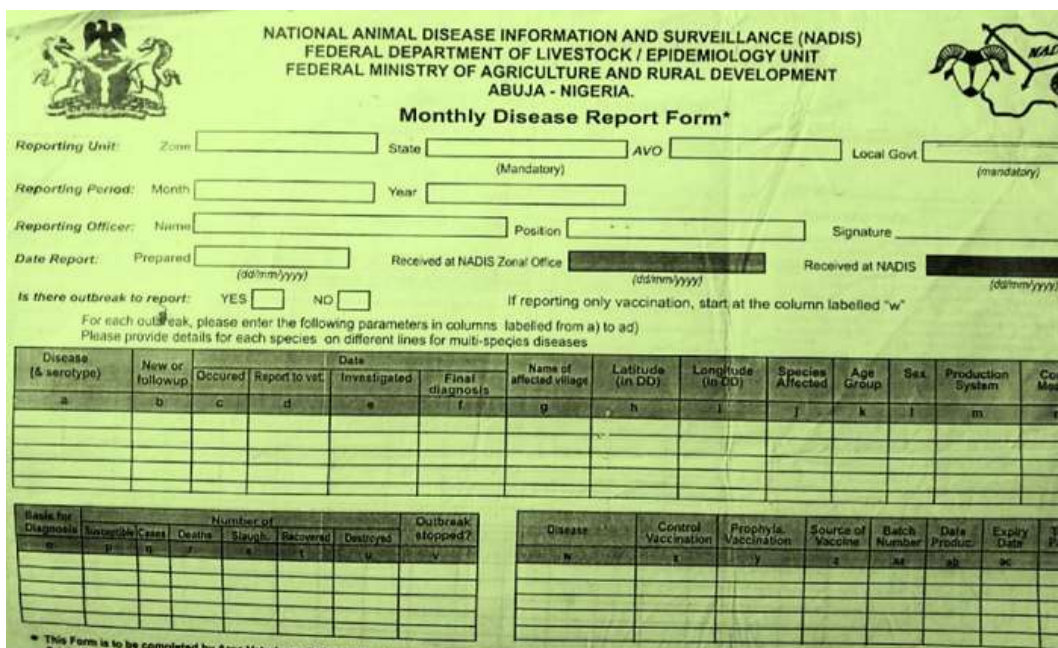
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**Table 1:** selected classes of disinfectant effective against avian influenza

| Disinfectant  | Concentration               | Uses   |
|---|-----------------------------|--|
| Sodium hypochlorite   | 2% active chlorine solution | Disinfection of equipment                          |
| Quaternary ammonium salts   | 4% solution                 | Treatment of walls, floors, ceilings and equipment |
| Potassium peroxomonosulphate + sulphamic acid + sodium alkyl benzene sulphonate | as a ready-to use product   | Treatment of floors, walls, ceilings and equipment |
| Formalin and permanganate   | -----                       | Fumigation   |

**Table 2:** how to determine compensation claims of farmers based on statistic of poultry affected during outbreaks of avian influenza

| Parameters   | Variable   |
|--|--|
| Total number of poultry on the farm before suspected outbreak                                  | (nTB)  |
| No of Poultry culled at (₦2000) per birds layers   | TPCx(₦2000)  |
| Poultry eggs (₦800per crate of 30 egg),bags of feeds destroyed,(25kg at ₦3000) to be mopped up | Egg (₦800) per crate + 25kg Feeds(₦ 3000) per bag              |
| Total number compensation to be paid (TC)  | TC=TPCx(₦2000)+egg per crate (₦800)+25kg feed (₦ 3000) per bag |



NATIONAL ANIMAL DISEASE INFORMATION AND SURVEILLANCE (NADIS)  
FEDERAL DEPARTMENT OF LIVESTOCK / EPIDEMIOLOGY UNIT  
FEDERAL MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT  
ABUJA - NIGERIA.

**Monthly Disease Report Form\***

Reporting Unit: Zone  State  AVO  Local Govt   
(Mandatory) (mandatory)

Reporting Period: Month  Year

Reporting Officer: Name  Position  Signature

Date Report: Prepared  Received at NADIS Zonal Office  Received at NADIS   
(dd/mm/yyyy) (dd/mm/yyyy) (dd/mm/yyyy)

Is there outbreak to report: YES  NO  If reporting only vaccination, start at the column labelled "w"

For each outbreak, please enter the following parameters in columns: labelled from a) to ad)  
Please provide details for each species: on different lines for multi-species diseases

| Disease (& serotype) | New or followup | Occured | Report to vet. | Date | Investigated | Final diagnosis | Name of affected village | Latitude (in DD) | Longitude (in DD) | Species Affected | Age Group | Sex | Production System | Cont. Measure |
|----------------------|-----------------|---------|----------------|------|--------------|-----------------|--------------------------|------------------|-------------------|------------------|-----------|-----|-------------------|---------------|
| a                    | b               | c       | d              | e    | f            | g               | h                        | i                | j                 | k                | l         | m   | n                 |               |
|                      |                 |         |                |      |              |                 |                          |                  |                   |                  |           |     |                   |               |
|                      |                 |         |                |      |              |                 |                          |                  |                   |                  |           |     |                   |               |
|                      |                 |         |                |      |              |                 |                          |                  |                   |                  |           |     |                   |               |
|                      |                 |         |                |      |              |                 |                          |                  |                   |                  |           |     |                   |               |

| Basic Data | Susceptible | Cases | Deaths | Number of |           |           | Outbreak stopped? |
|------------|-------------|-------|--------|-----------|-----------|-----------|-------------------|
|            |             |       |        | Stagnant  | Recovered | Destroyed |                   |
| g          | h           | i     | j      | k         | l         | m         | n                 |
|            |             |       |        |           |           |           |                   |
|            |             |       |        |           |           |           |                   |
|            |             |       |        |           |           |           |                   |

| Disease | Control Vaccination | Prophylaxis Vaccination | Source of Vaccine | Batch Number | Date Produced | Expiry Date | Tested (FAO) |
|---------|---------------------|-------------------------|-------------------|--------------|---------------|-------------|--------------|
| o       | p                   | q                       | r                 | s            | t             | u           | v            |
|         |                     |                         |                   |              |               |             |              |
|         |                     |                         |                   |              |               |             |              |

\* This Form is to be completed by Area Veterinary Officer at the District level.

Figure 1: a copy of disease reporting form

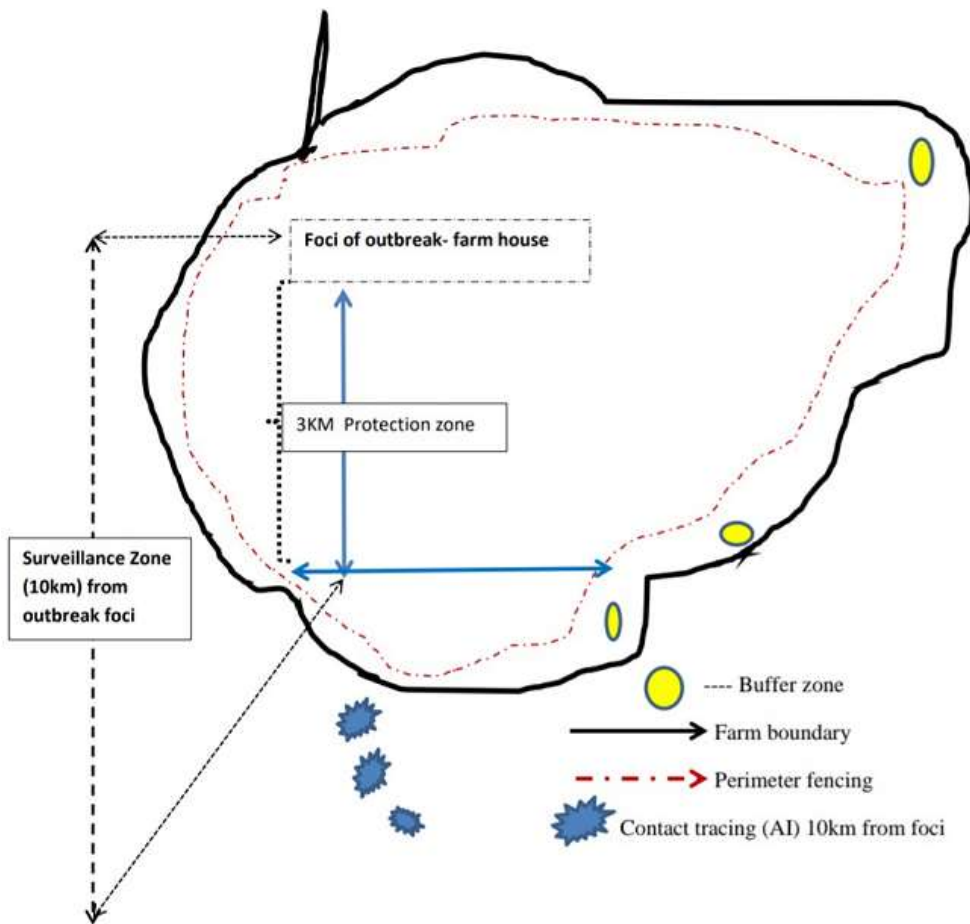




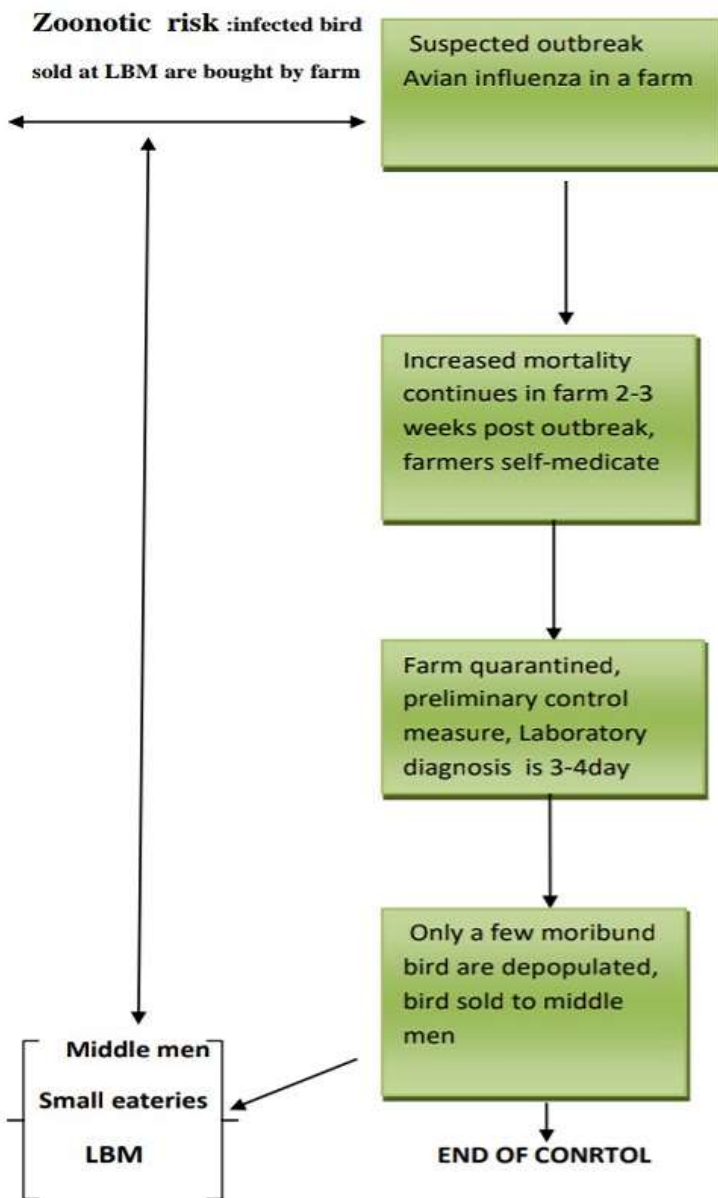
Figure 2: a copy of quarantine notice



Figure 3: poultry chicken buried in six foot pit



**Figure 4:** avian influenza surveillance and contact tracing zones



**Figure 5:** flow chart showing sequence of events following outbreak of avian influenza and critical points that may lead to spread and potential zoonoses