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BENEFIT-COST ANALYSIS OF AVIAN INFLUENZA CONTROL PROGRAMME IN ENUGU STATE, NIGERIA

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ABSTRACT

The outbreak of the highly pathogenic avian influenza (HPAI) in Nigeria attracted the intervention of the federal government and international organisations. Large amount of funds were spent for the HPAI Control Programmes. These control programmes brought some positive results. However, it is important to investigate the profitability of these control programmes. The objective of this study was to carry out a benefit-cost analysis of the avian influenza control programme in Enugu State, Nigeria. A non-participatory observation scheme and an in-depth interview of the non-literate was utilised in sourcing primary data. Secondary data was abstracted from relevant records at the Avian Influenza Control Programme (AICP) Desk Office Enugu, the Nnamdi Azikiwe Library of the University of Nigeria, Nsukka and the Headquarters of the Enugu State Ministry of Agriculture at Enugu. The benefit-cost (B/C) ratio was analysed by simple division of net benefits by the total cost of conducting the control programme. The result of the benefit-cost (B/C) ratio of the HPAI control programme in Enugu State was 2.7. This showed that the control programme was highly beneficial and efficient thus the alternative "to control" was 2.7 times preferred to the alternative "not to control" the outbreak. In addition to the financially quantifiable benefits accruing from avoided loss in production and decrease in cost of production, there are other sublime benefits like restoring consumer confidence, saving of the poultry industry in Nigeria and avoidance of loss of human life. Thus, based on this result, there is a strong policy advocacy in favour of early and concerted effort made at "controlling" poultry and livestock disease outbreak over and above "not controlling" in an event of a subsequent outbreak.

***Keywords*:** Avian Influenza, Control, Poultry, Enugu State, Benefit/cost

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INTRODUCTION

The agricultural sector is vital to the overall development of Nigeria. The poultry sub-sector contributed about 4.45% of the overall agricultural gross domestic product (GDP) in 2004 [1], and 9-10% in 2005 [2,3]. Estimates from the National Bureau of Statistics (NBS) showed that in Nigeria the poultry sub-sector grew at 5.9% per year with effect from year 2000, and by 2005, reached a population of 150 million [2]. However, this growth was interrupted by the emergence of the highly pathogenic avian influenza (HPAI) virus of the H5N1 sub type in 2006 [4,5], which in turn led to a decline in its contribution to the GDP [5,6]. In Nigeria, the first outbreak of the avian influenza caused by H5N1 was first recorded in Kaduna State; announced on February 8, 2006 [5,7]. By the end of 2006, the infection had spread to 130 farms across the 36 states and the Federal Capital Territory (FCT) [4,7]. Death of birds, loss of employment and finance, which had attendant negative impact on the socio-economy of the farmers were recorded. There was one confirmed human case in Lagos in February 2007 [7,8].

The macro-economic implication of this outbreak was a decline in development of the poultry industry with a concomitant drop in its contribution to the GDP of the country [5,9,10]. Following the emergence of HPAI in Nigeria, the Nigerian government, the United Nations, and some other international donor agencies, intervened during the periods of 2006 to 2008 and expended very huge sums of money as credits and grants for capacity building, active disease surveillance, control and compensation [2,11,12,13,14,15,16]. These control measures yielded positive results in that they led to the containment of the disease since no new cases were reported [2].

However, it is imperative to justify the efficiency and profitability of the control` programmes in financial terms. Thus, it became necessary that a benefit/cost analysis of the intervention strategies should be carried out. The objective of the study was to analyze the benefit-cost of the Avian Influenza Control Programme in Enugu State, Nigeria.

Materials and Methods

The Study Area

The study was conducted in Enugu State of Nigeria and covered the control and prevention programmes carried out in the State during the outbreak of the Asian strain of the highly pathogenic avian influenza (HPAI) between 2006 and 2010. Enugu State has a population of about 3.3 million people [18]. Poultry production in Enugu state has been classified into extensive (about 75%) and intensive (about 25%) systems [4,19,20]. Outbreaks caused by the HPAI virus subtype H5N1 occurred in poultry in Enugu State in 2007 [21].There are 17 Local Government Areas (LGA) in Enugu State [18] all of which were affected in the outbreak. Fifteen LGAs were selected for inclusion in this study by the simple random sampling method. Multi-stage random sampling technique was used to select ten farms from each LGA given a total of 150 farms. The research was carried out retrospectively using questionnaire instrument.

Data Sources and Collection

Primary data were sourced through direct observation and also abstracted from relevant records. Data were obtained from both functional and non-functional poultry farms, oral interview of the farm owners, meat shop operators, veterinarians and government agencies and the use of structured questionnaires administered to the farm attendants and farm owners. Data obtained were- numbers of slaughtered birds, and compensations paid (where applicable), the cash and material interventions by government and non-governmental donor agencies and other intervention strategies setup for Avian Influenza control.

Secondary data was sourced from records provided by the avian influenza control programme (AICP) desk officers at Enugu State and FCT, Abuja. These data included, among others, types and values of costs and recorded benefits of the control programmes.

Data Analysis

The World Health Organization (WHO) consultative group established in 1972 that only financially quantifiable benefits and costs can be defined and used to develop a Benefit Cost Ratio (BCR) [22]. Based on this, in the formula for analyzing the benefit/cost of AI control programmes in this study, only measureable direct and indirect losses and costs due to AI outbreak as well as benefits derived by the control programmes were considered. The costs of the control programme were collated using the economic-engineering analysis approach because this approach could capture the impact of AI on the livelihood of farmers [23]. Additionally, the Bennett formula, which has been universally adopted as the appropriate formula for estimating direct costs associated with HPAI prevention and control measures was adopted. Following Bennett [23], Cost "C" has been defined as direct costs associated with HPAI prevention and control measures and has the formula:

$$C = (L + R) + T + P \text{ [24].}$$

Where: L is the value of the loss in expected output to society (such as income losses due to fall in stock) due to the presence of HPAI, which in this case refers to loss due to death; R is the value of losses due to fall in domestic prices and demand, and P is the cost of HPAI prevention measures such as vaccines (not applicable to Nigeria), disinfectants, foot baths, and other costs related to controlling the disease and improving biosecurity, that the government spent and 'T' is the cost of treatment [24]. However, since Nigeria did not treat the sick birds, 'T' was dropped. Therefore, the adopted formula for this work was

C = (L + R) + P

In this case: L = Loss in Expected Output = (fall in Stock) X Unit Cost of Birds; R = (Stock before AI X Price before AI) – (Stock During AI X Price during AI) and P = Prevention and Control Costs.

Measuring Benefits (B)

Benefit can be expressed in two parts, firstly as a sum of the avoided losses of the expected output added to and secondly as the decrease in the cost of prevention (decrease in P) [24]. Thus, sum of Avoided Losses = (Value of population with Control – Value of expected Population without Control) plus Decrease in the cost of prevention = (Cost of Control before Containment of AI – Cost of Control after Containment). The net benefit is the difference between benefits (B) and direct disease control and prevention costs (C). Then, the BCR = Net Benefit/Total Cost

RESULTS

The population of birds in Enugu State before outbreak was 1,829,082 birds but dropped to 1,435,628 birds during the outbreak and after containment rose to 2,220294 birds (AICP Office Enugu, 2010). Thus, there was a drop of 786,908 birds representing 21.05% of the population due the outbreak. At the prevailing market price of $2/bird, loss in expected output (L) was ₦119, 609,560.00 (Table 1). The mean selling price before outbreak was ₦437.19, during outbreak was ₦190.59 and after containment was ₦1,166.47 (Table 2). The mean value of the poultry industry in Enugu State before outbreak was ₦799,656,359.58 but it was reduced to ₦273,616,340.52 during the outbreak. Thus value of loss due to fall in price and demand (R) was ₦526, 040,019.06 (Table 2).

The Cost of the HPAI prevention and control programmes in Enugu State during the outbreak (2006-2007) was ₦7,000,000.00 in the first work plan but this dropped to ₦2,189,720.00 in the second work plan (2008-2009) and in the third work plan it was ₦4,000,000.00 (2009-2010). Thus, the total cost of prevention (P) (2006-2010) was ₦13,189,720. Therefore, the total cost of the control and prevention i.e. {C= (L + R) + P} was (₦119,609,560 + ₦526,040,019.06) + ₦13,189,720, which is ₦658,839,299 (Table 3).

With a 21.05% drop in population due to outbreak, the expected new population without control should have been 1,133,428 birds. However, due to control the population rose to 2,220,294. Therefore, the

Table 1. Population of birds involved in the outbreak and control efforts against AI in Enugu State, Nigeria.

Population of Birds in Enugu State									
Before Outbreak		During Outbreak						After Outbreak	
Mean Population	Total Population	Mean Population	Total Population	Fall in Stock	% Drop in Population	Prevailing price/unit	Value of loss due to drop in population	Mean Population	Total Population
15,438	1,829,082	12,189	1,435,628	393,454	21.05	$2*	119,609,506	18,897	2,220,294

Source: AICP Office Enugu, [25]; *Source [26]

Table 2. Value of loss due to fall in domestic prize and demand for poultry meat as a result of the outbreak of AI in Enugu State (Naira)

Selling prices of Poultry meat (All Values in NGN)							
Before		During				After	
Mean Selling Price	Total Value of Birds	Mean Price	Total Value of Birds	% Drop in Selling Price	Total loss in Value of Birds	Mean Selling Price	Total Value of Birds
437.19	799,656,359.58	190.59	273,616,340.52	56.40%	526,040,019.06	1,166.47	2,589,906,342.18

Source: AICP Office Enugu, [25]

Table 3. Cost of HPAI prevention and control in Enugu State, Nigeria

Cost of Work Plans across Years (₦)			Average Cost after Containment	Decrease in cost of prevention	% Decrease in cost of prevention	Total Cost of Prevention (2006-2010)
During Outbreak (2006-2007)	After Containment (2008-2009)	After Containment (2009-2010)				
7,000,000	2,189,720	4,000,000	3,094,860	7,000,000 - 3,094,860 = 3,905,140	55.78%	13,189,720

Source: AICP Office Enugu, [25]

Table 4. Avoided Losses due to containment of avian influenza in Enugu State, Nigeria

Population before outbreak	Population during outbreak	% drop in population due to the outbreak	Expected population without containment	Population with control	Avoided loss in population	Price of Birds after containment	Value of Avoidable Loss = population X price after containment
1,829,082	1,435,628	21.05%	1,133,428	2,220,294	2,086,866	1166.47	2,434,266,582.02

Source: AICP Office Enugu, [25]

Table 5. Benefit/Cost Ratio

Value of Avoided Loss	Decrease in cost of prevention	Total Gross Benefit = avoided loss + decrease cost in prevention	Total Cost	Net Benefit = Gross benefit- total cost	Benefit/Cost Ratio = Net Benefit/total cost
2,434,266,582.02	3,905,140	2,438,171,722.02	658,839,299.06	1,779,332,422.96	2.70

Source: AICP Office Enugu, [25]

avoided loss was 2,086,866 birds and at the prevailing market price of ₦1,166.47 the value of avoided loss was ₦2,434,266,582.02 (Table 4).After the containment of the HPAI, the cost of prevention dropped by 55.79%. Thus total benefit due to decrease in cost of prevention was 3,905,140.00. Total gross benefit, which is value of avoided loss plus value of decrease in cost of prevention, was ₦2,438,171,722.02. Net benefit being gross benefit minus total cost was 1,779,332,422.96. Consequently, the Benefit-Cost Ratio, which is Net benefit/ total cost was 2.70.

DISCUSSION

In the theory of Benefit/Cost Ratio (BCR), when the ratio above 1 it means that the benefits of the project outweigh the cost thus the project is considered beneficial and effective. From the results of this programme, the BCR was 2.7 suggested that the AI control programme was highly beneficial and efficient. In monetary terms, the benefit of the control programme was 2.7 times more than the cost. Basically, a BCR is an analysis of the cost effectiveness of different alternatives to see whether the benefits outweigh the costs and which alternative is the most beneficial. In this study the alternatives considered were "to control" and "not to control". The alternative "to control" the outbreak was 2.7 times preferred to the alternative "not to control". In addition to the financially quantifiable benefits accruing from avoided loss in production and decrease in cost of prevention of disease, there are other benefits which are not financially easily quantifiable. These are the benefits of restoring consumer confidence, saving of the poultry industry in Nigeria and the avoidance of loss of human life. So, in all ramifications, the control programme was very beneficial.

CONCLUSSION

The results of this study suggest that the control of AI outbreak in Enugu State yielded far greater financial benefits than its operational costs. The estimated expected financial loss, without the control programme far outweighs the cost of controlling the outbreak. Thus, a policy in favour of "controlling" is advocated for instead of "not controlling". In addition to the financial benefits of the control programme, macro-economically, it restored consumer confidence in poultry products and thus saved jobs and the Nigerian poultry industry, which ultimately restored the industry's contribution to Gross Domestic Product.

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