Assessment of the Mortality Prevalence Factors in Exotic Chicken Production among Small-Scale Farmers: A Case Study of Kusini and Mjini Magharib Regions of Zanzibar

Abrahman Suleiman Issa[1], Said Abdalla Bakar[2], Salma Makungu[3], Burhan Said Ahmed[4], Mohamed Saleh Nassor[5]

[1, 2, 3, 5]School of Agriculture, State University of Zanzibar - Tanzania

[1]abrahman. issa[at]suza.ac.tz
[2]said.bakar[at]suza.ac.tz
[3]salma.makungu[at]suza.ac.tz
[4]burhan. ahmed[at]suza.ac.tz
[5]memoraiz[at]hotmail. com.

Abstract: *This study aims to investigate factors that contribute to mortality in exotic chicken production among small - scale farmers in the Kusini and Mjini Magharib regions of Zanzibar. The research focuses on key factors influencing mortality rates. The findings reveal the association of education levels, chicken breeds, farm management practices, health management, disease outbreaks, vaccination practices, and rearing methods at different level of mortality contribution. Thus, the study gives insights to the development of tailored strategies to mitigate mortality challenges and foster sustainable exotic chicken production.*

Keywords: Exotic Chicken, mortality, small - scale farmers

1. Introduction

The demand for poultry meat and eggs has experienced significant growth in Tanzania over the past few decades. The Tanzania agriculture survey shows that, out of 7, 837, 405 agricultural households, a total of 55.4% households raised chicken by small - scale commercial poultry farming during 2019/20 agricultural year (Agriculture, 2019/2020). In Zanzibar alone, the household raised chicken were 100, 538 (2.3%) distributed as layers 57.1%, indigenous 40.7% and broilers 2.2% (Agriculture, 2019/2020, Ouma et al 2023). Thus, the number of improved chickens especially exotic one in the smallholder sectors is relatively higher compared to traditional one making it a vital component in contributing to food security, economic development, and employment. The efficiency of exotic chicken production has improved dramatically through genetic selection, nutrition, and management practices.

However, as the chicken industry in Zanzibar expands to meet population's protein needs especially with the booming tourism industry, it faces numerous challenges that are required to be addressed. Small scale farmers in Zanzibar are depending on importing about 90% of one day old chicks (DOCs) from Tanzania mainland while only 10% produced inside the Zanzibar. Statistics indicate that About 367, 000 of one day chicks coming from hatcheries of FALCON, Inter - chick, NAPOCO, that are located in Dar es Salaam, Arusha, Mbeya, Morogoro, and Mwanza (Hassan, 2013 - 2014). Presence of infectious diseases and non - infectious diseases described to be a major challenge facing the industry. In these source regions, thus, creating the downstream challenges in improving livestock productivity in Zanzibar (Ouma et al 2023). Avian influenza, Gumboro, Chicken pox and New Castle Disease, were amongst the most prevalent infectious diseases described to infect poultry during 2019/20 Agricultural year.

In the Kusini and Mjini Magharib regions of Zanzibar, the severity of this issue is evident in the agricultural landscape, impacting both broiler and layer farming systems. High mortality rates not only lead to economic losses for farmers but also pose a threat to food security and sustainable poultry production in the regions (Larghani, 2023). This brings an alarm toward researcher on assessing severity of exotic chicken mortality for effective strategies. Thus, the main aim of this study is to identify common risk factors associated with high mortality and to determine geographical region with high prevalence for the case of Zanzibar.

2. Methodology

The research covered two regions, Mjini Magharibi Unguja and Kusini Pemba located in Zanzibar island - Tanzania, two regions described to have the largest number of households raising chicken in Zanzibar (Agriculture, 2019/2020).

2.1 Data Sampling and collection

The research targeted exotic chicken farming population in Zanzibar as a direct actor while extension officers or veterinary officers responsible for livestock production and health management as indirect actors. List of farmers were drawn from the district veterinary office while list of the veterinary officer was drawn from the regional office. The sampling frame work of the farmers was drawn from the list of key active farmers in the regions. Probability of the multistage sampling method used to have a sample unit of 96

farmers (sample size) from the two regions that have four districts. For the indirect actors, purposeful method was used to have 12 key respondents.

2.2 Surveys

For the case of exotic chicken farmers, the interview took place in four districts of Unguja and Pemba islands. The districts were Mkoani and Chakechake for Pemba, and Mjini, Magharib B and Magharib A for Unguja. Information about disease control and treatment practices, prevention measures, vaccination protocols, medication usage, management, nutrition and risk were the main interviewed questions.

For the case of extension officers and veterinarians, the interviewed questionnaires were farmers' experiences, challenges, and decision - making processes toward veterinary issues during their production time.

2.3 Observation

Following on farm visit, direct observation was done to understand farmers' practices related to disease control and treatment. A Checklist was prepared that documents the physical conditions of the farm, biosecurity measures, cleanliness, vaccination procedures, medication administration, and other relevant practices

2.4 Data Analysis and Processing

Data collected from the key respondents after interviews were transcribed to represent quantitative data. Quantitative analysis was done through the statistical package for social sciences (SPSS). The outputs were expressed as frequency tables, percentage Bar chart and cross - tabulation for descriptive statistics. For inferential statistics, chi - square test, independent t - test and logistic regression were used to analyze the comparative factors of the regional results as explained below:

$$\log \frac{P(x)}{1-p(x)} = \beta o + x.\beta + \cdots$$

Where:
P = Probability of the exotic chicken motility
x = Dependent variable
βo = Intercept
β = vector of estimated coefficient of dependent variable
…. Mortality rate as independent variable which categorical variable where dependent variable were based on farm management, Disease and security, veterinary service and demographic status which also are categorical.

3. Results

3.1 Current Status of Exotic chicken Farmer.

The household characteristics of the respondents (Table 1) revealed that Majority of respondent (70.8%) were male compared to female (29.2%) with marital status for both genders as 92.7% indicate married. The respondents also indicated average age of above 45 (78.1%). Livestock farming as main occupation accounted for 69.8% and source of income for the respondent are business (59.4%). Majority of farmer keep layers chicken breed (53.1%) while broilers

accounts for 45.8%. concerning education level, more than half of the respondents (57.3%) have secondary level of education

Table 1: Distribution of the Respondents Status according to their Socioeconomic Characteristics

Variable	Frequency	Percentages
Gender		
Male	68	70.8
Female	28	29.2
Level of Education		
Primary level	15	15.6
Secondary level	55	57.3
College	26	27.1
Age (Years)		
26 - 35	9	9.4
36 - 45	12	12.5
≥45	75	78.1
Marital status		
Married	89	92.7
Single	5	5.2
Divorced	2	2.1
Livestock Farming	67	69.8
Crop Farming	8	8.3
Entrepreneur	14	14.6
Employee	7	7.3
Type of exotic chicken breeds		
broiler	44	45.8
Layers	51	53.1
Dual purpose	1	1.0
Capital for the Business		
Family friends support	23	24.0
Cooperative	1	1.0
Business	57	59.4
Microfinance	8	8.3
Government credit	2	2.1
Livestock saving	4	4.2
personal saving	1	1.0
Microfinance	8	8.3

Source: Primary data, Feld Survey 2023

3.2 Factors that determine mortality in the two regions.

Factors that determine severity of mortality during poultry production were observed after cross tabulating variables from common five dependent variables with mortality in the Kusini and MjiniMagharib regions, indicated in table 3.2. There was a significant association between general level of farm plan and death occurrence (χ^2 (2) = 8.168, p=0.017< 0.05) while the results of Cramer's V and Phi measures high impact of by 0.292. This implies that death is related to level of farm general management which start from equipment, housing plan and financial plans.

The results of the relationship between time of disease outbreak and death occurrence shows significant association since (χ^2 (3) = 11.550, p=0.009< 0.05) while the results of Cramer's V and Phi measures high impact of by 0.418. This implies that death is related to time of diseases outbreak and it is explained by the exposure of the microorganism to the incubation period. The results for level of education, veterinary access and experience have shown to have medium impact to disease outbreak.

Volume 14 Issue 3, March 2025
Fully Refereed | Open Access | Double Blind Peer Reviewed Journal
www.ijsr.net

Paper ID: SR241216115634   DOI: https://dx.doi.org/10.21275/SR241216115634   47

Table 2: Chi - square test of the dependent variable

Variable	Value	df	Sig2 – sided	Phi value
Level of education	2.631	2	0.268	0.166
Experience	0.559	3	0.906	0.076
General management plan	8.168	2	0.017	0.292
Disease outbreak	11.550	3	0.009	0.418
Veterinary doctor access	2.635	1	0.105	0.166

3.3. Prediction of the factors associating the Mortality of the poultry

Table 3.3 represent logistic regression model test to predict a dichotomous categorical variable of mortality related to independent variables of farm management, disease and bio security, veterinary services and demographic status. Diseases and biosecurity ranked the first and second followed by farm management, demographic and veterinary services. When a simple logistic regression was conducted to determine whether mortality predicts the probability that factors are the main source, the first test was the mortality explained by 15.8% (Nagelkerke R2) of the variance in the farm management. Thus, the factor of mortality was associated with the likelihood of farm management factors since model fit is statistically significant (χ^2 (11) =.04, p < 0.001). The second test was that mortality explained by 92.8% (Nagelkerke R2) of the variance in the diseases and biosecurity. This imply that mortality was associated with the likelihood of diseases and biosecurity factors since model fit is statistically significant (χ^2 (4) =.000, p < 0.001). The third test was that the mortality explained by 21.1% (Nagelkerke R2) of the variance in the veterinary service. Thus, mortality not associated with the likelihood of veterinary services factor since model fit was not statistically significant (χ^2 (11) =.147, p > 0.001). The fourth test was the mortality explained by 32.1% (Nagelkerke R2) of the variance in the demographic meaning the number of death (mortality) was associated with the likelihood of demographic factors since model fit is statistically significant (χ^2 (4) =.000, p < 0.001).

Table 3: Indicating Logistic regression test association of the four factors with Mortality variable

Explanatory Variables	Chi - square	df	Sig.	Nagelkerke R^2	% Correct
Farm Management	11.619	5	.040	.158	66.7
Diseases & Biosecurity	105.238	4	.000	.928	97.8
Veterinary services	15.841	11	.147	.211	67.7
Demographic status	25.256	11	.008	.321	78.1

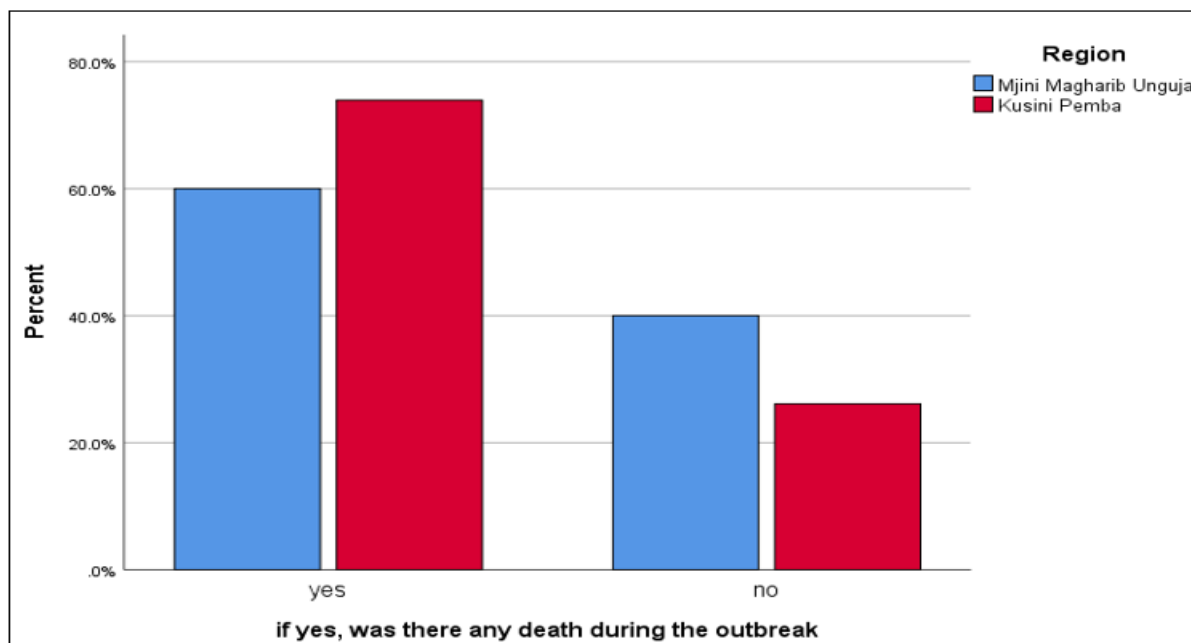## 4. Geographical region mortality prevalence

The independent t test was used across regions and district and check if there were any significant differences in the mortality b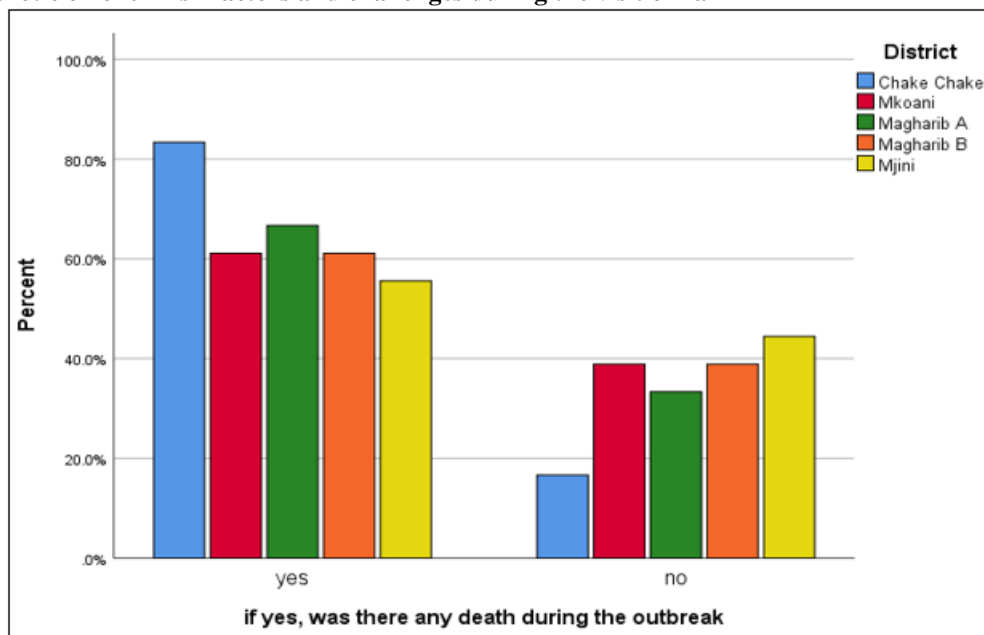etween variables. The results shown in table 3.5 indicates that there is no significance difference between regions, and district in terms of death prevalence since p - value > 0.001. However, there were some slight differences shown at districts level (figure 3.5) that might be due to the difference in type of chicken that the farmers keep.

Table 4: Results from Region and District after Independent T test table

Levene's Test for Equality of Variances		F	Sig.	T	df	Sig. (2 - tailed)	95% Confidence Interval of the Difference	
							Lower	Upper
Region	Equal variances assumed	3.241	.075	1.445	94	.152	- .058	.371
	Equal variances not assumed			1.456	63.366	.150	- .058	.371
District	Equal variances assumed	.362	.549	- 1.800	94	.075	- 1.183	.058
	Equal variances not assumed			- 1.833	65.180	.071	- 1.175	.050

Volume 14 Issue 3, March 2025
Fully Refereed | Open Access | Double Blind Peer Reviewed Journal
www.ijsr.net

Paper ID: SR241216115634   DOI: https://dx.doi.org/10.21275/SR241216115634   48

3.5. Observed exotic chicken risk factors and challenges during the visit on farm

Better to worse bio - security practices have been assessed in both regions by ranking with ticks for factors ranging from Disease control and treatments all the way to specific environmental stress as shown in table 3.6

Table 5: Field Checklist indicating on farm situation 1. Better (√√√) 2. Good (√√) 3. Worse (√)

Observed items	Mjini Magharib	Kusini Pemba
Disease control and treatment.	√√√	√√
Physical conditions of the farm,	√√√	√√
Bio - security measures,	√√	√
Cleanliness,	√√	√√
Vaccination procedures,	√√	√√
Medication administration,	√√√	√√√
Other relevant practices (Hygiene of stock person).	√	√√
Average temperature inside the chicken ban	√	√
Average humidity level in the chicken ban	√	√
Ventilation system is used in the chicken ban	√√√	√√
Lighting schedule provided to the chicken	√√	√
Specific environmental stressors identified (e. g. ammonia levels, dust)	√	√

The results indicated that the better ranked factors were Medication administration for both regions while the Ventilation system, Disease control and treatment, Physical conditions of the farm and Vaccination procedures ranked good. The worst ranked factors were specific environmental stressors, average temperature and average humidity level in the chicken ban for both two regions. There were also some differences between the two regions with MjiniMagharibi slightly outweigh Kusini Pemba for the case of Disease control and treatment, Physical conditions of the farm and Ventilation system a few to analysis

5. Discussion and Conclusion

Losses due to mortality of exotic chickens in poultry farms in Zanzibar is one of the challenges that have been there for decades. It is expected that some of the factors contributing to the losses are the lack of knowledge and skills of the farmers, time exposure of diseases outbreak, veterinary access, diseases and bio - security and chicken demographic factors in the ban.

For Zanzibar, MjiniMagharibi Unguja and Kusini Pemba were taken as a case study for the investigation of the factors that affect mortality in this study. The results indicate that exotic chicken farming in Zanzibar is dominated by males with a considerable good experience in livestock keeping and majority are literate with secondary level of education. Chicken famers have been keeping exotic breeds for business as compared to local chicken breeds. This description of the chicken farmers in Zanzibar is not different from other studied areas in developing countries that indicated similar trends for the male domination in the chicken farming and the preference of keeping exotic chicken for business due to market preferences as well as short circle of production for the exotic chicken breeds (Msami, 2017)

For the case of Mortality of exotic chicken, the results indicated high association of mortality with the level of farm management which is in line with other studies in many developing countries that shows the same association (Bereket Addis et al 2014, Šranková et al, 2019, Hanif and Larghan 2023). The generalization from these studies indicated that farmers should have at least three aspects involved in management plan which are production plan,

equipment and housing plan and financial plan (Biki, 2015, Wycliffe A. Otieno (2023)) .

Chicken mortality was also highly related to the time of diseases outbreak, and the number of exotic chicken placement in this finding. This survey result can be explained by the exposure of the microorganism to the incubation period as well as easy infection of densely placed chicken as other studies suggested (Msami, 2017, Azizzadeh, 2013) .

The results for level of education, veterinary access and experience have shown to have medium impact to disease outbreak. The reason might be that environmental stressor like disease are not given much attention as most of chicken farmer could lend experience from previously chicken farmers on how to deal with these stressors instead of depending on education or government extension services.

Overall, this study emphasized that multiple factors such as time exposure of diseases outbreak, veterinary access, hygiene practices, disease management, and vaccination, bio - security and chicken demographic factors in the ban have contributed to the raise in exotic chicken mortality rates. For these reasons, by recuperating these conditions it is likely that the intensity of losses will decline and therefore will play a significant role in the growth and development of the exotic chicken farming industry in Zanzibar. Thus, the findings of this study indicate critical areas for intervention for sustainable exotic chicken farming and lay the foundation for future research and policy development in the poultry sector.

References

[1] Agriculture, N. S. C. o. (2019/2020). *National Crops and Livestock Sectors and Fish Farming Report*. NSCA: National Bureau of Statistics.

[2] Amal Yasein M m. H. E., Mohamed Ahamed El Hado, and abdalbasit adam mariod 2020. The Impact of Poultry Production on Empowering of Rural Women Development. *YuzuncuYil University Journal of Agricultural Science,* 30.

[3] Azizzadeh, M. (2013). The rate of losses and influencing factors in insured broiler farms in Mashhad city. *Veterinary Journal*, 45 - 49.

[4] Bello, O. G., Kayode, A. O., Orifah, M. O., Agbana, O., Onasanya, G. O and Ajayi, G. T. (2020). Livestock Farmers' Perception towards the Utilization of Veterinary Services in Kwara State, Nigeria. *Journal of Information, Education, Science and Technology (JIEST) Federal University of Technology Minna, Niger State, Nigeria, 6* (2).

[5] Bereket A., Desalew T & Shigdaf M. (2014). Study on major causes of chicken mortality and associated risk factors in Bahir Dar Zuria District, Ethiopia. *African Journal of Agricultural.* Vol.9 (48), pp.3465 - 3472. DOI: 10.5897/AJAR2014.9012

[6] Dawit Mamo Zegeye, M. B. A. a. W. E. W. (2023). COMMERCIAL LAYING HEN PRODUCTION AND EGG VALUE CHAIN MAPPING IN NORTHERN ETHIOPIA. *Tropical and Subtropical Agroecosystems, 26*. doi: http: //doi. org/10.56369/tsaes.4354

[7] Hassan, M. A. J. (2013 - 2014). *Income Projections and Financial Spending of the Ministry of Livestock and Fisheries*. Zanzibar: House of Representative Retrieved from http: //www.mlfzanzibar. go. tz/index. php?mlf=budget.

[8] Larghani, M. A. H. F. (2023). Investigation of Factors and Mortality Rate of Broiler Chickens in Poultry Farms in Maymana City. *Journal for Research in Applied Sciences and Biotechnology, 12* (5), 119 - 127. doi: https: //doi. org/10.55544/jrasb.2.5.20

[9] Laws, S., Harper, C., Jones, N., & Marcus, R. (2013). *Research For Development* (Second Edition ed.).1 Oliver's Yard, 55 City Road, London EC1Y 1SP: Sage Publication Inc.

[10] Msami, D. H. (2017). *Strategies for the Prevention and Control of Infectious Diseases (including Highly Pathogenic Avian Influenza) in Eastern Africa*. Retrieved from

[11] Mutibvu, T, Maburutse, B. E, Mbiriri, D. T & Kashangura, M. T (2012). Constraints and opportunities for increased livestock production in communal areas: A case study of 12 Simbe, Zimbabwe. *Livestock Research for Rural Development* 24 (9).2012 Irrd. org/irrd24/9/muti24165. htm

[12] Wycliffe A. Otieno, R. A. N., Stephen G. Mbogoh, Elizaphan J. O. Rao. (2023). Adoption of farm biosecurity practices among smallholder poultry farmers in Kenya – An application of latent class analysis with a multinomial logistic regression. *Elsevier: Preventive Veterinary Medicine, 217* (105967).

[13] ŠRANKOVÁ V. LENDELOVÁ J. MIHINA S,. ŽITŇÁK M. & Nawalany G. (2019). Mortality of Broiler Chickens During Summer Fattening Periods Affected by Microclimatic Conditions. *Acta Technologica Agriculturae*. DOI: 10.2478/ata - 2019 - 0005

[14] Biki, M. (2015). Analysis of losses in broiler farms in Qom province using logistic regression. Scientific - Research Journal of the National Institute of Animal Science, 51 - 58.