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Chicken production systems and management practices and their role on Newcastle Disease outbreaks in Kenya: A survey of Kakamega and Machakos Counties

Billy O. Ipara[a], David J. Otieno[a], Rose A. Nyikal[a] and Stellah N. Makokha[b]

a University of Nairobi, Department of Agricultural Economics, Kenya
b Kenya Agricultural and Livestock Research Organization (KALRO), KALRO Biotechnology Center, Kabete, Kenya

Introduction

The Newcastle Disease is regarded as the most prevalent and fatal fowl disease in Kenya (King'ori et al, 2010a; Atela et al., 2016). Despite the known losses from the disease, efforts to address the problem of the disease are not adequate. The challenges faced in controlling ND in Kenya include the lack of basic preventive and control mechanisms, lack of basic training on animal health and inadequate knowledge regarding the disease.

Continuous vaccination offers the only effective control measure against the disease. However, most small-scale chicken farmers rarely vaccinate their flock partly because they can ill afford mandatory refrigeration services that are required for storage and transportation of commercially available vaccines. Free range systems of production pose difficulties in terms of management of ND because they expose the birds to direct contact with parasites and disease-causing pathogens (Ogada et al., 2016). It is also unclear how the farmers especially those using the free-range production system manage the disease. The use of poor practices favors the introduction and outbreaks of the disease, posing challenges in the control of ND. Whereas evidence of control of the ND in commercial chicken is well documented, the challenge remains in free range production systems.

There exists limited information on how the chicken value chain practices influence ND outbreaks as farmers traders manage their flocks differently. The paper aimed at addressing the mentioned gap by determining the effect of production systems and management practices on the frequency of ND outbreaks.

Material and Methods

2.1 Study area

The study was conducted in Kakamega and Machakos Counties, Kenya. Kakamega County is located in the western part of Kenya, and mainly relies on agricultural production. The presence of tropical rain forests like Kakamega and Malava forests within the County provide an environment for interaction between wild birds, migratory birds and domesticated birds. These were of significant interest to the study on ND outbreaks.

Machakos County is located in the eastern part and Indigenous chicken is one of the prioritized value chains in the County. The county is also located along a traditional migratory corridor for wild animals and pastoralists moving their cattle. This creates an environment for the interaction

between wild animals and domesticated poultry, which can have considerable implication on disease spread.

2.2 Study design, sampling and data collection

A focus group discussion (FGD) was conducted in Kakamega County. The insights from the FGD were utilized to refine and validate the survey tools to be used during data collection, and the eventual results from this study. Due to the devolved nature of agriculture in Kenya, key informant interviews were conducted in both counties to account for differences in perspectives regarding chicken production.

A three-stage sampling procedure was applied. In the first stage, purposive sampling was used to select Kakamega and Machakos Counties. In the second stage, 6 sub-Counties namely Butere, Ikolomani, Lurambi, Matunguu, Mumias and Shinyalu were selected from Kakamega. In Machakos, 5 sub-Counties namely Kathiani, Kola, Masaku, Mwala and Masii were selected Villages in the sub-Counties were randomly selected with the help of Agricultural officers.

A simple random sampling method was used to select 192 and 140 farmers for interview in Kakamega and Machakos, respectively. Data was collected through face-to-face interviews using semi-structured questionnaires.

The Poisson Regression Model (PRM) was used in this study. analyze the effects of production systems and management practices as well as the farmer attributes on the frequency of ND outbreaks. The dependent variable (the frequency of ND) was of count nature, and was measured as the number of outbreaks a farmer has experienced within a 6-month period.

Results and Discussion

4.4 Effects of chicken production systems and management practices on ND outbreaks

Flock size was found to have a positive effect on the frequency of ND outbreaks in Machakos as well as in the pooled sample. Ownership of large flock sizes increases the likelihood of disease spread form bird to bird. According to Tomo (2009), thus birds in large flock sizes have a higher chance of infecting each other because of contact.

Age of the birds was found to have a positive effect on the frequency of ND outbreaks among farmers in Machakos. Farmers with multi-aged birds were likely to experience more outbreaks of ND as they create challenges for effective administration of vaccines within the flock. Dimitrov et al (2017) highlights multi-age birds as one of the impediments of preventing outbreaks of ND.

Housing was found to have a negative effect on the frequency of ND outbreaks in the pooled sample. Farmers who provided special housing for their flock were likely to experience more outbreaks of ND. Housing of chicken under special shelters reduces the risk of birds being exposed to disease causing pathogens. According to Njagi (2008), good housing reduces disease transmission by reducing contact of chicken with infectious agents.

Flock composition under housing had a negative effect on the frequency of disease outbreaks in Kakamega. Farmers who separated their flock according to the age or the sex of the birds were likely to experience lesser ND outbreaks compared to those who did not separate their flock. Kusina et al. (2001) highlights that the existence of various age groups in the flock may contribute to disease spread as younger birds are more susceptible to diseases.

Table 1: Effects of production systems, management practices and farmer attributes on ND outbreaks

	Kakamega (n = 192)		Machakos (n = 140)		Pooled Farmers (n = 332)	
Practices	**Coef.**	**p-value**	**Coef.**	**p-value**	**Coef.**	**p-value**
Breed composition	-.283	0.491	-.451	0.212	-.268	0.298
Flock size	.103	0.690	.729	0.010***	.342	0.057*
Age of birds	-.069	0.901	1.742	0.091*	.547	0.248
Source of birds	.471	0.399	-1.752	0.091*	-.283	0.552
Form of housing	-.242	0.233	-.345	0.147	-.388	0.005***
Housing composition	-.581	0.024**	.026	0.901	-.136	0.378
Frequency of cleaning housing	.376	0.096*	-.188	0.298	.027	0.839
Means of feeding	-.105	0.580	-.263	0.209	-.223	0.099*
Feed administration	.080	0.749	-.317	0.186	-.170	0.308
Screening of birds	-.460	0.104	-.412	0.101	-.476	0.007***
ND vaccination	-.378	0.091*	-.423	0.057*	-.350	0.016**
Production system						
Intensive	-.265	0.460	-1.371	0.184	-.461	0.149
Semi intensive	-.362	0.167	.148	0.568	-.201	0.260
Mixed	-.344	0.266	-.463	0.108	-.387	0.056*
Farmer attributes						
ND awareness	-.607	0.039**	-.553	0.016**	-.489	0.005***
Extension access	-.653	0.001***	-.034	0.878	-.319	0.021**
Experience	.183	0.349	-.321	0.133	.039	0.785
Training access	-.237	0.249	-.073	0.743	-.156	0.291
Constant	-1.400	0.003	.168	0.701	-.533	0.085
Log likelihood	**-201.730**		**-167.015**		**-396.559**	
Pseudo R^2	**0.109**		**0.141**		**0.084**	
Prob> chi2	**0.000**		**0.000**		**0.000**	

Note: ***, **, * denote significance at 10, 5 and 1 percent, respectively.

Source: Survey Data (2018).

Screening of birds had a negative effect on the frequency of ND in Machakos as well as the pooled sample. The absence of screening lead to disease introduction and outbreaks. Aila et al. (2014) found that the dominance of indigenous poultry systems with limited practices like screening provides a challenge in preventing poultry disease outbreaks in Kenya.

Vaccination had a negative effect on the frequency of ND outbreaks in both Counties as well as the pooled sample. Farmers who vaccinated their flock were likely to experience fewer outbreaks of ND compared to those who did not. According to Maragnon and Busani (2007) vaccination of flock is effective in reducing mortalities and production losses.

Production system had a negative effect on the frequency of ND in the pooled sample. Compared to the free-range production system, farmers who used a mixed system of production were likely to experience less outbreaks of ND. In the free-range system, birds are exposed to disease causing agents due to the scavenging nature of the birds as the movement of birds is rarely controlled.

ND awareness was found to have a negative effect on the frequency of ND outbreaks in both counties. Farmers who were aware of ND were likely to experience less outbreaks of ND compared to those who were not aware. Farmers with limited awareness are likely to experience more outbreaks of ND due to their limited knowledge regarding disease prevention and control.

Extension access was found to have a negative effect on the frequency of ND outbreaks in Kakamega as well as the pooled sample. Farmers who had access to extension services were likely to experience less outbreaks of ND, compared to those without access. Akintunde and Adeoti (2016) also reported that extension increases the knowledge of disease prevention. This helps to reduce the frequency of ND outbreaks.

Conclusions and Outlook

Based on the findings from this study, there is need to create awareness among chicken farmers on aspects like disease detection and symptoms of ND, disease response strategies as well as mitigation measures during outbreaks. Results show that aspects such as housing and feeding routines promoted the outbreaks of ND. Farmers should be sensitized on the need to invest in better feeding practices for chicken as well as proper housing for chicken. Adoption of the practices will reduce the likelihood of birds coming into contact with disease spreading pathogens.

Vaccination is generally seen as the most effective tool in combating ND. However, some farmers did vaccinate their flock against ND. Counties in collaboration with the veterinary department and agrovets can implement vaccination campaigns and trainings to sensitize farmers on the importance of vaccination their flocks so as to improve immunity against ND.

References

Aila, F. O., Oima, D., Ochieng, I. and Odera, O. 2012. Biosecurity factors informing consumer preferences for indigenous chicken: A literature review. *Business and Management Review,* 1 (12), 60 – 71.

Akintunde, O. K and Adeoti, A. I. 2014. Assessment of factors influencing the level of poultry diseases management in South West Nigeria. *Trends in Agricultural Economics*, 7 (21): 41-56.

Atela, J. A., Ouma, P. O., Tuitoek, J., Onjoro, P. A. and Nyangweso, S. E. 2016. A comparative performance of indigenous chicken in Baringo and Kisumu Counties of Kenya for sustainable agriculture. *International Journal of Agricultural Policy and Research*, 4 (6), 97-104.

Dimitrov, K. M., Afonso, C. L., Yu, Q., and Miller, P. J. (2017). Newcastle disease vaccines—A solved problem or a continuous challenge? *Veterinary microbiology*, 206, 126-136.

King'ori, A. M., Wachira, A. M and Tuitoek, U. K. 2010a. Effects of dietary crude protein levels on egg production, hatchability and post-hatch offspring performance of indigenous chickens. *International Journal of Poultry Sciences;* 9 (4); 324-329.

Kusina, J., Kusina, N. T., and Mhlanga, J. 2001. A survey on village chicken losses: causes and solutions as perceived by farmers. *ACIAR Proceedings*, 148-155.

Marangon, S., and Busani, L. 2007. The use of vaccination in poultry production. *Revue Scientifique et Technique-Office International des Epizooties*, 26(1), 265.

Njagi, L. W., Nyaga, P. N., Mbuthia, P. G., Bebora, L. C., Michieka, J. N and Minga, U. M. 2010. A retrospective study of factors associated with Newcastle disease outbreaks in village indigenous chickens. *Bulletin of Animal Health and Production in Africa,* 58, 22-33.

Ogada S, Lichoti, J., Oyier P. A., Imboma T, Peng, M. S, Ngeiywa, K. J., Ommeh,S. C. 2016. A survey on disease prevalence, ectoparasite infestation and chick mortality in poultry populations of Kenya. *Livestock Research for Rural Development, 28.*

Tomo, A. 2009. Economic impact of Newcastle Disease control in village chicken; A case study in Mozambique. Master of science thesis. Michigan State University, USA.