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# Household characteristics influencing management of indigenous chicken: A case study of Machakos and Busia Counties in Kenya

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**The study was conducted in 225 indigenous chicken keeping households between August 2020 and July 2021 in Machakos and Busia Counties. A semi-structured questionnaire was used to collect data on socio-economic factors, flock characteristics and management practices from targeted households. Overall, majority of respondents were male (82%) with formal education (87%). Agriculture was the main source of income for most households (71%). One third of the households accessed extension services (26%), market information (31%) and credit (33%). The extensive system of production was predominant (66%) with an average chicken flock size of 28 birds characterized by low chick survival rate (33%). There was selective adoption of management interventions, with 76% of households adopting feed supplementation and half (55%) adopted improved chicken housing. Lesser proportion of households practiced improved chick rearing (32%) and vaccinated their chicken (30%). Access to credit and literacy increased adoption of the management interventions ($p<0.05$). Adoption of management interventions such as improved chick rearing and housing increased chick survival and average chicken flock size significantly ($p>0.05$). The findings point to necessary targeted efforts such as improving farmer access to credit and provision of specifically packaged extension messages to meet needs of indigenous chicken farmers.**

**Key words:** Indigenous chicken, management interventions, adoption, socioeconomic factors.

## INTRODUCTION

In Kenya, poultry is vital to the livelihoods of a population of over 24 million people, most of who reside in rural areas. To poultry keepers, poultry contributes to household income, food security, social support and

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provides capital for investments (KIPPRA, 2020). Nationally, the poultry sub-sector contributes to 7.8% of Kenya's agricultural gross domestic product (AgGDP) and to 0.7% of the total GDP (KNBS, 2021). Indigenous chicken (IC) accounts for over 80% of the total poultry population in Kenya and produces 61% of poultry meat and 47% of eggs consumed in the country (KNBS, 2016). Indigenous chicken keeping is a low-input enterprise that is particularly attractive to the marginalized groups such as women, the elderly, youth, persons living with disability and those living with HIV/AIDs and thus an important source of livelihood (KNBS, 2020). Indigenous chicken is undisputedly, a livestock resource that contributes significantly to Kenya's economy, wealth and livelihoods of its population and has even greater potential to bring sustainable economic development among the resource poor countries. However, IC productivity is low due to the use of low performing chicken breeds, poor management, poor nutrition, lack of disease control measures and lack of infrastructural and policy support (Ndegwa et al., 2015).

Indigenous chicken in Kenya consists of a heterogeneous population with low performance. They reach a low average live weight of 1.8 and 2.6 kg for a mature hen and cock respectively (Kingori et al., 2010). Hens lay an average of 72 eggs per year. The indigenous chicken are kept in a low input production system which involves scavenging for insects, food wastes, green grass and scattered grain (Okeno et al., 2012) with occasional supplementation with household wastes and grain. The estimated feed intake of scavenging birds is deficient in crude protein and energy required for growth and production (Kingori et al., 2010). Lack of disease control measures in IC production system in Kenya results in 40 to 60% chick mortality over the first 8 weeks (Olwande et al., 2010), with Newcastle disease, fowl pox, parasitic infestation and predation being the highest cause of mortality (Olwande et al., 2016). Although the genetic performance of the indigenous chicken ecotypes and the poor nutrition, lack of disease control measures and lack of housing results in low-output of eggs and meat production per bird, indigenous chickens are hardy and able to survive in harsh environments; they are able to produce in low input management systems with fluctuations in available feed resources. Improvement in management of IC could result in improved production and productivity (Magothe et al., 2012)

Management interventions such as disease prevention and control, predator control, improved feeding, housing, chicken rearing and genetic improvement are suggested as measures to mitigate challenges in IC productivity (Okeno et al., 2012). In an effort to improve IC productivity, the County Governments and other stakeholders have cranked efforts by enhancing the knowledge of farmers on practices needed for improved poultry management. However, in spite of the capacity building efforts, improved poultry management interventions have poorly been adopted by farmers due to poorly understood reasons.

This study reports the household characteristics influencing management of IC by comparing two counties in Kenya with different IC production systems; one tending towards commercialization and the other practicing traditional extensive IC rearing. The study contributes to information critical for targeted management interventions in IC production systems in Kenya and the African region in general.

## MATERIALS AND METHODS

### Study area

The study was conducted in Busia and Machakos Counties in Kenya (Figure 1) between August 2020 and July 2021. These two counties were selected because households predominantly keep IC for food and income. Busia County is situated in Western Kenya bordered by Kakamega County to the East, Bungoma County to the north, Lake Victoria and Siaya County to the South and Busia District, Uganda to the west. The county has arable land and has received above 1000 mm of rainfall annually which supports subsistence mixed farming accounting for 60% of all economic activities and employs 80% of the inhabitants. The poultry sector has potential to contribute to income and food for the households in the county and is a key sector in the County's development agenda. IC population in the County is approximately 90% (1.5 million) of the total poultry population kept under the traditional extensive system (County Government of Busia, 2018)

Machakos County is within the semi-arid region situated in the Eastern part of Kenya. The county's main economic activity is agriculture with 60% of its total land area being arable. Productivity of its arable lands is however, compromised by the low amounts of rainfall, usually below 500 mm per year in most areas, which is not only quite erratic but is also poorly distributed in time and space(County Government of Machakos, 2018). Consequently, livestock keeping is predominantly practiced in Machakos County. The county is home to some renowned cattle ranches and thus contributes significantly to red meat consumed in Kenya. Similarly, with an estimated IC population of 1.7 million birds, the county is one of the leading sources of the IC consumed by the inhabitants of Nairobi, Kenya's capital city. Annually, Machakos produces 954 Metric tonnes of meat and eggs valued at KES 191 million produced from IC sub-sector (County Government of Machakos, 2021).

### Sampling and farmers selected

The study was carried out in Busia and Machakos Counties which were purposively selected because they were part of the 24 Kenya Climate Smart Project (KCSAP) project counties. The two counties were also selected because of the high IC population.

The questionnaire survey was carried out as cross-sectional survey in August, 2020 followed by a follow-up study until July, 2021. A sample size of 225 households was obtained based on the formulae (Charan and Kantharia, 2013).

$$n = \frac{Z^2 P(1-P)}{d^2}$$

Where n = Sample size, Z = Z statistic for a level of confidence, P =

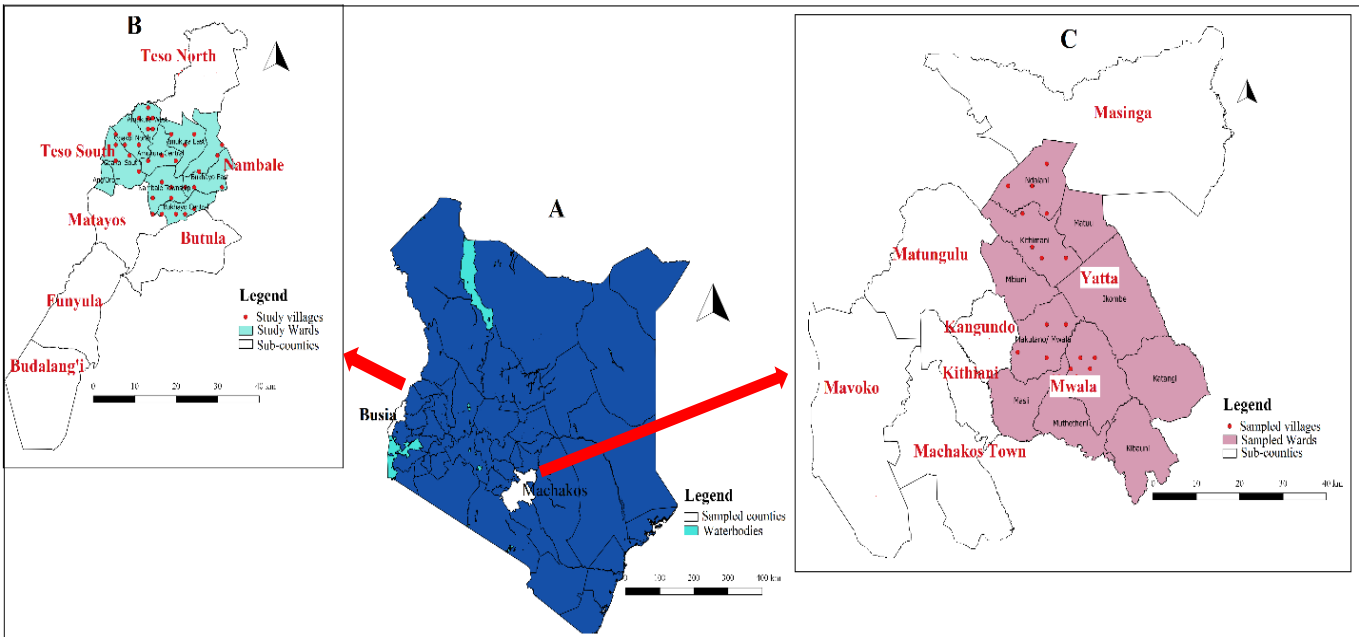


**Figure 1.** Geographical location of sampled households; A is a map of Kenya showing the location of Busia and Machakos counties indicated by arrows. B is a map of Busia County showing sub-counties, study Wards and villages. C is a map of Machakos County showing sub-counties, study Wards and villages.
Source: Author's 2022

proportion of population containing the major attributes of interest (IC keeping households), d = Precision. The proportion of IC keeping households is estimated as 50% because the proportion of households keeping IC is not known, a confidence level of 95% and precision of 7% was used. An increase of 15% of the calculated sample size was added to cater for non-response rate.

A multistage sampling was used to select the target households in Machakos and Busia Counties. The first step was the selection of two sub-counties from a list of sub-counties in the respective county. The selection was purposively done with those with the highest IC population getting selected. A list of wards in the selected sub-counties was then drawn before two wards were selected from each of the selected sub-counties using simple random sampling.

In each selected ward, four villages were purposively selected on the basis of IC population. From the selected villages, a list of indigenous chicken keepers was compiled with guidance from the County Veterinary and Livestock offices. Finally, eight IC keepers were purposively selected from each of the 4 villages where those with chicken flock sizes of at least 10 birds were selected. In total, 225 IC keepers were selected with Busia County contributing 117 farmers and Machakos farmers contributing 108 farmers.

### Survey instrument and survey

A structured questionnaire was developed, pre-tested and used during the baseline survey. The questionnaire captured data on household characteristics, IC management and production parameters. Household characteristics included the age, gender and education level of household head, access to credit**,** access to extension services, access to market information and main source of household income. The questionnaire also collected data on management interventions such as; feeds and feeding, breeds and breeding, housing and disease control as well as production parameters. Questionnaire survey was conducted through face-to-face interviews with household heads or their nominated representatives.

### Data management

Data were entered in Ms Excel and cleaned ready for analysis. Various parameters were analyzed descriptively using percentages and frequencies. Relationships between household characteristics, management practices and chicken production were derived through generalized linear models (GLM). Significance of relationships were established at $p<0.05$. The analysis was done using R software. Data from 5 farms in Machakos County were not included in the data analysis due to incomplete follow-up.

## RESULTS AND DISCUSSION

### Household characteristics

The household characteristics that were considered in the analysis include gender, age, education, and sources of income. Institutional support characteristics considered included: Access to extension, access to training, group membership and access to market information (Table 1). Majority of the respondents in both Busia and Machakos were male, with women respondents accounting for about one fifth. This is contrary to the assertion that chicken keeping is a preserve for women and youths

**Table 1.** Household and institutional support characteristics of indigenous chicken farmers (%) in Machakos and Busia County, Kenya.

| Variable | Households (%) | | |
|---|---|---|---|
| | Busia | Machakos | Overall |
| **Gender** | | | |
| Male | 79.5 | 84.5 | 81.8 |
| Female | 20.5 | 15.5 | 18.2 |
| **Education level of household head** | | | |
| No formal education | 14.6 | 10.7 | 12.7 |
| Primary level | 33.3 | 40.8 | 36.8 |
| Secondary level | 28.2 | 31.0 | 29.6 |
| Tertiary level | 23.9 | 17.5 | 20.9 |
| **Household main source of income** | | | |
| Agriculture | 70.1 | 70.9 | 70.5 |
| Salaried employment | 14.5 | 14.6 | 14.5 |
| Business | 6.0 | 7.8 | 6.8 |
| Casual labor | 9.4 | 6.8 | 8.2 |
| Access to extension | 36.8 | 14.7 | 26.4 |
| Group membership | 29.9 | 35.9 | 32.7 |
| Access to market information | 33.3 | 27.2 | 30.5 |
| Access to credit | 20.6 | 21.4 | 21.0 |
| **Sources of credit** | | | |
| Informal sources | 90.0 | 86.4 | 88.2 |
| Semi-informal sources | 8.5 | 4.6 | 6.6 |
| Formal sources | 1.5 | 9.0 | 5.2 |
| **Number** | **117** | **103** | **221** |

Source: Author's 2022

(Guèye, 2005). This is an indication of a paradigm shift with men are starting to take keen interest of the chicken enterprise and could be attributed the beginning of the transforming of the IC sub-sector from predominantly subsistence to commercial. A few of the household heads in both Busia (15%) and Machakos (11%) had no formal education. Slightly over one-third of the respondents had attained basic primary education level. The mean age of the household head was 53 years but ranges from 28 to 98 years.

Agriculture was the main source of income for majority of the households as it accounted for about 70% in both Busia and Machakos. Respondents who were in salaried employment accounted for just about 15% in both counties.

Institutional support to indigenous chicken keeping households was limited, with only about one third of the households getting access to extension services. Although agriculture is the main source of income for rural households; extension services are not reaching theses rural farmers. The current governance structure in which agriculture has been devolved seems to have contributed to this. Underfunding and staff challenges at the county level are the key contributors. This is of great concern since access to extension is vital in provision of knowledge and skills to enable farmers address production constraints (Ochieng et al., 2011). Similar to extension, access one fifth of the households accessing credit and those who reported accessing credit are predominantly sourced it from the informal sector including borrowing from friends, neighbors and self-help groups. On the contrary, formal sources, including banks, SACCOs and semi-informal sources (Micro-finance institutions), were less preferred as sources of credit in both counties, with only 6.6 and 5.2% of households accessing credit via these sources respectively. Therefore, there exists an opportunity to scale uptake of credit services to shore up investment and enhance the productivity of the sub-sector. Only one third of the farmers had membership to self-help groups. Self-help groups enables households to access inputs, credit, training and lobby for better market prices (Yadav et al. 2021). Besides, since IC and IC products are marketed through unorganized markets and marketing channels

**Table 2.** Average number and composition of indigenous chicken flocks in Busia and Machakos County.

| Chicken category | Average number (% proportion of flock) | | |
|---|---|---|---|
| | Busia | Machakos | Overall |
| Chicks | 13 (50.0%) | 11(35.5%) | 12(42.9%) |
| Growers | 6 (23.1%) | 9 (29.0%) | 7 (25.0%) |
| Pullets and cockerels | 3 (11.5%) | 5 (16.1%) | 4 (14.3%) |
| Hen | 3 (11.5%) | 4 (12.9%) | 4 (14.3% |
| Cock | 1 (3.9%) | 2 (6.5%) | 1 (3.5%) |
| **Flock size** | **26** | **31** | **28** |

Source: Author's 2022

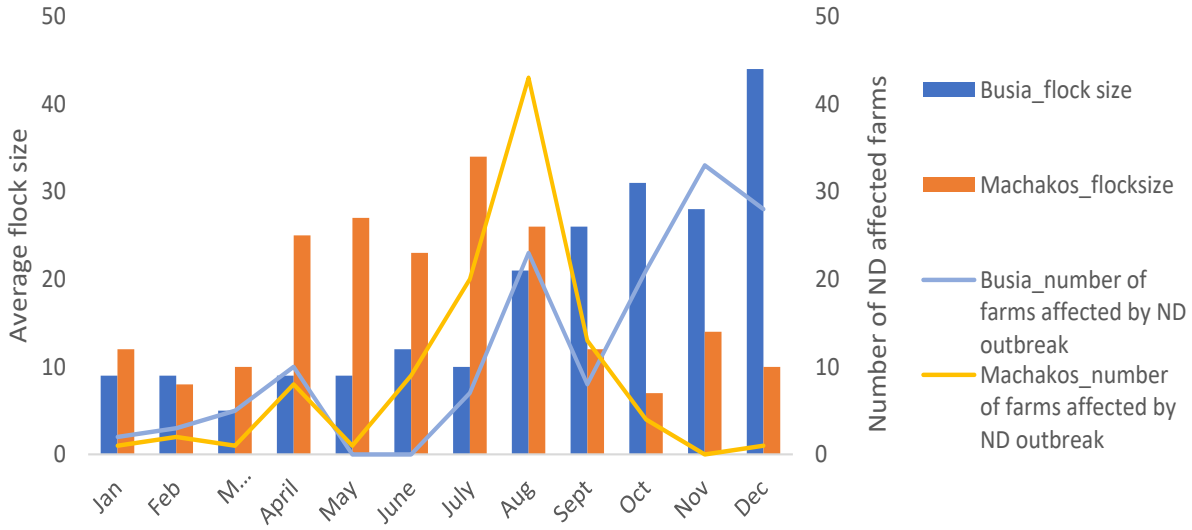


**Figure 2**. Association between Newcastle disease outbreaks and fluctuation in average flock mean numbers by months of the year in Busia and Machakos Counties, respectively.
Source: Author's 2022

where brokers seem to be the main actors who buy chicken directly from individual farmers. Self-help groups present opportunities for collective marketing and linkage to other value chain actors.

## Flock structure and dynamics

On average, the sampled households kept 28 chickens (Table 2). Comparatively, flock sizes were slightly higher in Machakos County (31) than in Busia County (26). These flock sizes are comparable with studies in developing countries that have reported mean flock size between (Olwande et al., 2010; Ngongolo and Chota, 2021). Chicks and growers made up two thirds (69.1%) of the flock. In both counties, the number of chicks was highest, although Busia had slightly more chicks than Machakos. Chick predominance in IC flocks has also been reported in other African countires (Moussa et al., 2019). Growers and hens also accounted for higher numbers in both counties. However, the number of growers, pullets and cockerels was higher in Machakos than Busia County. Cocks were the least kept, in the interviewed households.

The chicken flock size varied throughout the year among sampled farmers in both Machakos and Busia County. April to August and August to December recorded a peak in average flock sizes among the selected indigenous chicken keeping households in Machakos and Busia respectively (Figure 2). Decline in average flock sizes in both counties coincided with months following peaks of Newcastle disease outbreaks in April, August and November-December. Fluctuations in flock sizes have been linked to feed abundance and disease outbreaks (Okeno et al., 2012).

Free-range scavenging system was the most preferred

**Table 3.** Production system and flock dynamics of indigenous chicken in sampled households (%) in Machakos and Busia County.

| Variable | Households (%) | | |
|---|---|---|---|
| | Busia | Machakos | Overall |
| **Chicken production system** | | | |
| Free-range | 84.6 | 46.6 | 66.8 |
| Semi-intensive | 15.4 | 53.4 | 33.2 |
| **Chicken breeds** | | | |
| Indigenous only | 91.5 | 89.3 | 90.5 |
| Indigenous and crossbreeds | 8.5 | 10.7 | 9.5 |
| Keep mixed poultry species | 35.0 | 15.5 | 25.9 |
| **Main reason for keeping chicken** | | | |
| Commercial and subsistence | 69.2 | 85.4 | 76.8 |
| Subsistence only | 30.8 | 14.6 | 23.2 |
| **Number** | **117** | **103** | **221** |

Source: Author's 2022

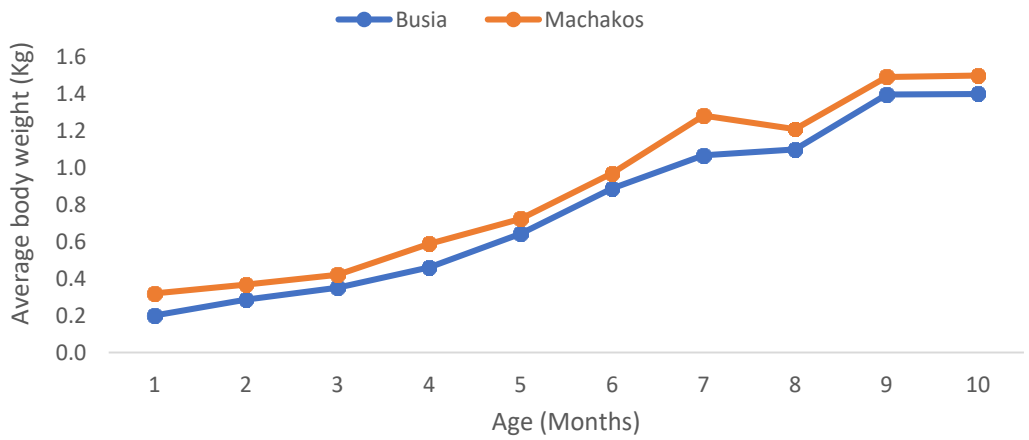


**Figure 3.** Changes in average body weight of indigenous chicken by age in Busia and Machakos.
Source: Author's 2022

system of raising chickens on 85% and 47% of households in Busia and Machakos Counties respectively (Table 3). Predominance of the extensive production of IC is similar to other African countries (Haoua et al., 2015). Busia County, chicken are kept for subsistence purposes and farmers make little investment with birds left to scavenge with limited supplementation from the food remains and poorly developed housing. In Machakos however, for semi-intensive system was preferred by more than half of the farmers. This is attributable to better off-take and income from the indigenous chicken and the commercial oriented production in Machakos County. Indigenous chicken keepers in Machakos County rear chickens with a market in mind having a niche market in Nairobi. Subsistence or commercial production affects the kind and level of inputs used for production as well as management practices (Khobondo et al., 2015).

Indigenous chicken ecotypes were the most predominant, accounting for about 90% of the birds in the interviewed households in both Busia and Machakos Counties. Only a paltry 9% in Busia and 11% Machakos of the respondents had preference for the improved indigenous crossbreeds, mainly Kenbro and Kuroiler. In the two study sites, indigenous chicken birds exhibit low body weight gain with the average body weight of the increased from 0.2 to 1.1 kg in Busia and 0.3 to 1.4 kg in 1 month old chicks and 10 months old pullets in Machakos respectively (Figure 3). The average number of eggs laid per bird per year was 69 and 100 in Busia

**Table 4**. Adoption levels of the different improved chicken management practices by households (%) in Busia and Machakos Counties, respectively.

| Improved management practice (%) | Busia (n=117) | Machakos (n=103) | Overall (n=220) |
|---|---|---|---|
| Vaccination | 29.1 | 31.1 | 30.0 |
| Feed supplementation | 65.8 | 86.4 | 75.5 |
| Housing | 40.2 | 71.9 | 55.0 |
| Brooding and Chick rearing | 23.9 | 41.7 | 32.3 |
| **Overall** | **9.4** | **14.6** | **11.8** |

Source: Author's 2022

and Machakos respectively. This may be a result of poor genetic quality of the IC chicken ecotypes as well as supplementation with feeds of inadequate nutrition (Khobondo et al., 2015). Chicken in their early ages require sufficient proportion of crude protein, 18 to 21% in the first weeks. However, due to competition for the protein rich foods for human consumption, IC keepers may not readily avail protein for chick feed formulation. Alternatives such as insect harvesting would provide the necessary protein. Selection and breeding of chicken ecotypes with better body weight gain and egg production is also an important step towards improved productivity of IC (Khobondo et al., 2014).

Keeping mixed poultry species, that is, ducks, guinea fowls and pigeons, together with chicken, was practiced in about a third of the households in Busia County but was a less common practice in Machakos County (16%). In both counties, households predominantly (77%) kept chicken for both commercial and subsistence purposes. In Busia County, twice the number of households (31%) kept chicken only for subsistence as compared to Machakos County (15%).

## Level of adoption of improved chicken management practices

Overall, in Machakos and Busia Counties, there was low adoption (12%) of the improved full management intervention package although respondents in Machakos had a slightly higher adoption level (13%) compared to those in Busia (3%) (Table 4). The indigenous chicken keeping households selectively adopted the improved management interventions similar to previous reports (Ochieng et al., 2012). Overall, feed supplementation was the most commonly (76%) adopted management intervention. Feed supplementation involved the use of local feeds and home rations which were less-costly. Commercial feeds were purchased by very few households specifically for chicks and growers. Such feeds have higher nutritive value and enhance growth (Adolwa et al., 2021). However, given the low output nature of IC and the fact that feeds contribute 60 to 70% of the production costs, it thus will not make sense to spend money buying expensive feeds for supplementing IC. It would therefore be better to use highly nutritive feeds that are cheap and locally available.

Two thirds of the respondents in Busia supplemented their birds using kitchen leftovers, grains including whole maize, sorghum, millet, brewer's grain; whereas in Machakos County, over four fifths of the respondents supplemented their chicken using commercial concentrates and locally made feed formulations which mainly includes maize bran, cowpea, green grams, pigeon pea, brewer's grain and fishmeal. Choice of the feed supplement to be given to chicken was dependant on the age of the chicken, availability and cost with chicks receiving commercial concentrate supplementation and other birds supplemented with local feed formulations and household wastes.

Overall, over half of the households housed their chicken, although respondents in Machakos County reported the highest ownership of chicken houses (72%) compared to about two thirds of respondents in Busia. Households that had no chicken houses kept their chicken in their living rooms or kitchens, at night. Without appropriate housing chicken are exposed to harsh conditions and allows loss of chicken through predation, theft, extreme weather, illness and injury (Hofmann et al., 2020). Improved housing is necessary to prevent such losses.

Chick rearing and brooding was practiced by about two-fifths of the households in Machakos County with a slightly smaller proportion of households (24%) practicing this in Busia County. Chick rearing involved separation of hatched chicks from mother hen and keeping them in brooders or in traditional baskets during the day, to prevent mother hen from wondering far with chicks. This was commonly practiced in Busia County. Households in Machakos County which practiced these completely separated chicks from the hens and kept them in improvised brooders until 6 weeks of age. In both Busia and Machakos County, improvised brooders were made from locally available material, such as cartons, old cooking pots or plastic basins. These brooders were either covered with blankets for warmth or provided with

**Table 5**. Multivariate linear regression analysis of the improved chicken management interventions against flock size and chick survival.

| Improved chicken management package | Chicken flock size (n=220) | | Chick survival (n=219) | |
|---|---|---|---|---|
| | ß-Coefficient | p-Value | ß-Coefficient | p-Value |
| Constant | 14.7(7.9-21.5) | | 7.1(-12.6-26.8) | |
| Feed supplementation | 1.3(-5.9-8.5) | 0.568 | 10.1(-10.9-31.1) | 0.314 |
| Vaccination | 3.3(-3.3-9.9) | 0.329 | 3.0(-20.0-26.1) | 0.498 |
| Brooding and chick rearing | 6.9(0.1-13.8)* | 0.048 | 57.4(34.3-80.4)* | 0.000 |
| Housing | 19.1(12.5-25.9)* | 0.000 | 11.1(-8.2-30.3) | 0.254 |

*Denotes ß-coefficients values which are significantly different (p<0.05);Values in parentheses 95% CI of the ß-coefficients.
Source: Author's 2022

lamps. Adoption of improved chick rearing methods in Machakos could have been responsible for reduction in chick mortality by half in Machakos (20.6%) compared to Busia County (49.2%).

Vaccination was not well adopted yet this is an effective disease control option for indigenous chicken farmers with about one third of the respondents in both counties vaccinated their chicken flocks. All the households who had adopted vaccination of their flocks did so to predominantly control Newcastle disease. Overall, a small proportion (7%) of the respondents reported adopting vaccination against Infectious Bursal disease (Gumboro) and 3.5% adopting vaccination of their chicken flocks against fowl pox. Various reasons have been given for low adoption of vaccination among indigenous chicken farmers including high cost of vaccines and lack of information (Campbell et al., 2019). While vaccination was not well adopted, the study results show that Newcastle disease outbreaks resulted in low chicken flock sizes associated with high chicken mortality in infected and non-vaccinated flocks. Newcastle disease is a major constraint to indigenous chicken production causing 50 to 100% mortality in unvaccinated flocks (Ipara et al., 2021).

Table 5 shows the result of the average chicken flock size and number of chicks surviving to 3 months regressed against management interventions in a multivariate analysis. Among the improved chicken management practices, housing and chick brooding and rearing were significant (p<0.05) interventions which influenced flock size. Brooding and chick rearing significantly (p<0.5) influenced chick survival. Generally, households that housed their chicken and those that had adopted chick rearing brooding had significantly (p <0.05) higher flock sizes.

Adoption of brooding and chick rearing practices significantly (p<0.05) increased the number of chicks surviving to 3 months by 60 fold. Although vaccination and feed supplementation had little influence on flock size and chick survival (p>0.05) with multivariate regression, the two interventions showed a significant (p<0.05) increase on these two production parameters on univariate regression analysis (Additional file 1).

## Household characteristics influencing adoption of management interventions

Households in Machakos County had significantly (p<0.05) higher odds and thus more likely to adopt improved chicken management interventions including vaccination feed supplementation housingand chick rearing compared to those in Busia County (Table 6). Similar to the findings, adoption of management interventions has been linked to household socioeconomic factors such as income, education level and institutional support (Nanyeenya et al., 2013).

Household heads who had at least tertiary level of education had significantly (p<0.05) higher odds of adopting vaccination and chicken housing management interventions compared with those who had only primary level or no formal education. Similarly, household heads who were able to access credit were significantly (p<0.5) more likely to adopt the various improved management package compared to those that had no access to credit or financial support. While literacy levels ensure a better understanding of the need for management interventions, access to credit gives capital and also enhances purchase of inputs necessary for adoption of the interventions for example vaccines, feed and materials for chicken house construction (Youn and Lloyd, 2017).
Female- headed households were significantly (p<0.5) less likely to adopt chicken housing interventions compared to the male- headed households. This disparity could reflect gender differences in decision making and in access to resources and variation in skills of the different gender (Akite et al., 2018).

The role of construction chicken houses is a task mainly undertaken by men (Okitoi et al., 2007). While previous studies report gender differences in adoption of feed supplementation with higher adoption reported in female-headed households (Desta and Wakeyo, 2012;

**Table 6.** Household characteristics influencing adoption of management interventions by indigenous chicken keeping households in Busia and Machakos counties.

| Variable | Management intervention | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Vaccination | | Supplementation | | Housing | | Chick rearing and brooding | |
| | Odds ratio | p | Odds ratio | p | Odds ratio | p | Odds ratio | p |
| **Geographical location of household** | | | | | | | | |
| Busia | | | | | | | | |
| Machakos | 2.3(1.1-5.2)* | 0.03 | 3.2(1.4-7.5)* | 0.01 | 7.7(3.6-17.3)* | 0.00 | 3.0(1.5-6.2)* | 0.00 |
| **Gender of household head** | | | | | | | | |
| Male | | | | | | | | |
| Female | 0.8(0.3-2.2) | 0.72 | 0.5(0.1-1.3) | 0.13 | 0.4(0.2-1.0)* | 0.04 | 0.5(0.2-1.4) | 0.24 |
| Age of household head (years) | 1.0(0.9-1.1)) | 0.68 | 1.0(0.9-1.1) | 0.43 | 1.0(0.9-1.1) | 0.17 | 1.0(0.9-1.0) | 0.45 |
| Experience of in keeping poultry | 1.0(0.9-1.0) | 0.89 | 1.0(0.9-1.0) | 0.86 | 1.0(0.9-1.0) | 0.69 | 1.0(0.9-1.1) | 0.20 |
| **Education level of household head** | | | | | | | | |
| Primary level | 0.7(0.2-2.4) | 0.56 | 1.7(0.5-4.9) | 0.37 | 2.1(0.7-6.8) | 0.20 | 1.8(0.6-6.5) | 0.36 |
| Secondary level | 1.2(0.4-4.1) | 0.78 | 1.3(0.4-4.2) | 0.65 | 1.6(0.5-5.2) | 0.45 | 1.8(0.5-6.8) | 0.36 |
| Tertiary level | 3.8(1.1-15.5)* | 0.04 | 1.5(0.4-5.6) | 0.55 | 7.5(2.0-30.6)* | 0.00 | 2.6(0.7-11.1) | 0.17 |
| **Household main source of income** | | | | | | | | |
| Non-agriculture sources | 0.5(0.2-1.0) | 0.07 | 0.5(0.2-1.1) | 0.07 | 1.1(0.5-2.4) | 0.77 | 1.9(0.9-4.1) | 0.08 |
| Access to extension (%) | 0.9(0.4-2.0) | 0.87 | 0.8(0.2-0.9) | 0.12 | 0.91(0.4-1.9) | 0.80 | 0.8(0.4-1.6) | 0.51 |
| Group membership (%) | 0.5(0.2-1.1) | 0.07 | 1.7(0.8-4.0) | 0.22 | 0.8(0.4-1.9) | 0.48 | 0.9(0.4-1.7) | 0.71 |
| Access to credit (%) | 3.6(1.7-7.8)* | 0.00 | 2.5(1.1-5.9)* | 0.03 | 3.2(1.5-7.0)* | 0.00 | 2.1(1.1-4.4)* | 0.04 |
| **Number** | 66 | | 166 | | 121 | | 71 | |

*Denotes odds ratio which are significantly different; values in parentheses are 95% CI of the Odds ratio.
Source: Author's 2022

Olaniyan and Camara, 2018), no such differences were observed in this study. This is attributable to higher involvement of men in the indigenous chicken enterprise especially when it is tending towards commercialization (Chawala et al., 2022).

## Conclusion

The study concludes that:

1. The indigenous chicken production is mainly low input-low output free-range system but the semi-intensive system is becoming common especially in areas tending towards commercialization of the enterprise where it gives higher returns. (2.) Higher productivity of indigenous chicken can be achieved with better management practices including improved housing, vaccination, brooding and chick rearing practices. (3.) Despite their benefit in improving productivity and profitability of the enterprise, adoption of management interventions still remains low among indigenous chicken farmers in Kenya. (4.) Literacy levels and access to credit are the major household factors influencing adoption of management interventions. (5.) Use of cheaper local sources of feed for age targeted supplementation to improve nutrition and farmer-assisted standardized protocol for proper selection and breeding of IC ecotypes exhibiting

better body weight gain and egg production will enhance productivity

## CONFLICT OF INTERESTS

The authors declare that there was no conflict of interests.

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