

Research Article

Farmers' Perception on the Welfare of Broiler Chickens in Smallholder Production Systems in Kiambu County, Kenya

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In Kenya, commercial broiler production is growing rapidly due to increasing demand for poultry meat resulting in higher incomes for farmers. Due to this increase in demand, broiler chicken production is increasingly becoming intensive where chickens are overstocked in deep litter systems subjecting the birds to suffering perpetuated through burns on their shanks and breasts with constant footpad lesions, thus compromising their welfare. This study was conducted to determine the farmers' attitudes towards the welfare of broiler chickens in smallholder production systems in Kiambu County, Kenya. A total of 120 farmers were randomly chosen for the study consisting of 42 and 78 respondents from Kikuyu and Kabete subcounties, respectively. A semistructured questionnaire was used to interview the farmers on their knowledge, attitudes, and practices in regard to broiler welfare. The results of this study indicated that most farmers (74%) in Kikuyu and Kabete subcounties had knowledge about broiler welfare. Media, hatcheries, agrovet centres, and extension agents were the main sources of information on broiler welfare to farmers at 61%, 40%, 38.8%, and 31.5% respectively. Farmers perceived that good feeding (88%), good health (83%), suitable housing (82%), and appropriate behaviour (48%) were very important indicators of broiler chicken welfare. Gumboro (infectious bursal disease) and new castle disease (NCD) were prevented through vaccination by most farmers (91%), while coccidiosis was controlled through cleaning and disinfection of broiler sheds and equipment as well as treatment of sick birds with coccidiostat. In conclusion, farmers' perception on broiler welfare has a bearing on the performance of broiler chickens.

1. Introduction

In Kenya, the commercial broiler production is growing rapidly and is one of the popular animal husbandry sub-sectors contributing about 7.8% of the overall GDP ([1], [2]). The country has also, over the last decade, seen an increase in poultry numbers in such areas as Kiambu, Kajiado, Machakos, Thika, Mombasa, and Nairobi counties, where commercial farming is practiced by many farmers ([1], [2]). The poultry industry is also an important income-creating activity in Kenya. Furthermore, the annual poultry meat consumption in Kenya rose sharply from 54.8 metric tonnes in 2000 to 91.4 metric tonnes in 2010, and it is expected to rise to 164.6 metric tonnes by 2030 [3]. In Nairobi, consumption is expected to rise from 6 to 30.5 thousand metric tons [4].

High growth rates, efficiency in feed conversion, as well as high carcass yields have been the main objectives in intensive selection of broiler chickens [5]. An increase in demand for poultry meat has led to intensification of broiler operations, where the chickens are kept in high densities in deep litter systems. Poor cleaning of litter units after cycle of production results in ammonia build up in houses causing burns on the birds' feet with severe and constant footpad wounds that often compromise the welfare of the birds [6]. Broiler chickens farmed intensively are kept at a high stocking density to increase profit from production. However, it is well understood that increasing the density compromises the welfare of the birds. Berg and Yngvesson [7] reported that stocking density above 30 kg per m² leads to a reduction in growth due to heat stress. Accordingly,

overcrowding of broilers leads to high dissipation of heat of metabolism together with an increase in litter temperature that enhances microbial activity because of higher moisture and nitrogen content causing heat stress [6]. Stocking density also impacts the welfare of housed birds mainly through the quality of litter and air [8]. This causes inconvenience to the birds as they approach market age. Thus, observing and monitoring the physical conditions and behaviour of the birds is very important [9].

Broiler chicken welfare concerns have prompted many consumers in Europe to demand an increased supply of broilers reared on free-range systems, which have access to daylight, fresh air, environmental enrichment, and the opportunity to exercise outdoors during the production cycle [10]. Conversely, a report by Lake Research Partners [11] in the U.S. showed that 77% of consumers were concerned about animal husbandry practices and checked food labels prior to purchase. As a result, a certification scheme was established by traders to embrace animal welfare ensuring that consumers' perception of animal welfare has a bearing on the type and brand of poultry products they purchase [5, 12].

The welfare of an animal encompasses the treatment received by the animal, for example, well-being, husbandry, and behaviour [13]. Therefore, the animal is said to be in good welfare condition when it enjoys the following five freedoms: (i) freedom from hunger and thirst; (ii) freedom from discomfort; (iii) freedom from pain, injury, and disease; (iv) freedom to express normal behaviour; and (v) freedom from fear and distress [14].

In Europe, the Council of the European Union has approved a directive that ensures the protection of broiler chickens [6]. However, in Kenya, there is no legislation that can be compared to that in Europe and America. Nonetheless, two livestock acts, namely, the Prevention of Cruelty to Animals Act of 1963 and the Animal Diseases Act of 1965 would guarantee animal welfare in Kenya if enforced sufficiently [15]. Therefore, this study was conducted to determine the farmers' perceptions of the welfare of broiler chickens in smallholder production systems in Kiambu County, Kenya.

2. Materials and Methods

2.1. Study Area. The study was conducted in Kikuyu and Kabete subcounties of Kiambu County, one of the 47 administrative units of Kenya (Figure 1). The county and subcounties were selected as study areas based on the poultry population and proximity to the University of Nairobi.

2.2. Sample Size and Its Determination. Simple random sampling was carried out to select the 120 farmers who took part in the study from the total population of 172 farmers keeping broilers in the area. A sample of 120 farmers was used according to the formula of Yamane (1967:886) [16]. The number of broiler farmers in the area was 172 [17].

Where n = the sample size, N = the population size, and $e = 0.05$; the level of precision (error term). By solving for n , a sample size of 120 was obtained.

2.3. Data Collection. Simple random sampling was done to select broiler farmers who were then interviewed using a semistructured questionnaire to collect information on demographic and socioeconomic parameters. These included age, gender, marital status, level of education, and land size of the farm in hectares. Information regarding the farmers' level of knowledge, attitudes, and practices in relation to broiler welfare was also collected.

2.4. Data Analysis. The obtained data was first systematically checked before it was carefully entered into the excel sheet for coding. The data were then imported into SPSS (Statistical Package for Social Sciences), version 21.0 for statistical analysis [18], where the frequencies, means, standard deviations, percentages, and correlations were computed. Summary tables and graphs were prepared using Microsoft Excel and Word processing programs.

3. Results and Discussion

3.1. Age Group of the Farmers. Figure 2 shows the age of the farmers who took part in the study. The majority of them (46.6%) were between 31 and 50 years of age, followed by those (39.3%) in the age bracket of 51 to 70 years. Farmers interviewed in the age group of 21–30 years and over 70 years were only 9.8% and 4.3%, respectively. The age group of 31–50 years is usually composed of energetic individuals who often show a commitment to farming [19]. The age category between 21 and 30 years comprises young people who are normally inexperienced and have newly ventured into poultry farming with little or no capital. On the other hand, the age group of 50 years and above mostly represents older adults who are retired and keep poultry for supplementing their pension. However, according to Shukri [20], the age of the farmers may affect their level of adoption of modern poultry farming practices as older farmers are more rigid to the adoption of the latest technologies than their younger counterparts. Besides, this may influence their awareness of emerging trends in the sector, such as that of broiler welfare, which may limit the level of output from poultry production.

3.2. Gender and Marital Status of the Farmers. Gender and marital status of farmers in the study area are shown in Table 1. About 71% of the farmers were women, and the rest were men. On average, above 90% of the farmers were married, while singles and widows/widowers were only 6 and 2%, respectively. Married farmers have higher chances of venturing into broiler farming than their single or widowed counterparts due to the availability of capital and labor as their partners and children may support them. Recent studies have shown that women contribute about 43% of the

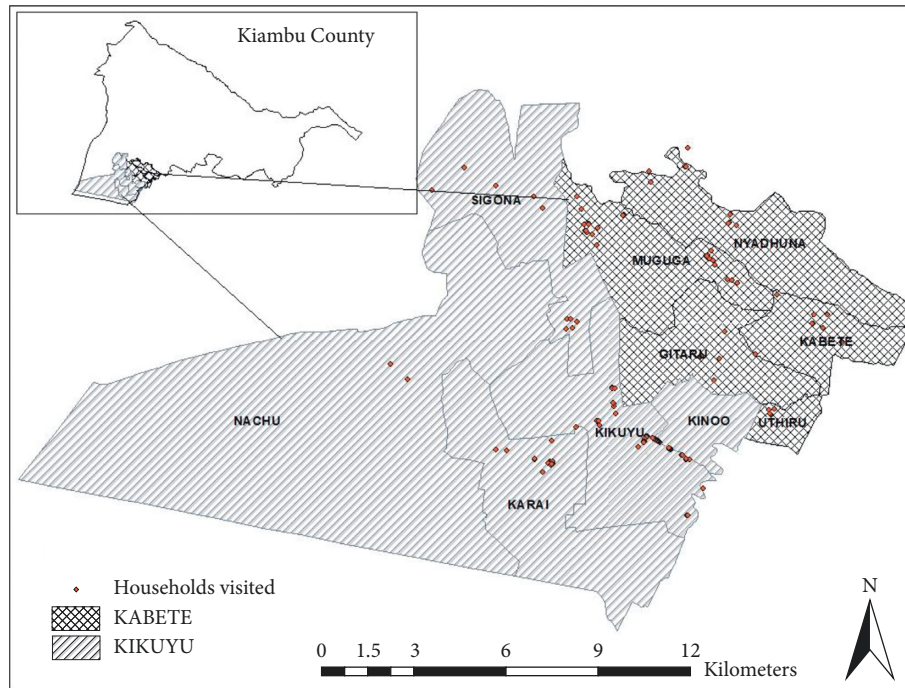


FIGURE 1: Map of Kiambu County showing the study areas.

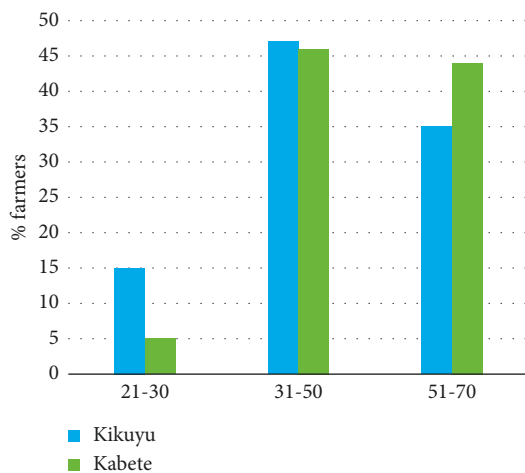


FIGURE 2: Age of farmers in the study area.

TABLE 1: Gender and marital status of respondents in the study area (%).

Category	Kikuyu (n = 42)	Kabete (n = 78)	Mean
Gender			
Female	56.91	85.22	71.07
Male	43.09	14.78	28.93
Marital status			
Married	91.55	92.06	91.81
Single	4.82	7.94	6.38
Widow/widower	3.63	0.00	1.81

labor force in the agriculture sector in developing nations [21]. Moreover, the role played by women in poultry management is of utmost importance as chickens are often managed and fed within the homestead [22].

3.3. *Level of Education of the Farmers.* The education level of farmers is shown in Table 2. An average of 51% of farmers had attained secondary school education, while 32 and 17% of them had attained primary and postsecondary education, respectively. The level of education influences farmers’ learning and problem-solving techniques as well as the decision-making process, resulting in increased agricultural productivity [23, 24]. In a study in Bureti subcounty, Kirui [25] reported that farmers with postsecondary education had better returns than those who had a primary or secondary school. The correlation coefficient between the level of education and farmers’ knowledge of animal welfare was $r = -0.275$ (Table 3). This implied that the relationship between the level of education and farmers’ knowledge of animal welfare was significant ($p = 0.01$).

3.4. *Land Size.* The land size owned by the farmers in the study area is shown in Table 4. On average, the land size was 0.81 ± 0.9 hectares per household. This was double the size of land owned by farmers in Kabete subcounty that was reported as 0.4 ± 0.3 hectares by Shukri [20]. Indeed, in this study, it was found that the average land size per family in the five wards that made up Kabete subcounty was 0.4 ± 0.3 , which was similar to the findings of Shukri [20]. However, data from the County Government of Kiambu [26] indicated that Kabete subcounty is more densely populated than Kikuyu subcounty, thus land size shrinks as the human population increases [27]. The land size in Kikuyu subcounty was 1.18 ± 1.44 ha/farmer, which was higher than that in Kabete.

3.5. *Knowledge of Farmers on Broiler Welfare.* Most of the farmers (74.2%) in Kikuyu and Kabete subcounties were

TABLE 2: Education level of broiler farmers in the study area (%).

Education level	Kikuyu ($n = 42$)	Kabete ($n = 78$)	Mean
Postsecondary	22.97	11.47	17.22
Secondary school	42.82	58.48	50.65
Primary school	34.21	30.05	32.13
None	0.00	0.00	0.00

TABLE 3: Correlation between level of education and farmers' knowledge on broiler welfare.

	Education level	Knowledge on animal welfare
Pearson correlation	1	-0.275**
Sig. (2-tailed)		0.01
N	120	120

**Correlation is significant at the 0.01 level (2-tailed).

TABLE 4: Average land size of farmers in the study area.

Land size (hectares/ farmer)	Kikuyu ($n = 42$)	Kabete ($n = 78$)	Mean
Mean	1.18	0.44	0.81
SD	1.44	0.36	0.90

aware of broiler welfare, as shown in Figure 3. Only a small fraction (25.8%) of farmers were not aware of broiler welfare needs. The proportion (74.2%) from the two subcounties was relatively higher than reported by Shukri [20], who found that 59% of poultry farmers in Kabete subcounty were aware of broiler welfare. The level of awareness about broiler welfare in Kabete subcounty (93.6%) was much higher than in Kikuyu subcounty (54.7%). This difference might be due to the farmers' accessibility of extension services.

3.6. Sources of Information on Broiler Welfare. The sources of information to farmers on broiler welfare were the media, hatcheries, agrovets, government extension agents, feed millers, social networks, and NGOs (Table 5). The media was the most important source of information representing 60.1%. Within the media, farmers identified two TV programmes, which are aired in the area, namely, Farmer's TV and Mugambo wa Murimi as important sources. This was reported during a focus group discussion with the farmers. However, hatcheries, agrovets, and government extension agents were also important in disseminating information at 40.2, 37.8, and 30.5%, respectively. Similarly, farmers also sought information on broiler welfare from feed millers, other farmers, and NGOs at 15.9, 15.8, and 2.4%, respectively, in addition to field days. Electronic and print media were also used to disseminate information on animal welfare. This agreed with the study reported by OIE in 2017, which stated that information sharing that considers language barriers improves farmers' responses towards the health and welfare of their animals. Conversely, Shukri [20] reported that through the media, extension programs, and

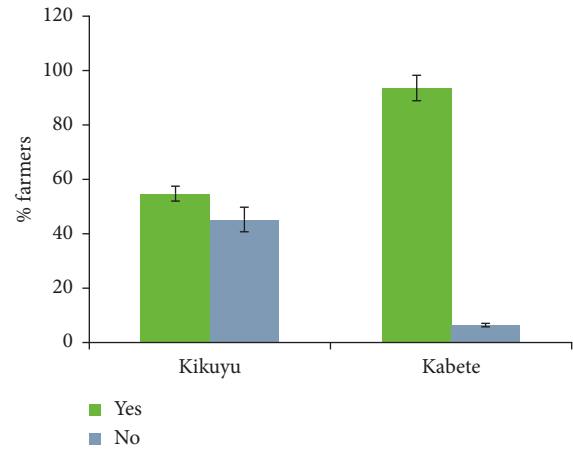


FIGURE 3: Number of farmers aware and not aware of animal welfare.

TABLE 5: Sources of information on broiler welfare to respondents (%).

Sources	N*	Percentage of cases
Media ¹	50	61.0
Hatchery	33	40.2
Agrovets	31	37.8
Government extension agents	25	30.5
Feed millers	13	15.9
Other farmers	19	15.8
NGOs	2	2.4

N* = number of respondents; media¹ = radio, TV, and newspaper.

training, farmers could acquire information on animal welfare.

3.7. Perception of Farmers on Broiler Welfare. Farmers' attitude to broiler welfare were assessed using several indicators of welfare (Table 6). About $88.3 \pm 0.32\%$ of farmers agreed that good feeding was a very important indicator of broiler chicken welfare. Also, 83, 82, and 48% of farmers indicated that good health, suitable housing, and appropriate behaviour, respectively, were important indicators of good broiler welfare. This finding agreed with the study by Hansson and Lagerkvist [28], who concluded that identifying farmers' attitudes towards animal welfare improves their understanding on how to determine the living conditions of their animals.

3.8. Measures Put in Place to Control Diseases in the Study Area. Most farmers managed commonly occurring diseases through vaccination (90.2%), isolating sick birds (29.8%), and treatment (22.6%), as shown in Table 7. Farmers also reported during a focus group discussion that sanitation practices such as cleanliness and disinfection were other important practices that they employed for disease prevention and control. Conversely, 91.4% of farmers sourced their drugs and vaccines from agrovets shops, while a small proportion of farmers obtained theirs from hatcheries and

TABLE 6: Perception of broiler welfare by respondents (%).

Parameter	Level of importance	Frequency	Percentage
Good feeding	Very important	106	88.3
	Important	14	11.7
Good health	Very important	99	82.5
	Important	13	10.8
	Slightly important	8	6.7
Suitable housing	Very important	98	81.7
	Important	15	12.5
	Slightly important	6	5.0
	Not important	1	0.8
Appropriate behaviour	Very important	57	47.5
	Important	26	21.7
	Slightly important	30	25.0
	Not important	7	5.8

TABLE 7: Management practices used by farmers in the study area (%).

Management practices	Kikuyu (n = 42)	Kabete (n = 78)	Mean
<i>Disease prevention and control measures</i>			
Vaccination	90	91.03	90.52
Isolating sick birds	32.2	27.38	29.79
Treatment	28.57	16.66	22.61
<i>Sources of vaccines and drugs</i>			
Agrovet shops	86.36	96.43	91.4
Hatcheries	12.67	0.57	6.62
Private veterinarians	0	3	1.5
<i>Who helps in disease prevention and control</i>			
Agrovet shops	74.58	70.52	72.55
Private veterinarians	13.61	13.97	13.79
Government vets	10	14.55	12.28
Hatcheries	1.82	5.56	3.69

private veterinarians at 6.6 and 1.5%, respectively. About 72.5% of farmers were supported by agrovet shops in disease prevention and control. However, 13.9, 12.3, and 3.7% of farmers obtained their support from private and government veterinarians and hatcheries, respectively.

Although there is no effective treatment against pneumonia, at least 60% of farmers in Kikuyu subcounty managed their birds against this condition (Figure 4). However, pneumonia can be prevented or controlled by avoiding moist litter and reducing stocking density in broiler pens [9]. Also, 40% of farmers in Kikuyu subcounty managed their birds against water belly (ascites). Water belly causes heart failure and affects liver function in broilers, and it is said to affect 5% of broilers in the world causing enormous mortality and carcass condemnation to broilers in modern farms [10]. These were the most common diseases encountered by farmers in the two subcounties. Although Gumboro (infectious bursal disease) and New Castle Disease were not common during the study, farmers reported to have controlled them through vaccination, while coccidiosis was managed through cleaning and disinfection of broiler sheds and equipment.

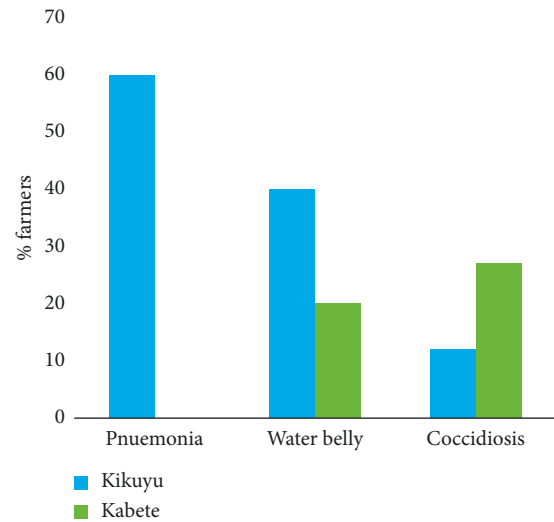


FIGURE 4: Diseases managed by farmers in Kikuyu and Kabete subcounties (%).

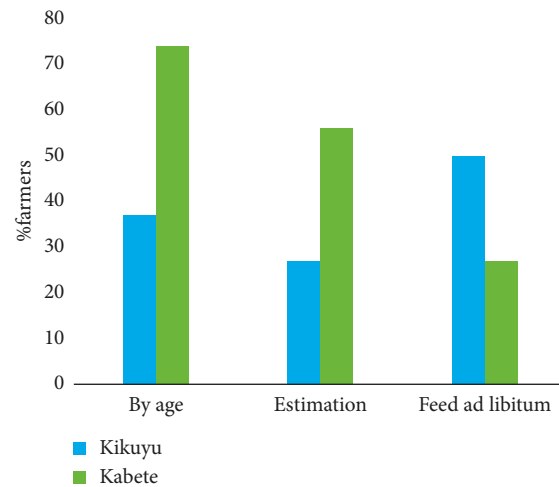


FIGURE 5: Ways farmers used to determine the amount of feed to their birds.

3.9. *Feeding Practices.* About 74% of farmers in Kabete subcounty measured the amount of feed provided to their birds based on the age of birds, whereas 56% of them from the same subcounty determined the amount of feed by estimation (Figure 5). However, 50% of farmers in Kikuyu subcounty gave feed ad libitum to their birds. Due to the high cost of feed, only 32% of farmers in Kabete fed their broilers ad libitum. Ochieng et al. [29] reported that the high cost of feeds (about 60–75% of production cost) often frustrates many farmers who could not provide enough feed to their birds.

3.10. *Farmers' Experience in Broiler Farming.* About 57% of farmers in Kikuyu reported having kept broilers for a period of 1–5 years, while 37% of farmers in Kabete reported the same (Figure 6). About 14% of farmers from the two

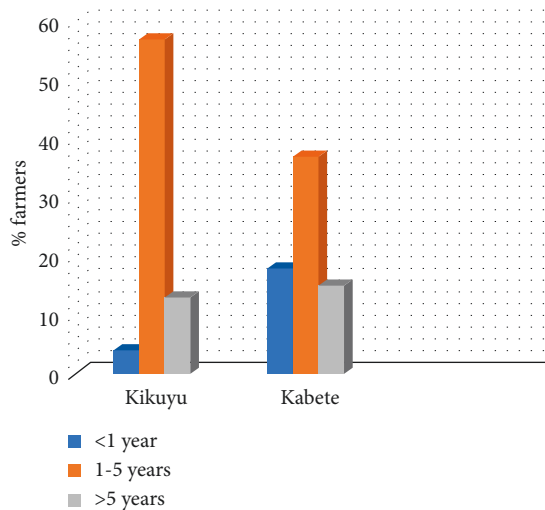


FIGURE 6: Number of years in keeping poultry by farmers.

subcounties had more than 5 years of experience in broiler farming, whereas only 11% of them had less than one year of experience. This implied that more farmers had ≤ 5 years of experience in broiler farming and thus had learned management practices for ensuring the good welfare of their birds. Long years of experience increase poultry productivity due to the knowledge gained in management [30].

4. Conclusion

Over 70% of farmers were informed about broiler chicken welfare. The media, hatcheries, agrovet centres, and extension agents were important sources of information on broiler welfare to the farmers. The overall assessment of this study was that the perception of farmers on broiler chicken welfare influences their performance.

Data Availability

The data used to support the findings of this study have been deposited in the University of Nairobi Research Archive repository (<https://erepository.uonbi.ac.ke/handle/11295/152943>). The data was collected from Kabete and Kikuyu subcounties of Kiambu County, Kenya, from the period of January to May 2019. Therefore, the data that are partially presented in this study cannot be released due to copyright concerns.

Disclosure

The main article of this manuscript has been presented as a thesis at the University of Nairobi, Kenya.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Supplementary Materials

Additional supplementary information was collected and analyzed but not included in this manuscript, and it has been presented as tables from the ten wards which make up Kikuyu and Kabete subcounties of Kiambu County, i.e., Kikuyu subcounty = Kikuyu, Karai, Sigona, Kinoo, and Nachu; Kabete subcounty = Kabete, Gitaru, Uthiru, Muguga, and Nyathuna. The supplementary tables were captioned as follows: characteristics of broiler chicken production in the study area. Age of broiler farmers in Kikuyu and Kabete subcounties. Gender of broiler farmers in Kikuyu and Kabete subcounties (numbers). Gender and marital status of broiler farmers in Kikuyu and Kabete subcounties (%). Marital status of broiler farmers in Kikuyu and Kabete subcounties (numbers). Marital status of broiler farmers in Kikuyu and Kabete subcounties (%). Level of education of broiler farmers (numbers). Level of education of broiler farmers (%). Land size of broiler farmers (hectares). Analysis of the land size of broiler farmers. Challenges to broiler production in the study area. Measurement of stocking density, humidity, temperature, and size of ventilation of boiler houses in the study area. Human population in Kabete and Kikuyu subcounties. Land size and human population of Kabete and Kikuyu subcounties. Analysis of farmers' awareness of broiler chicken welfare. Analysis of farmers' perception on broiler welfare indicators. Farmers' perception on broiler welfare indicators. Sources of information on broiler chicken welfare. Disease management practices by farmers. Common poultry diseases reported by farmers (%). Broiler chicken feeding times reported by farmers. (*Supplementary Materials*)

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