

Food and Agriculture Organization of the United Nations

AFRICA SUSTAINABLE LIVESTOCK 2050 Biosecurity and public health practices along the poultry value chain

**UGANDA** Evidence from Mukono and Wakiso districts





Financial support provided by the United States Agency for International Development (USAID)

#### Required citation:

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## Acknowledgments

May 2021. This report has been drafted by Gerald Nizeyimana (FAO Uganda) and Frank Mubiru (FAO Uganda). We thank the District local governments of Wakiso and Mukono for assisting FAO with the data collection on the ground; participants in workshops organized both in Wakiso and Mukono Districts to validate the findings of the report, held on 9 and 10 February 2021, respectively; Joachim Otte (FAO HQs) and Ugo Pica-Ciamara (FAO HQs) for comments on earlier drafts of this report.

# 1. Introduction

In response to the increased threat to human health posed by zoonotic pathogens, major One Health programs have been launched to foster the design of policies and practices that reduce public health risks along livestock value chains. However, in many countries their implementation remains patchy at best. Reduction of livestock-related public health risks requires that all stakeholders along the value chain adopt good practices that minimize pathogen introduction, emergence and transmission. This includes the prevention of selection for antimicrobial resistance and spread of resistance conferring genes.

The extent to which livestock-associated pathogens pose risks to public health is determined by the broader context in which livestock stakeholders operate and behave, both collectively and individually (FAO, 2011). Understanding stakeholders' behaviour as they perform various functions along the multiplicity of livestock value chains is thus crucial to inform, revise, and update policies.

In Uganda, to satisfy the rapidly increasing demand of growing urban populations for animal source food (ASFs), livestock holdings and value chains in and around peri-urban and urban areas are transforming more rapidly than elsewhere in the country, exacerbating the potential negative impacts of livestock keeping on the environment and public health. In order to identify major public health hazards associated with the particularly rapidly expanding poultry value chain(s), we surveyed the poultry value chain actors in Wakiso and Mukono districts. We assessed their business practices and the extent to which they comply with recommended legislation on biosecurity and public health practices.

# 2. Materials and methods

This study consisted of two components: (i) a review of good practices and regulations pertaining to various 'nodes' (production, trade/transport, retail, and slaughter) of the poultry value chains; (ii) a survey of the characteristics and compliance of poultry value chain actors with the identified good practices and regulations.

## 2.1. Review of good practices and legislation

We first reviewed available documentation and systematized recommended biosecurity and public health practices at each node of the poultry value chain. Then, we assembled the existing legislation and assessed to what extent it prescribes the adoption of the key biosecurity and public health practices. Finally, in consultation with representatives from the national and local governments, we prioritized 'key' good practices, those that if complied with by stakeholders are anticipated to significantly reduce public health risks. The prioritized biosecurity practices at each node of the chain and corresponding legislation are indicated in Tables 1 to 5.

## Table 1: 'Good practices' for poultry production

Value chain node	Biosecurity and public health practices
Production	Purchase day-old chicks from clear origin/source
	<ul> <li>Separate newly introduced birds for at least two weeks and observe regularly</li> </ul>
	<ul> <li>Clean and disinfect the poultry house before birds are brought</li> </ul>
	<ul> <li>Provide treated footbaths at farm/poultry house entry points</li> </ul>
	<ul> <li>Vaccinate the birds according to recommended schedule</li> </ul>
	<ul> <li>Change clothes and shoes when entering or exiting the poultry house</li> </ul>
	<ul> <li>Only use antibiotics when prescribed by a veterinarian</li> </ul>
	<ul> <li>Dispose of dead birds in a safe way by (deep pits, incinerate)</li> </ul>
	<ul> <li>Do not sell/slaughter sick or dead birds</li> </ul>
	Feed withdrawal - 8 hours before selling

## Table 2: 'Good practices' for poultry transport

Value chain node	Biosecurity and public health practices
Transport	<ul> <li>Use a proper transport means, well ventilated and spaced carriages</li> <li>Vehicle and boxes/crates for transporting poultry and poultry products should be cleaned and disinfected</li> <li>Clean vehicle surfaces using high pressure fan jet and disinfect</li> <li>Clean and disinfect trucks and cages before leaving Live Bird Markets</li> <li>Apply disinfectants to all non-metal surfaces within the cabin</li> <li>Clean and disinfect footwear with detergent and scrubbing brush. Wash hands.</li> </ul>
	<ul> <li>Inspect birds before loading</li> <li>Check documentation including obtaining a health movement permit</li> <li>Do not transport sick/dead poultry</li> <li>Segregate poultry according to species, size, sex, and age and flock</li> <li>Ensure effective cold storage of dressed poultry and poultry products</li> </ul>

## Table 3: 'Good practices' for poultry marketing/retail

Value chain node	Biosecurity and public health practices
Marketing	<ul> <li>Use cages / crates of materials that are easy to clean</li> </ul>
	<ul> <li>Clean and disinfect cages / crates and clean vehicles</li> </ul>
	• Do not keep birds over 24 hours at market and do not take live birds back to
	the farm
	<ul> <li>Do not sell/slaughter sick or dead birds.</li> </ul>
	Dispose of dead birds in a way that does not contaminate the environment
	(in practice).
	• Slaughter area should be at least 200 meters from residential areas.

Value chain node	Biosecurity and public health practices
Processing	<ul> <li>Source birds only from areas free of zoonotic diseases.</li> </ul>
	<ul> <li>Ensure slaughterhouse is isolated from poultry farms, resident areas</li> </ul>
	<ul> <li>Clean and disinfect equipment regularly at the completion of each</li> </ul>
	slaughtering session
	<ul> <li>Clean and disinfect slaughterhouse floor regularly</li> </ul>

Table 4: 'Good practices' for poultry slaughter and processing

The 'good practices' that are backed by legislation are compiled in Table 5. As can be noted, a number of advised biosecurity measures for poultry production, e.g. sourcing of birds, cleaning and disinfection, are not backed by legislation.

	Table 5: Legislation	related to identified	'good practices'
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Good practice	Legislation
Poultry health	
Separate sick birds and report to an official	Uganda Animal Diseases Act, Chapter 38, Part II, 2.
Use veterinary medicine as recommended by animal health professional	Uganda National Drug Policy and Authority Act, Part IX, Section 13
Report to an official if a bird dies	Uganda Animal Disease Rules (S.I. 38-4), 17.
Safe disposal of dead birds	Uganda Animal Diseases Act, Part III, 7.
Do not sell sick or dead birds	Uganda Food and Drugs Act, Part II, 3 (1) Section 6 (1)
Poultry movement/transport	
Obtain movement permit	Uganda Animal Disease Rules (S.I. 38-4), 9. Uganda Public Health (Meat) Rules, Section 14. (1)
Transport poultry separately from other species or products	Uganda Public Health (Meat) Rules, Section 14. (3) (b)
Clean vehicle after each transport	Uganda Public Health (Meat) Rules, Section 14. (3) (a)
Poultry slaughter & processing	
Slaughter in a licensed facility	Uganda Public Health (Meat) Rules, Section 4.
Ensure a public veterinarian performs pre- slaughter (ante-mortem) and meat (post- mortem) inspection	Uganda Public Health (Meat) Rules, Section 9. (4)
Clean and disinfect after each slaughter	Uganda: only provision available <sup>1</sup> under Animal Diseases Act, 1958 Section 21, G
Have a valid food handler's certificate	Uganda Public Health Act (Meat) Rules, Section 24.

## 2.2. Survey of poultry value chain actors

A survey was conducted in urban and peri-urban areas of Wakiso and Mukono districts with support from local government staff and representatives from Ministry of Agriculture Animal Industry and Fisheries, Ministry of Water and Environment and Ministry of Health.

The survey used a pre-developed questionnaire for Key Informant Interviews (KIIs) and a check list for Focus Group Discussions (FGDs), drafted and agreed upon by the implementing districts for each node of the poultry value chain. Frontline animal health staff nominated by the district veterinary office conducted the survey. The staff were trained in administering the questionnaires (KIIs) for each of the

<sup>&</sup>lt;sup>1</sup> Animal Disease Act Section 21 (g), see Appendix for further details

nodes by FAO. Representatives Ministry of Agriculture Animal Industry and Fisheries, Ministry of Water and Environment, Ministry of Health and FAO staff conducted the FGDs.

A snowball sampling approach in the different administrative zones in Mukono and Wakiso was used to sample participants along the various nodes of the poultry value chain. The required minimum bird batch size at production node was 200, with a target of at least ten producers in each of the Sub-counties/Town Councils/Municipalities.



Figure 1: Enumeration areas for Good Practices Survey on Poultry Value Chain Actors in Mukono and Wakiso Districts

*Source:* for country boundaries: United Nations, Map No 4170, October 2020; for regional boundaries, GADM, accessed in March 2021. The boundaries and names shown and the designations used on this/these map(s) do not imply the expression of any opinion whatsoever on the part of FAO concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers and boundaries.

A total of 214 poultry producers, 75 and 139 from Wakiso and Mukono districts, respectively, were interviewed. For marketing, transporting and slaughtering, we sampled as many respondents as were accessible. Forty-one (41) transporters, 99 marketers and 55 slaughterers were interviewed for the KIIs. Seven FGDs were conducted, one per district for each node of the value chain with the exception of transporters, for which only one FGD was held in Mukono district.

# 3. Findings

This section presents the socio-economic characteristics of poultry actors at the four nodes of the value chain and the reported practices as they emerge from the KIIs and FGDs.

## 3.1. Characteristics and practices of poultry producers

A total of 214 poultry producers were surveyed. Nearly 60 percent of the poultry producers were women (Table 6). Slightly more than 60 percent of producers were between 30 and 50 years of age

and more than 75 percent had completed at least secondary education. The 'urbanization' of poultry farming appeared to be higher in Wakiso district, with around one quarter of farms being located in urban areas vs. less than 10 percent in Mukono district. Also, farmers in Wakiso district seem to raise more birds per batch (medians of 475 vs. 300 birds) and more batches per year than their counterparts in Mukono district (6 vs. 5 batches).

	Mukono	Wakiso	Total
<b>Characteristics<sup>β</sup></b>	(N=139)	(N=75)	(N=214)
Gender			
Female	82 (59.0%)	43 (57.3%)	125 (58.4%)
Age category (years)			
<30	23 (16.5%)	13 (17.3%)	36 (16.8%)
30-40	54 (38.8%)	20 (26.7%)	74 (34.6%)
41-50	36 (25.9%)	22 (29.3%)	58 (27.1%)
>50	22 (15.8%)	19 (25.3%)	41 (19.2%)
Highest level of education <sup>®</sup>			
None	2 (1.4%)	1 (1.3%)	3 (1.4%)
Primary	31 (22.3%)	12 (16.0%)	43 (20.1%)
Secondary	57 (41.0%)	35 (46.7%)	92 (43.0%)
Tertiary level or equivalent level	44 (31.7%)	24 (32.0%)	68 (31.8%)
Poultry location <sup><sup>β</sup></sup>			
Urban	11 (7.9%)	20 (26.7%)	31 (14.5%)
Peri-Urban	79 (56.8%)	34 (45.3%)	113 (52.8%)
Rural	41 (29.5%)	19 (25.3%)	60 (28.0%)
Average (SD) number of batches	5 (4)	6 (5)	5 (4)
raised the last 12 months			
Median (IQR) number of birds	300 (200, 500)	475 (250, 1 500)	350 (200, 500)
raised per batch in last 12 months			

**Table 6:** Socio-economic and demographic characteristics of poultry producers

 $\beta$  Missing: Age=5, gender=1, education =8, poultry location =10

Producers reported that day-old chicks (DOCs) are acquired through prior booking from the chicken breeding company of their choice, which they selected based on previous experiences, peer/fellow farmer recommendations and marketing aggressiveness of the companies. Producers reported that the main companies that supply chicks are Kuku Chic Uganda, Uga-Chick and Biyinzika Poultry International. The majority of producers in the study area purchased chicks from Biyinzika because of market availability, good after-sale service and high growth rate of the birds. At the time of booking, an upfront deposit payment of 50 percent is made; two weeks later a notification by phone call is done by the company for collection of the chicks. The balance is paid on the day of collecting the chicks.

Some farmers produce DOCs. They use eggs from chicken they have raised on their farms, mated by males from the batch, which is inbreeding in its own sense since chicks are from the same batch. These eggs are in turn either sold to farmers who want chicks and then taken to the hatchery, or directly taken to the hatchery by the famer. This is a major source of poor-quality chicks. Some farmers reported that they buy 2-3 weeks old birds from fellow farmers out of fear to handle day-old chicks.

Upon securing the supply of DOCs, farm preparation begins including brooder preparation, disinfection of the housing unit and all related equipment, such as drinkers and feeders. DOCs are received after the initial vaccines have been administered at the hatcheries, but subsequent vaccines are administered by the farmers following a vaccination calendar provided by the hatcheries. Some

producers complained that, despite claims by the hatcheries, some of the day-old chicks were supplied unvaccinated and ended up dying.

The level of biosecurity varies but is largely insufficient to limit introduction and spread of pathogens. The majority of the interviewed producers did not have a footbath at the entrance of the broiler house and those who had rarely changed the disinfectant. Drinkers were generally cleaned on a daily basis.

	Mukono	Wakiso	Total
Practices	(N=139)	(N=75)	(N=214)
Frequency of changing / filling in disinfectant in a	footbath / basin		
I do not use disinfectant	79 (56.8%)	15 (20.0%)	94 (43.9%)
Never change disinfectant	15 (10.8%)	17 (22.7%)	32 (15.0%)
When it is dirty	21 (15.1%)	23 (30.7%)	44 (20.6%)
After rain	1 (0.7%)	3 (4.0%)	4 (1.9%)
When it dries up	1 (0.7%)	1 (1.3%)	2 (0.9%)
According to manufacturer recommendations	8 (5.8%)	6 (8.0%)	14 (6.5%)
Occasionally (when I can)	14 (10.1%)	10 (13.3%)	24 (11.2%)
Frequency of cleaning drinkers <sup>β</sup>			
Daily	122 (87.8%)	70 (93.3%)	192 (89.7%)
When the equipment is dirty	7 (5.0%)	2 (2.7%)	9 (4.2%)
Twice/thrice a day	4 (2.9%)	0 (0.0%)	4 (1.9%)
When refilling	3 (2.2%)	0 (0.0%)	3 (1.4%)

 Table 7: Frequency of changing disinfectants in a foot/tyre bath and cleaning drinkers

 $\beta$  missing: Frequency of cleaning drinkers=8

Almost three quarters (74 percent) of producers immediately separated birds that got sick from the remainder of the flock, and many sought advice from an animal health professional or agro-vet shop keeper. About one third (34 percent) claimed to report any disease incident to a public animal health official. Forty-three per cent reported that they self-medicated the birds with medicines they had at home. Around 20 percent of respondents slaughtered sick birds, with around half of these consuming the slaughtered birds. A few producers slaughtered sick birds and sold them as dressed chicken.

Birds that die are mostly buried (61 percent) and fed to dogs (48 percent), but rarely reported to animal health professionals.

Table 8: Actions taken when chickens get sick or die at the production node

	Mukono	Wakiso	Total
Action	(N=139)	(N=75)	(N=214)
Action when a chicken gets sick			
Immediately separate it from all other birds	109 (78.4%)	50 (66.7%)	159 (74.3%)
Sell it alive	3 (2.2%)	2 (2.7%)	5 (2.3%)
Report to the public animal health professional	55 (39.6%)	18 (24.0%)	73 (34.1%)
Seek advice of an animal health professional	83 (59.7%)	25 (33.3%)	108 (50.5%)
Seek advice of the agro-vet shop keeper	87 (62.6%)	13 (17.3%)	100 (46.7%)
Seek advice of neighbours / friends	42 (30.2%)	3 (4.0%)	45 (21.0%)
Give it the medicines I have at home	62 (44.6%)	29 (38.7%)	91 (42.5%)
Slaughter and consume	18 (12.9%)	1 (1.3%)	19 (8.9%)
Slaughter and sell	3 (2.2%)	0 (0.0%)	3 (1.4%)
Slaughter and give it away for free	3 (2.2%)	0 (0.0%)	3 (1.4%)
Slaughter and give to the dogs	8 (5.8%)	2 (2.7%)	10 (4.7%)
Slaughter and bury/incinerate/throw away	7 (5.0%)	0 (0.0%)	7 (3.3%)
Throw away	2 (1.4%)	0 (0.0%)	2 (0.9%)
Do Nothing	1 (0.7%)	0 (0.0%)	1 (0.5%)
Actions when a chicken dies			
Report to a public animal health professional	30 (21.6%)	24 (32.0%)	54 (25.2%)
Consume	2 (1.4%)	2 (2.7%)	4 (1.9%)
Give it to the dogs	70 (50.4%)	31 (41.3%)	101 (47.2%)
Sell	2 (1.4%)	0 (0.0%)	2 (0.9%)
Bury / incinerate	90 (64.7%)	38 (50.7%)	128 (59.8%)
Throw away	10 (7.2%)	4 (5.3%)	14 (6.5%)

The majority of the producers treat the birds themselves when sick. Most (71 percent) stated that they always medicate following the advice of an animal health professional, while around one third (34 percent) treated their birds based on previous experience. Eighty percent (80 percent) claimed to always observe the recommended dosage and duration of treatment. Treatments are usually (74 percent) flock based, even if only one bird is sick. DOCs are routinely medicated (67 percent) and 60 percent of producers always or sometimes treat their birds before transport. Almost 20 percent of producers sometimes or always used drugs for human use to treat their chickens.

Vaccination is almost entirely carried out by farmers themselves citing the fact that it's costly to pay for veterinary services every time they need to vaccinate. Chick suppliers also have veterinary professionals that guide the farmers on vaccination schedules. **Table 9:** Medication practices of poultry producers

	Mukono	Wakiso	Total
Practices	(N=139)	(N=75)	(N=214)
Give medicine only as advised by an animal h	ealth professional		
Always	107 (77.0%)	46 (61.3%)	153 (71.5%)
Rarely/sometimes	28 (20.1%)	23 (30.7%)	51 (23.8%)
Never	4 (2.9%)	6 (8.0%)	10 (4.7%)
Give medicine to poultry based on symptoms	treated before		
Always	47 (33.8%)	24 (32.0%)	71 (33.2%)
Rarely/sometimes	76 (54.7%)	32 (42.7%)	108 (50.5%)
Never	16 (11.5%)	19 (25.3%)	35 (16.4%)
Observe recommended dosage (quantity and	duration)		
Always	116 (83.5%)	55 (73.3%)	171 (79.9%)
Rarely/sometimes	15 (10.8%)	7 (9.3%)	22 (10.3%)
Never	8 (5.8%)	13 (17.3%)	21 (9.8%)
Give medicine to the entire flock when a bird	/few get sick		
Always	113 (81.3%)	45 (60.0%)	158 (73.8%)
Rarely/sometimes	16 (11.5%)	14 (18.7%)	30 (14.0%)
Never	10 (7.2%)	16 (21.3%)	26 (12.1%)
Give medicine to day old chicks			
Always	96 (69.1%)	47 (62.7%)	143 (66.8%)
Rarely/sometimes	13 (9.4%)	13 (17.3%)	26 (12.1%)
Never	30 (21.6%)	15 (20.0%)	45 (21.0%)
Treat poultry before and after transporting			
Always	25 (18.0%)	21 (28.0%)	46 (21.5%)
Rarely/sometimes	57 (41.0%)	29 (38.7%)	86 (40.2%)
Never	57 (41.0%)	25 (33.3%)	82 (38.3%)
Use human medicine to treat poultry			
Always	12 (8.6%)	1 (1.3%)	13 (6.1%)
Rarely/sometimes	13 (9.4%)	13 (17.3%)	26 (12.1%)
Never	114 (82.0%)	61 (81.3%)	175 (81.8%)

Business challenges cited by producers during the FGDs include but are not limited to: high and fluctuating feed prices, poor quality of feeds with, including lack of key ingredients, poor quality of the birds/day old chicks, high costs of the chick breeds supplied by some companies, limited support from the public veterinary services, lack of organized poultry farmers' groups, lack of training in poultry management, and an occasional lack of buyers.

## 3.2. Characteristics and practices of poultry transporters/traders

Most of the poultry transporters are also traders/marketers. Transporters mainly source and transport chicken from farmers/farms and village chicken brokers to the market for sale. In some cases, transporters are contracted by hotels, market stall owners and slaughterers to just transport the chicken.

All except one of the 41 interviewed transporters were male. Almost 40 percent of transporters were below 30 years of age and close to half had no or only primary education. A quarter the transporters had not been in the business for longer than three years.

Characteristics	Mukono	Wakiso	Total
	(N=17)	(N=24)	(N=41)
Gender			
Male	16 (94.1%)	24 (100.0%)	40 (97.6%)
Age category (years)			
<30	2 (11.8%)	14 (58.3%)	16 (39.0%)
30-40	8 (47.1%)	7 (29.2%)	15 (36.6%)
41-50	6 (35.3%)	3 (12.5%)	9 (22.0%)
>50	1 (5.9%)	0 (0.0%)	1 (2.4%)
Highest level of education			
None	3 (17.6%)	5 (20.8%)	8 (19.5%)
Primary	7 (41.2%)	5 (20.8%)	12 (29.3%)
Secondary	6 (35.3%)	13 (54.2%)	19 (46.3%)
Tertiary level or equivalent level	1 (5.9%)	1 (4.2%)	2 (4.9%)
Median (IQR) year poultry	2016 (2010, 2018)	2015 (2013, 2017)	2016 (2011, 2017)
transportation started			

 Table 10: Socio-economic and demographic characteristics of poultry transporters

Transporters usually make phone calls to farmers to find out if they have ready chicken for sale. They approach farmers also through personal connections and references from fellow transporters. In some cases, they are contracted to transport the chicken by farmers, hotels, slaughterhouses, and retailers. To select the birds they transport, the majority reported to enter the farms. In order to ensure that the chickens to be transported are healthy, they scare them to check for alertness, check the colour and consistency of droppings, look out for soiling of the vent, the eyes, and cleanliness of the feathers among others. Chickens that fail the tests are not transported while, if transported, they are purchased at a much lower price.

Transporters commonly use metallic cages to transport live chicken, some use sacks, while others just hang them on a motorcycle or a car. Over 30 percent of the transporters do not clean the cages they use with any disinfectant. Transporters who use metallic cages claim that these don't need to be cleaned. Those using wooden cages clean them every two days using liquid soap and detergent.

The median number of birds transported per week was similar in both districts, 145 in Mukono and 125 in Wakiso. The majority (60 percent) of transporters in Wakiso district also transported dressed chickens while only one transporter from Mukono transported dressed chicken.

 Table 11: Practices and transport volumes of poultry transporters

Practices	Mukono (N=17)	Wakiso (N=24)	Total (N=41)
Practices followed to choose poultry			
Compare price of different suppliers	11 (64.7%)	14 (58.3%)	25 (61.0%)
Source the birds only from registered suppliers	0 (0.0%)	0 (0.0%)	0 (0.0%)
Source the birds always from the same suppliers	5 (29.4%)	3 (12.5%)	8 (19.5%)
Ask for a health certificate	0 (0.0%)	0 (0.0%)	0 (0.0%)
Enter the farm and select the birds	8 (47.1%)	23 (95.8%)	31 (75.6%)
Use of disinfectant	9 (52.9%)	19 (79.2%)	28 (68.3%)
Median (IQR) number of live birds transported per week	145 (85, 410)	125 (70, 500)	145 (70, 420)
Transport dressed chicken	1 (5.9%)	14 (60.9%)	15 (37.5%)
Median (IQR) number of dressed birds transported per week	20	100 (40, 150)	100 (40, 150)

About 22 percent of the transporters reported not to have ever been asked by enforcers to present a chicken movement permit, although this is a requirement under the Animal Diseases Act. The majority (56 percent) reported not to possess/use movement permits during transportation. When transporting chickens over long distances under hot conditions transporters pour water on to them for cooling to ensure they reach their destination in good condition.

In case a chicken gets sick or dies while in transit, some reported to deliver it and sell it in any case; some to slaughter and give it away for free usually to the willing consumers or those who use it as animal feed (dogs and pigs); others self-consume.

	Mukono	Wakiso	Total
Actions	(N=17)	(N=24)	(N=41)
Actions taken when a chicken is suspected to be s	ick during transp	ort	
Contact the owner	3 (17.6%)	3 (12.5%)	6 (14.6%)
Immediately separate it from all other birds	13 (76.5%)	8 (33.3%)	21 (51.2%)
Sell it in any case	2 (11.8%)	7 (29.2%)	9 (22.0%)
Slaughter and consume	1 (5.9%)	4 (16.7%)	5 (12.2%)
Slaughter and give to the dogs	3 (17.6%)	11 (45.8%)	14 (34.1%)
Slaughter and sell	1 (5.9%)	6 (25.0%)	7 (17.1%)
Slaughter and give it away for free	0 (0.0%)	4 (16.7%)	4 (9.8%)
Slaughter and bury / incinerate	0 (0.0%)	1 (4.2%)	1 (2.4%)
Throw it away	1 (5.9%)	0 (0.0%)	1 (2.5%)
Nothing	0 (0.0%)	1 (4.2%)	1 (2.4%)
Actions taken when a chicken dies during transpo	rt		
Contact the owner	3 (17.6%)	3 (12.5%)	6 (14.6%)
Report to the public animal health professional	3 (12.5%)	3 (7.3%)	3 (7.7%)
Sell	6 (35.3%)	2 (9.1%)	8 (20.5%)
Consume	0 (0.0%)	2 (8.3%)	2 (4.9%)
Give it to the dogs	8 (47.1%)	11 (45.8%)	19 (46.3%)
Give it away for free	1 (5.9%)	3 (12.5%)	4 (9.8%)
Bury / incinerate	0 (0.0%)	6 (25.0%)	6 (14.6%)
Nothing	0 (0.0%)	1 (4.2%)	1 (2.4%)

Table 12: Actions of poultry transporters when birds fall sick or die during transport

#### 3.3. Characteristics and practices of poultry retailers

Retailers acquire birds from farmers that supply them directly or from traders / transporters that deliver to them. Birds for sale in Mukono and Wakiso districts are brought from as far as eastern districts of Uganda and are transported on taxi (Matatu) or other public vehicles. Chickens are also directly sourced from large scale producers such as Ugachick, both old parent stock and off layers. The criteria for selecting farms to buy birds from depends on cleanliness of the farm and health of birds.

Half of the interviewed retailers were male. Nearly 40 percent of them were below 30 years of age and slightly more than two thirds had secondary of higher education. About a quarter had been in the retail business for three years or less. Slightly more than a quarter (28 percent) of the marketers in Wakiso are also farm owners and sell their own birds.

	Mukono	Wakiso	Total
Characteristics	(N=48)	(N=51)	(N=99)
Gender			
Male	25 (52.1%)	24 (47.1%)	49 (49.5%)
Age category (years)			
<30	22 (45.8%)	16 (31.4%)	38 (38.4%)
30-40	18 (37.5%)	13 (25.5%)	31 (31.3%)
41-50	6 (12.5%)	12 (23.5%)	18 (18.2%)
>50	2 (4.2%)	10 (19.6%)	12 (12.1%)
Highest level of education <sup>β</sup>			
None	1 (2.1%)	1 (2.0%)	2 (2.0%)
Primary	19 (39.6%)	11 (21.6%)	30 (30.3%)
Secondary	17 (35.4%)	38 (74.5%)	55 (55.6%)
Tertiary level or equivalent level	9 (18.8%)	0 (0.0%)	9 (9.1%)
Farm owner, does not purchase	0 (0.0%)	14 (27.5 %)	14 (14.1 %)
Median (IQR) year poultry retail started	2016 (2014,	2015 (2009,	2015 (2011,
	2019)	2017)	2018)

Table 13: Socio-economic and demographic characteristics of poultry retailers

 $\beta$  missing: Highest level of education=3

Most (81 percent) of the retailers have a fixed market stall. A large share use metal cages to keep the birds and only very few use wooden cages. However, in Wakiso many retailers (35 percent) do not have any cage and just lay the birds on the ground, pending sale. Wakiso marketers keep an average of 92 birds at the market per day, far more than marketers in Mukono, who average 27 birds. Likewise, in Wakiso marketers sell a median of 100 birds per week while in Mukono the respective figure is 35 birds. The low number of daily sales in Mukono translates into a large share of birds remaining in the market for more than three days (85 percent). In Wakiso, 20 percent of birds stay in the market for one day or less and 33 percent remain in the market for more than three days.

Table 14: Practices and turnover of poultry retailers

	Mukono	Wakiso	Total
Practices	(N=48)	(N=51)	(N=99)
Have a fixed stall to keep the poultry at the market	45 (93.8%)	33 (64.7%)	78 (78.8%)
Type of cage / crate used to hold the poultry at the ma	arket <sup>β</sup>		
Metal cage / crate	44 (91.7%)	32 (62.7%)	76 (76.8%)
Wooden cage / crate	2 (4.2%)	0 (0.0%)	2 (2.0%)
Do not keep the birds in any cage / crate	0 (0.0%)	18 (35.3%)	18 (18.2%)
Average (SD) number of birds kept per day in the	27 (33)	92 (79)	54 (65)
market			
Median (IQR) number of birds sold per week	35 (21, 75)	100 (40, 240)	50 (25 <i>,</i> 135)
Maximum number of days birds are kept in the market before sale <sup><math>\mu</math></sup>			
Less than one day	0 (0.0%)	5 (9.8%)	5 (5.1%)
One day	3 (6.3%)	4 (7.8%)	7 (7.1%)
Two days	0 (0.0%)	4 (7.8%)	4 (4.0%)
Three days	2 (4.2%)	5 (9.8%)	7 (7.1%)
More than three days	41 (85.4%)	17 (33.3%)	58 (58.6%)

 $\beta$  : 2 missing,  $\mu$  : 4 missing

Mukono marketers more frequently keep unsold birds at the market for longer (73 percent) than marketers in Wakiso (55 percent), while the latter are more inclined to sell them at lower prices (26

vs. 6 percent). In Wakiso, 69 percent of marketers sell slaughtered birds while in Mukono only 29 percent sell slaughtered birds.

Practices	Mukono	Wakiso	Total
	(N=48)	(N=51)	(N=99)
Actions to unsold live birds			
It has never happened	5 (10.4%)	3 (5.9%)	8 (8.1%)
Keep them longer at the market	35 (72.9%)	28 (54.9%)	63 (63.6%)
Sell at a lower price	3 (6.3%)	13 (25.5%)	16 (16.2%)
Slaughter for self-consumption	4 (8.3%)	4 (7.8%)	8 (8.1%)
Take to another market	1 (2.1%)	2 (3.9%)	3 (3.0%)
Take home	3 (6.3%)	2 (3.9%)	5 (5.1%)
Slaughter and sell to public kitchen	0 (0.0%)	1 (2.0%)	1 (1.0%)
Slaughters and sells dressed chicken	14 (29.2%)	35 (68.6%)	49 (49.5%)
Slaughter on own farm	0 (0.0%)	8 (22.8%)	8 (8.4%)
Actions to unsold slaughtered birds (n=49)			
Only slaughter birds on order	4 (28.5%)	13 (37.1%)	17 (34.7%)
Only slaughter for self-consumption	2 (14.3%)	0 (0.0%)	2 (4.1%)
Keep them longer at the market	3 (21.4%)	3 (8.5%)	6 (12.2%)
Sell at a lower price	1 (7.1%)	3 (8.5%)	4 (8.2%)
Take home	0 (0.0%)	3 (8.5%)	3 (6.1%)
Refrigerate	4 (28.5%)	4 (11.4%)	8 (8.4%)

Table 15: Practices of poultry retailers with unsold live and slaughtered birds

When chickens get sick or die, some reported to: isolate and treat sick birds; slaughter for selfconsumption; selling to consumers both as human and animal food, throwing carcasses on common dumpsite. Over one third report sick birds to the market inspector.

	Mukono	Wakiso	Total
Actions	(N = 48)	(N = 51)	(N = 99)
Actions to sick birds			
Isolate and treat	20 (41.7%)	21 (41.2%)	41 (41.4%)
Slaughter and self-consume	11 (22.9%)	5 (9.8%)	16 (16.2%)
Slaughter and sell	1 (2.1%)	4 (7.8%)	5 (5.1%)
Slaughter and bury / incinerate	0 (0.0%)	1 (2.0%)	1 (1.0%)
Slaughter and throw it in the dump site	1 (2.1%)	2 (3.9%)	3 (3.0%)
Sell at a lower price for human consumption	5 (10.4%)	6 (11.8%)	11 (11.1%)
Sell at a lower price as animal food	5 (10.4%)	7 (13.7%)	12 (12.1%)
Report to a market inspector / veterinarian / official	15 (31.3%)	20 (39.2%)	35 (35.4%)
Actions taken when chicken dies			
It has never happened	5 (10.4%)	2 (3.9%)	7 (7.1%)
Slaughter and sell	1 (2.1%)	4 (7.8%)	5 (5.1%)
Bury / incinerate	0 (0.0%)	1 (2.0%)	1 (1.0%)
Throw it in the dump site	1 (2.1%)	2 (3.9%)	3 (3.0%)
Sell at a lower price for human consumption	5 (10.4%)	6 (11.8%)	11 (11.1%)
Sell at a lower price as animal food	5 (10.4%)	7 (13.7%)	12 (12.1%)
Report to a market inspector / veterinarian / official	15 (31.3%)	20 (39.2%)	35 (35.4%)
Give to dogs/pigs	3 (6.3%)	9 (17.6%)	12 (12.1%)

Table 16: Actions of poultry retailers with birds that fall sick or die

The business challenges cited by poultry sellers include: (i) High price of chicken at farm gate that reduces business opportunities as several customers, including hotels, refuse to purchase birds in case of high price. Things worsened during Covid-19 lockdown. (ii) The quality of chicken from producers being low and some of the chicken getting sick after reaching the market. Marketers are not sure if the problem is of the cages at the markets or management failures at the farms, but they also cannot rule out stress during transport. There are complaints that some farmers sell the birds before the last vaccination dose. This practice has caused several losses and often times forces marketers to treat the birds at the market. (iii) Marketers have limited capacity in book keeping and are not able to track expenses. (iv) Many operations are in non-gazzeted premises and people are complaining about the smell that comes from the chicken. (v) Poor quality cages that are not easy to clean.

## 3.4. Characteristics and practices of poultry slaughterers/processors

Slaughter birds for processing are acquired directly from farmers and marketers or through chicken brokers. Slaughterers slaughter birds for hotels, schools, customers who buy a few birds (one or two) for home consumption and for roasting places on main highways and urban centres. Many of the slaughterers/processors are contracted specifically for the slaughtering.

Overall, the majority (64 percent) of poultry slaughterers/processors are men with major differences in gender distribution between the two districts. In Mukono, 94 percent of interviewed slaughterers/processors were men while in Wakiso only half of them were men. In Mukono, slaughterers/processors are also generally younger and less educated than in Wakiso, where around 80 percent have at least secondary education as opposed to 40 percent in Mukono. Similar to production, poultry slaughter is more 'urbanized' in Wakiso than in Mukono. **Table 17:** Socio-economic and demographic characteristics of poultry slaughterers/processors

	Mukono	Wakiso	Total
Characteristics	(N=19)	(N=36)	(N=55)
Gender			
Female	1 (5.3%)	18 (50.0%)	19 (34.5%)
Age category (years) <sup><math>\beta</math></sup>			
<30	10 (52.6%)	9 (25.0%)	19 (34.5%)
30-40	5 (26.3%)	12 (33.3%)	17 (30.9%)
41-50	2 (10.5%)	6 (16.7%)	8 (14.5%)
>50	2 (10.5%)	8 (22.2%)	10 (18.2%)
Highest level of education <sup>µ</sup>			
None	1 (5.3%)	2 (5.6%)	3 (5.5%)
Primary	10 (52.6%)	5 (13.9%)	15 (27.3%)
Secondary	6 (31.6%)	24 (66.7%)	30 (54.5%)
Tertiary level or equivalent level	2 (10.5%)	2 (5.6%)	4 (7.3%)
Location of business <sup>µ</sup>			
Urban	6 (31.6%)	24 (66.7%)	30 (54.5%)
Peri-Urban	12 (63.2%)	7 (19.4%)	19 (34.5%)
Rural	0 (0.0%)	3 (8.3%)	3 (5.5%)

 $\beta$ : 1 missing,  $\mu$ : 3 missing

Many of the slaughterers do not have no food handler permit and operate in facilities that are not licensed. Ante and post-mortem examination are the exception rather than the norm. Many of the slaughterers stated that they rarely or even never have any public veterinarian visiting their facilities. In Wakiso, about half of the slaughterers/processors have their own poultry farm while in Mukono only 11 percent slaughter chicken from their own farm. Whole carcasses and meat cuts were the most frequently offered products for sale. Offal are sold mainly to pet owners, while manure and feathers are sold to crop farmers. Blood is left to flow to water channels usually discharging to wetlands or open surfaces. Fourteen per cent of slaughterers/processors did not use disinfectants in their facilities.

**Table 18:** Practices of poultry slaughterers/processors

	Mukono	Wakiso	Total
Characteristics	(N=19)	(N=36)	(N=55)
Slaughter chickens from own farm			
Yes	2 (10.5%)	20 (55.6%)	22 (40.0%)
Types of poultry products			
Whole carcass	15 (78.9%)	32 (88.9%)	47 (85.5%)
Meat cuts	10 (52.6%)	11 (30.6%)	21 (38.2%)
Offal	11 (57.9%)	6 (16.7%)	17 (30.9%)
Feathers	1 (5.3%)	2 (5.6%)	3 (5.5%)
Manure	1 (5.3%)	2 (5.6%)	3 (5.5%)
Blood	2 (10.5%)	2 (5.6%)	4 (7.3%)
Use of disinfectants for cleaning	15 (78.9%)	32 (88.9%)	47 (85.5%)

Upon entry into the slaughtering area, birds are kept in a cage or waiting nets. Some slaughterers separate the chicken from various sources others don't. Before slaughtering, they normally check the health of the chicken by observing the manure, alertness and nature of eyes, and nature of comb and wattle (if red, it is a sign of sickness).

Chicken slaughterers follow the halal norms with only Muslims allowed to slaughter. If birds are sick at the point of slaughtering, where possible the supplier is informed so he/she can inform the source to treat the remaining chicken. Because of the Halal norms, the sick chicken is slaughtered. If chicken organs, e.g. liver and intestines, appear damaged, the slaughterers advise the owners to give it to dogs/pigs. Upon realising that some birds are sick at the processing facility, some slaughterers apply treatments until the birds show signs of recovery. Birds are kept at the facility for as long as there is market for them; this the same practice as at live bird markets. Drug withdrawal is usually implemented as for every day the bird is treated the trader is incurring losses.

	Mukono	Wakiso	Total
Practices	(N=19)	(N=36)	(N=55)
Report to official/veterinarian	5 (26.3%)	10 (27.8%)	15 (27.3%)
Separate it from the rest of the flock	1 (5.3%)	8 (22.2%)	9 (16.4%)
Treat the entire batch	2 (10.5%)	3 (8.3%)	5 (9.1%)
Slaughter and self-consume	1 (5.3%)	0 (0.0%)	1 (1.8%)
Slaughter and sell to customers	2 (10.5%)	2 (5.6%)	4 (7.3%)
Slaughter and sell as animal feed	3 (15.8%)	4 (11.1%)	7 (12.7%)
Slaughter and bury	2 (10.5%)	0 (0.0%)	2 (3.6%)
Slaughter and throw on dumpsite	1 (5.3%)	2 (5.6%)	3 (5.5%)

**Table 19:** Practices of poultry processors when receiving sick poultry

Business challenges cited by the processors include: lack of designated areas for slaughtering; lack of medical forms/food handler permit; limited or nearly no inspection from veterinary officers and public health inspectors in the available slaughter areas. The interviewed slaughterers advocated for a need to put a ban on slaughter facilities in hidden areas for quality control purposes and to also stop activities of slaughters that do not follow the Halal norms.

## 4. Discussion and conclusion

The current legislative framework largely supports and prescribes the application of key biosecurity and public health practices along the livestock value chain. There is however limited awareness and poor implementation of the legislative framework in place.

A substantial proportion of producers clean the drinkers daily which is the recommended good practice. When a bird gets sick, the majority reported to immediately isolate it from the rest, report to a veterinarian. A majority buries or incinerates dead birds followed, but only a minority of producers report bird deaths to a veterinarian.

The majority of producers treat the entire flock when one bird gets sick and up to 60 percent treat birds before transportation or selling to markets. This is a major risk factor for exposure of consumers to drug residues. Treatments are based on clinical symptoms (80 percent) without laboratory diagnosis. Also, some producers (18 percent) reported to treat birds using human medicine.

The poor quality of chicks was cited by producers as among the biggest constraint to broiler production with some of the chicks failing to attain the required market weight by the 7<sup>th</sup> week. This compels the farmers to keep them longer in an effort to raise the weight. However, for each day after the 7<sup>th</sup> week, the producers suffer losses for maintaining the birds because the traders are reluctant to increase the price of a broiler that is sub-standard.

In terms of biosecurity, most of the producers do not own and use tyre or footbath on their farms and those who do rarely change the disinfectant until it is either dry, empty or dirty. This compromises the prevention of entry of disease pathogens to farms.

The transporters hold the birds for the shortest time compared to the other actors in the poultry chain. However, the practice of traders entering the farms/poultry house to select the birds that meet their quality expectations carries the risk of introducing disease into the farm. Most of the transporters rarely clean their cages despite moving from one farm to the other and from one market to the other. These traders are potential vectors for diseases from one area to the other. Relatedly, the majority do not use standard easy to clean cages.

At the retail node of the value chain, treatment of poultry immediately after transportation is a common practice. The treatments are commonly by antibiotics such as Oxytetracycline, chloramphenicol, among others. Following treatment, birds are sold when buyers show up without observing drug withdrawal periods. The most common complaint from retailers is that some of the birds from farmers are sold when sick and there is need to treat them to avoid losses. There is need for retailers, transporters and producers to work together, increase transparency if a wholesome product is to be available to consumers.

Many of the actors along the poultry value chain have started their business as late as 2016, with deficiencies in knowledge and experience. Designing specific packages that improve the knowledge of these actors might increase the adoption of good practices and compliance with the legislation. However, there is limited public attention paid to poultry sector especially in terms of inspection, enforcement of standards, among others. This is evident from the fact that most of the actors at marketing and processing nodes are operating from non-gazetted premises near or within the markets. Robust and detailed studies are required to make a case for prioritization of the poultry sector by the government of Uganda.