Value chain assessment of animal-source foods and vegetables in Ouagadougou, Burkina Faso – considering food safety, quality and hygiene perceptions and practices

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Value chain assessment of animal-source foods and vegetables in Ouagadougou, Burkina Faso – considering food safety, quality and hygiene perceptions and practices

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Abbreviations

ASF	Animal-source food
CNA	La Chambre Nationale d'Agriculture
COVID-19	Coronavirus disease
DGPSA	Direction Générale des Prévisions et des Statistiques Agricoles
DTA	Département Technologie Alimentaire
FAO	Food and Agriculture Organization of the United Nations
FBD	Foodborne diseases
FGD	Focus group discussion
GDP	Gross domestic product
GMO	Genetically modified organism
HIH	High-income household
ILRI	International Livestock Research Institute
INSD	Institut National de la Statistique et de la Démographie
IRSAT	Institut de Recherche en Sciences Appliquées et Technologies
KAP	Knowledge, Attitudes and Practices
KII	Key informant interview
LIH	Low-income household
MAH	Le ministère de l'agriculture et de l'hydraulique
MECV	Le ministère de l'environnement et du cadre de vie
MEF	Le ministère de l'economie et des finances
MIH	Middle-income household

MRA	Le ministère des ressources animales
ONI	Office nationale d'identification
Processor	Those involved in transforming the chicken carcass into food (e.g. in a restaurant or street food outlet)
RGA	Recensement Général de l'Agriculture
UDT	L'Union Des Transformateurs
UK	United Kingdom
UNDP	United Nations Development Program
USAID	United States Agency for International Development
USD	United States Dollars
VC	Value chain
VCA	Value chain actor
XOF	West African CFA franc

Executive summary

As a preliminary step in the Pull-Push project[1], this study was carried out to document the awareness, practices and perceptions of stakeholders along poultry and vegetable value chains. Issues covered included food safety, sanitary quality and hygiene of products consumed in the city of Ouagadougou. The research also identified risky practices and products in terms of consumer food safety. The study used desk review and qualitative research including focus group discussions and key informant interviews. Respondents comprised poultry and vegetable producers, retailers, consumers, input suppliers, public veterinary services and other regulators of the food chain.

[1] Urban food markets in Africa: Incentivizing food safety using a pull-push approach. https://www.ilri.org/research/projects/urban-food-markets-africa-incentivizing-food-safety-using-pull-push-approach

The chicken value chain

Local producers account for about 99% of chickens consumed in Ouagadougou, with 90% of chickens reared in village chicken scavenger and backyard production systems. An estimated 98% of poultry meat consumed is produced within Burkina Faso. Although there has been a higher demand for local village breed chicken, today, peri-urban broiler production is rapidly increasing.

The top five most consumed animal-source foods (ASFs) are chicken, fish, beef, mutton, goat meat and pork; fish was cited as the most consumed ASF by all household income categories. However, Low Income Households (LIHs) consume more dried fish than fresh fish since it is considered cheaper and better for long-term storage in the absence of home refrigeration.

Frequency of consumption of ASF differed by household category with High Income Households (HIHs) consuming more ASF than others. In terms of safety, local chicken and fish are perceived by consumers as the safest ASFs because they see them as receiving fewer veterinary drugs during production; while pork is perceived as least safe because of its high fat content associated with health problems such as high blood pressure.

Most chicken (90%) is consumed outside the home in street restaurants called '*maquis*' where the meat is prepared as grilled, flamed or roasted. Out-of-home consumption of chicken is dominated by adult men and young women, with formal restaurants being accessed more by HIHs and Medium Income Households (MIHs). In 70% of servings chicken is processed and consumed alone without vegetables, but is accompanied with raw vegetables such as onions or tomatoes as a side dish in 30% of servings. In LIHs, men have better access to ASFs compared to women; this happens while they are running errands. Unlike HIHs and MIHs where vegetables are mainly considered a side dish, in LIHs, most common preparation methods involve cooking ASFs and vegetables together.

Home consumption of chicken follows a local social construct where good parts of the chicken are consumed by people who enjoy privileged positions in households, such as male household heads and parents' in-laws. This means that women and children are disadvantaged as far as nutrition is concerned. However, this trend is particularly true for LIHs and MIHs, especially in rural settings; in HIHs these consumption trends are less frequently observed.

There is no difference in the description of seasonality of consumption of ASFs across household types and gender. ASFs are consumed all year round, with significant increase during festive periods and social and religious events. Home consumption of chicken by LIHs is occasional, and more frequent in HIHs and MIHs.

Local chicken is supplied to urban markets from villages upcountry and neighbouring markets (referred to as village chicken). Almost all chickens consumed are either slaughtered at the market (for village chicken production) or at the farm (for peri-urban production). Home slaughtering is usually practised by LIHs where the head of the household (mainly the man) brings a live chicken home on a special occasion.

Consumers are very concerned about the safety of the products they consume, but are more suspicious about the uncontrolled use of veterinary inputs such as vaccines and drugs at the production level. The use of certain pharmaceutical products such as tramadol and paracetamol during transportation of live chicken (to improve survival rate due to stress) and paracetamol added to aid cooking of meat (to accelerate the process) have been widely reported.

The poor conditions in which the slaughtering and processing of chicken happens is a concern according to market actors and consumers. This is due to the absence of dedicated slaughter slabs for poultry countrywide.

Challenges experienced by live chicken retailers include lack of space for storing and selling chickens, poor waste management, including chicken droppings and leftover feed, and lack of appropriate cages for storage of live chickens. Processors pointed out the lack of hygiene during slaughter and preparation, including cooking processes (here processors refers to those that turn the carcass into food, e.g. in at a restaurant/maquis or street food outlet). In rural areas, women play a critical role in poultry production since they invest a lot in the business. Paradoxically in the marketing and processing nodes, men are predominant. Socio-cultural codes partly determine gender roles; however, it must be noted that people in urban areas tend to be more progressive and less bound by socio-cultural codes than those in rural areas.

Constraints faced by value chain actors (VCAs) included the following:

- Consumers are aware of technologies that exist to boost the growth of chicken. However, they have no information on the potential impact of misuse of these 'technologies' on their health.
- For processors, there is a lack of dedicated slaughtering slabs leading to poor hygiene practices.
- For live chicken retailers, lack of space for storing and selling chicken, plus poor waste management are crucial.
- Producers reported that they are constrained by the poor quality of poultry feed, drugs and vaccines used in farms.

The vegetable value chain

An estimated 90% of vegetables consumed are produced in-country and almost all vegetables produced in Burkina Faso are consumed in-country, with limited export to the sub-region. Most consumption occurs within the household (60%). The top five most commonly consumed vegetables by households include tomatoes, onions, carrots, lettuce, cucumber and African eggplants. There is little variation in the types of vegetables consumed across household income groups. However, HIHs tend to consume more raw vegetables (especially salads) compared to MIHs and LIHs.

Consumption patterns follow the production calendar of a specific vegetable. The more available a vegetable is, the more it is consumed. Availability of vegetables is seasonal, and production depends on availability of temporary water points such as rainwater or irrigation. The periods of highest production are the cold and rainy seasons.

Consumers commonly use various vegetables in a range of soups. However, some vegetables such as lettuce, tomatoes and cucumbers can be eaten raw as a side dish or together with grilled chicken. HIHs reported that when vegetables are in season, there is a tendency to eat less ASFs. Those who consume chicken outside the home (usually men) consume a lot of raw vegetables, especially onion and tomatoes.

Consumers see all the vegetables mentioned above as presenting a risk to consumers because of exposure to pesticides at the production stage. Consumers believe that tomatoes and onions are relatively safer compared to lettuce because they are usually eaten cooked, hence germs are destroyed. Cucumbers are also relatively safer since they can be peeled to remove the outer layer which will reduce the risk of contamination. Lettuce is perceived as very risky because it is eaten raw and is difficult to wash given that it has many leaves and sufficient water is not always available, especially in LIHs. Consumption of vegetables by men outside of households is frequent. This is related to consumption of street chicken, while women and children reported consuming more lettuce at home, mostly when it is in season.

All categories of consumers agreed that consumption of raw vegetables is more nutritious compared to cooked vegetables. For home consumption, vegetables are bought by women from neighbourhood markets. It appeared that all or many types of vegetables are consumed by most people in the household except by those with specific intolerance due to illnesses or allergies. Some consumers mentioned that they do not consume raw vegetables because of the use of pesticides at the production stage. HIHs believe that for children under five years, consumption of fruits and vegetables is very important, especially raw vegetables such as tomatoes and carrots.

Quality of vegetables is an issue for consumers. They expressed concerns about the use of chemicals and wastewater in all stages of production, especially for those eaten raw. According to consumers, the use of chemicals is not without consequences to their health. An additional concern is the use of poor quality and modified seeds such as genetically modified organisms (GMOs). Poor quality vegetables are sold to households and popular restaurants; their consumption seems to be attributed to poverty and limited food choices. Large-scale vegetable production is dominated by men and youth, while home gardening is dominated by women. At the marketing node, women are key players. For all VCAs including consumers, retailers and producers, potential contamination of vegetables through the use of chemicals such as pesticides and wastewater at the production stage, especially those eaten raw, remains a major concern.

Part I: Background, materials and methods

Foodborne illnesses are a worldwide public health concern and a significant cause of reduced economic growth (White et al. 1997). These diseases can result from consumption of food contaminated with pathogenic organisms or toxic chemicals. In some developing countries, poverty and low educational levels can result in lack of awareness, poor hygienic and sanitation facilities, and lack of rules, quality control and alert systems, meaning that foodborne infections remain a persistent burden (Barro et al. 2007, Mensah et al. 2002). Contaminated raw or undercooked poultry products, especially chicken meat, can be an important source of foodborne pathogens, resulting in numerous cases of enteric infections (Wilson, 2002). Most of the foodborne illnesses are caused by three major bacteria: ***Campylobacter*** spp, ***Salmonella enterica*** and pathogenic ***Escherichia coli*** (Todd 1997). In Burkina Faso, traditional poultry farming is no longer sufficient; in recent times small-scale industrial broiler poultry businesses have expanded and are supplying the growing demand for animal proteins among the urban population. However, hygienic conditions in poultry markets, where slaughtering is also done, are poor and can lead to bacterial contamination of meat (Kagambèga, et al. 2011). Food safety of animal-source food and vegetables in Burkina Faso and most sub-Sahara African countries is under-researched, hence the lack of information on incidences of foodborne pathogens. The situation is worsened by lack of surveillance programs that target foodborne pathogens (Kagambèga et al. 2013).

The Pull-Push ('Urban Food Markets in Africa – incentivizing food safety using a pull-push approach') project aims to address the safety of fresh foods sold in urban informal markets while focusing on poultry and vegetables in Ouagadougou, Burkina Faso. It is also implemented in the cities of Dire Dawa and Harar in Ethiopia. While we are fairly certain that most of the health burden of foodborne diseases (FBDs) is associated with fresh foods sold in informal markets, there is little actionable information at country level on the priority hazards, health risks, economic costs or options for management. Knowledge gaps make it difficult for policy makers to prioritize and manage food safety and for consumers to make well-informed choices. Greater complexity of ASF value chains (VCs) and distances between production and consumption make it difficult to understand the epidemiology of FBDs (Grace 2016).

The aim of this study was to gain some understanding of the knowledge, attitudes and practices (KAP) of various actors throughout the poultry and vegetable VCs in the city of Ouagadougou. It sought to understand typical consumer food purchase, preparation and consumption practices and preferences, and perceptions of food quality and safety. This information will then be used to develop interventions that reduce the risk to consumers. Challenges faced by value chain actors (VCAs) were documented, as well as risky practices along the food chains. Finally, suggestions were made on how to improve the safety and quality of chickens, and vegetables for the benefit of consumers. This information will guide further household data collection, and microbial sampling in order to quantify value chain risks, provide information for quantitative risk models and identify potential consumer/retailer/regulator food safety interventions to be assessed later in the project.

1.1 Burkina Faso population and demographic characteristics

Burkina Faso is a developing country with a population (estimated in 2019) of over 20 million inhabitants (52% are women). A large part of the population (77.3%) live in rural areas, although a gradual decline in the rural population has been observed over the years. The country comprises 13 regions with Ouagadougou, the capital city located in Centre Region. In 2019, the population of Ouagadougou was estimated at about 2.5 million inhabitants (INSD, 2019) with one province, Kadiogo and seven communes: Ouagadougou commune (85% of the population), Komki Ipala (1.2%), Komsilga (3.1%), Koubri (2.5%), Pabre (1.6%), Saaba (2.9%) and Tanghin Dassouri (3.2%). The annual population growth rate of Burkina Faso is estimated at 7% (Delaunay, 2019). According to the last general census (2006), there are four main religions in the country: the majority are muslim (57.4%), followed by catholics (34.9%), protestants (6.2%), animists (0.4%), and others religions (1.1%) (INSD & MEF 2009a).

Based on the results of a sectoral survey conducted in 2014, the monetary poverty line is estimated at XOF 153.530 (USD 253). This corresponds to the level of income that enables the minimum caloric food requirement and basic non-food needs to be covered (INSD & MEF 2009b). In 2014, 40.1% of the Burkinabè population lived below this threshold. This value was 9.6% in the city of Ouagadougou (INSD & MEF 2019). Poverty was higher in rural (47.5% below this poverty line) than in urban areas (13.7%). Most of the people living in extreme poverty (94.4%) are in rural areas (INSD & MEF 2018). Centre Region has the lowest poverty incidence rate in the country (9.7% in 2014) (INSD & MEF 2015). The annual per capita expenditure at the national level is XOF 191.819 (USD 317) with XOF 376.626 (USD 622) in the central region, Ouagadougou. However, Ouagadougou is the commune with the highest level of inequality across the country (UNDP, 2014). It is estimated that 25% of households spend a maximum of XOF 12,000 (USD 20) per month on food expenses, half of the households (50%) devote a maximum of XOF 49,000 (USD 81) and 75% devote a maximum of XOF 70,000 (USD 116) per month (ANR, 2014). A 2008 study identified three household categories in the city of Ouagadougou: very poor (15%), poor (60%) and rich households (25%) (DGPSA 2008).

1.2 Socio-economic importance of the poultry and vegetable sectors in Burkina Faso

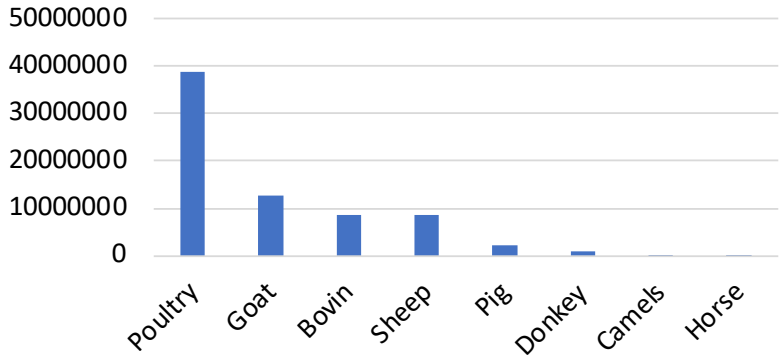
1.2.1 The poultry sector

The poultry sector plays a major role in the socio-economic development of Burkina Faso. It is among the country's most dynamic sectors. The value of poultry production in 2011 was estimated at over XOF 85 billion (USD 140 million), representing about 6% of the country's agricultural Gross Domestic Product (GDP) (FAO 2018). The traditional poultry sub-sector represents more than 98% of the quantity of poultry produced. Of this value, 46.4% arises from producers, 24% from processors (street grillers/roasters), while the rest is shared among the other actors in the VC including collectors, exporters, retailers and feather processors [i.e. processing feathers for various uses] (MRA 2007).

Traditional family farming is characterized by the rearing of local breeds with rudimentary animal husbandry techniques and equipment, plus limited inputs such as food, water and veterinary health monitoring. This production system plays a major role in the religious, social and cultural livelihoods of the rural population, in addition to being a source of income for poor farmers in rural areas, especially women (Alders 2005). In Burkina Faso, most consumers, and even some high-end hotels and expatriates, prefer traditionally-produced poultry for its flavour and less intensive production methods (Austin 2016, Ilboudo 2015). Chickens are widely consumed in Burkina Faso and exported to neighbouring countries (Kagambe'ga et al. 2012). Chicken consumption outside the home is significantly higher than home consumption (Austin 2016, Ilboudo 2015).

Traditional poultry farming involves a variety of actors of varying importance. There is little additional processing of poultry products before sale to the consumer due to the low level of sophistication in the market, the culinary and cultural habits and the low purchasing power of many consumers (USAID 2016).

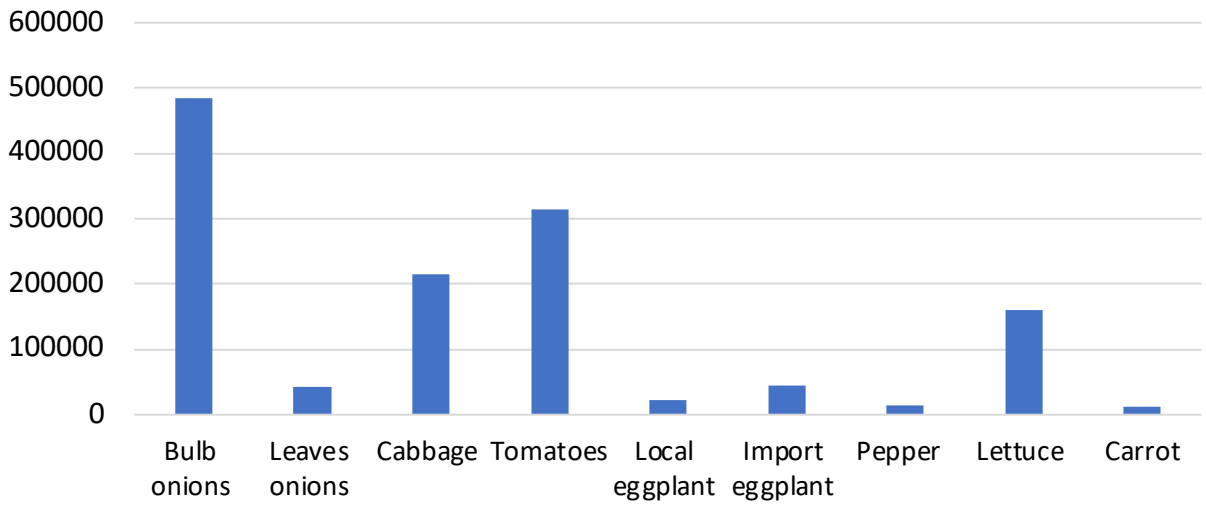
Figure 1: Livestock production in Burkina Faso in 2011, number of animals (FAOSATAT).



1.2.2 The vegetable production sector

The vegetable production sector plays an important role in the socio-economic development of the country. It is an important sector for job creation, poverty alleviation and a source of food supply to major cities (Dieye 2006, Économique 2006, FAO 2007). It is one of the few production sectors that creates many jobs in rural areas during the dry season and generates substantial income for women and youth who market most of the produce (MRA 2007). Results of the latest general agricultural census indicate that market gardening employs 617,502 people, 35% of whom are women. Total vegetable production was estimated at 747,488 tons in 2008: 242,258 (32%) bulb onions, 157,086 (21%) tomatoes, 107,476 (14%) cabbages and 79,617 (10%) lettuce (RGA, 2011). The total value of sales of farm products is estimated at over XOF 82 billion (USD 140 million) (RGA, 2011). It also brings in more than XOF 10 billion (USD 17 million) per year to the national economy with a contribution of more than 3% of GDP, similar to cotton (4% of GDP) (MAH 2011, MECV 2011). Except for green beans which are produced for export, all other vegetables (tomatoes, onions, cabbage, etc.) are largely produced for domestic consumption. In 2017, Burkina Faso exported 29,760 tons of vegetables, plants, roots and tubers (INSD & MEF, 2018). The main trading partners for tomatoes are Ghana, Togo, Benin and Côte d'Ivoire for exports, and Ghana and Niger for imports. For onions, the main countries for both imports and exports are Côte d'Ivoire, Ghana and Togo.

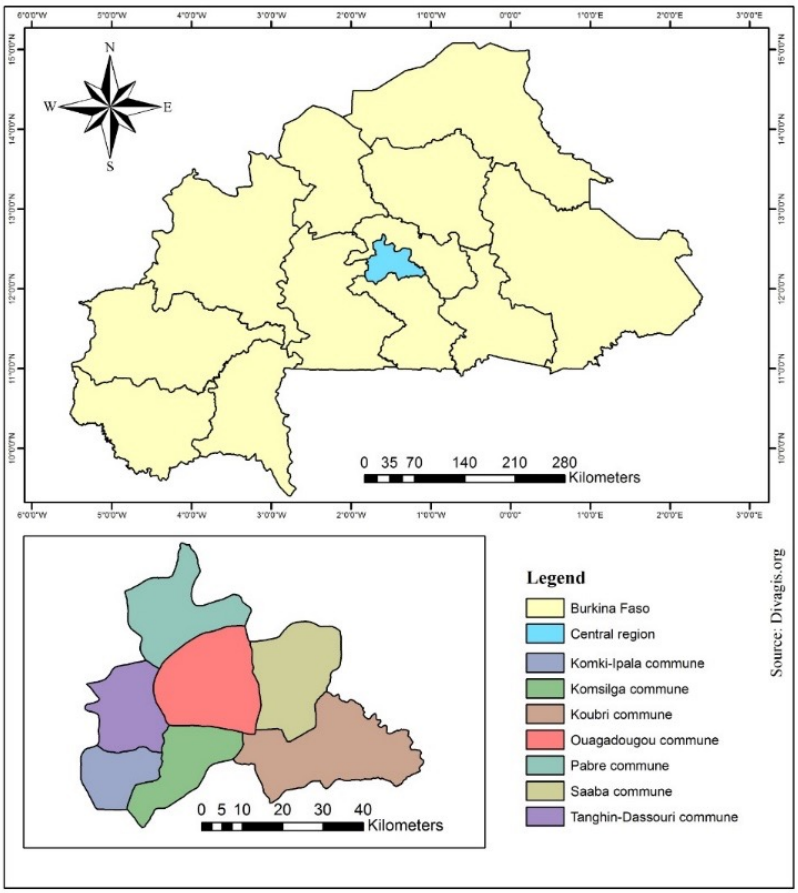
Figure 2: Trends in production of vegetables in Burkina Faso in 2011, tons (FAOSTAT).



1.3 Materials and methods

The study was purely qualitative, consisting of Focus Group Discussions (FGDs), Key Informant Interviews (KIIs) with various poultry and vegetable value chain actors, field observations and stakeholder consultations (Annex 1).

1.3.1 Study area and participants



Picture 1: Map of Ouagadougou city.

This study was carried out from December 03, 2019 to January 11, 2020 in the city of Ouagadougou. A total of 139 respondents participated in the different FGDs. They were divided into 15 discussion groups with the number of participants varying from seven to 11; there were an average of nine people per focus group (Annex 3).

1.3.2 Data collection tools

Four FGD and KII guides were developed by the project research team for consumers, retailers and producers of poultry and vegetables. The guides were structured around the following themes:

- Availability and use of animal-source foods and vegetables
- Animal-source foods and vegetables most consumed based on certain criteria, such as income
- Variation in the consumption of chicken and vegetables during the year
- Sources of supply (accessibility and traceability throughout the value chain)
- Quality and safety of chicken meat and vegetables (knowledge, attitudes and practices)
- Cooking, handling and consumption of chicken meat and vegetables

- Food preferences of different types of consumers
- Health risks and nutritional benefits
- Consumer suggestions for improving safety and hygiene
- Gender issues along the poultry and vegetable value chains.

1.3.3 Key informant interviews

Annex 2 highlights the distribution of key informants interviewed in the vegetable and poultry value chains including producers, wholesalers, retailers, consumers, supermarkets and public services.

1.3.4 Focus group discussions with poultry and vegetable producers

Two FGDs were conducted with poultry producers (Wayalghin and Saaba districts) who were all men and four FGDs with vegetable producers (Boulmiougou, Ouaga 2000, Saaba and Boulbi districts), among which one was a women's group involved in growing vegetables. Poultry producers were identified through a WhatsApp group. Participation in FGDs was voluntary and the team's knowledge network was considered when inviting. The vegetable producers were brought together through existing associations. In each site, the study focused on the predominant vegetable produced in the area: one group in Saaba focused on onions, the one in Ouaga 2000 focused on tomatoes, the one in Boulbi focused on cucumbers with the one in Boulmiougou focused on various vegetables (Annex 3).

1.3.5 Focus group discussions with poultry and vegetable retailers

Three FGDs were organized with retailers – one with live chicken retailers, one with grilled chicken retailers and one with women vegetable retailers. Vegetable retailers were brought together in Nagrin market, one of the largest vegetable markets in Ouagadougou. In this market, participation was on a voluntary basis. The same method was followed for the FGD with live chicken retailers in Gounghin market. Retailers of processed chicken (grilled chicken) were selected through their association (Annex 3).

1.3.6 Focus group discussions with consumers

Three groups of FGDs were organized – groups of low income, middle income and high income earners. The categorization of consumers was made based on data from the ***Institut National de la Statistique et de la Démographie*** (INSD). The INSD has defined a food basket of around 30 products which represents more than 80% of total annual consumption. Evaluation of the cost of this food basket and that of other basic needs made it possible to estimate the absolute threshold of monetary poverty at XOF 153.5 (USD 265) per adult person per year with current prices in Ouagadougou. This comes down to around XOF 12,800 CFA francs (USD 22) per adult as average monthly food expenditure. Thus, during the study, any person whose monthly expenditure was less than XOF 12,800 (USD 22) was classified as in the low income category, between 12,800 (USD 22) and XOF 20,000 CFA (USD 35) francs as in the middle income category and more than XOF 20,000 (USD 35) as in the high income category (Annex 3).

A total of six FGDs were organized with all categories of consumers, three with men and three with women. The groups were formed from within the locations where poultry and vegetable retailers were interviewed. An initial survey was carried out targeting a list of 100 voluntary consumers who registered in order to stratify participants for the FGDs on income. Unfortunately, a good representation of all the strata was not possible. A complementary list of consumers was obtained using the team's local knowledge network with the help of local leaders in target areas (Annex 3).

1.3.7 Composition of the field investigator team and validation process

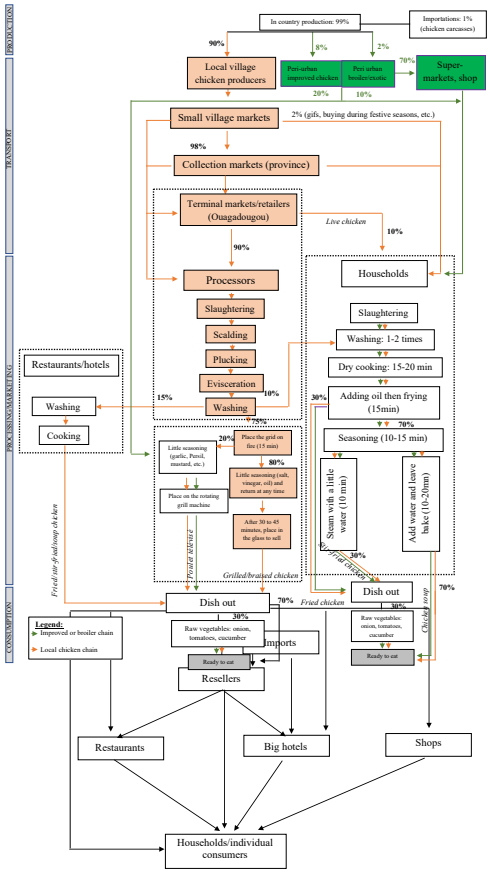
The field study was carried out in the city of Ouagadougou and surrounding areas by a multidisciplinary team made up of five researchers including three social scientists and two epidemiologists. A stakeholder validation mini-workshop was carried out to discuss validity of findings and to get insights from local experts. During the meeting, the poultry and vegetable value chain diagrams were discussed in detail and consolidated. Risk assessment experts who are part of the Pull-Push project were also consulted.

Part II: Chicken and vegetable value chain maps

2.1 The chicken value chain map

The main sources of chicken supply to Ouagadougou are local farmers accounting for about 99% of total production; local village chicken production accounts for 90%, while peri-urban broiler production is now growing due to higher demand for chicken meat. Importation of chicken from international markets both from the sub-region (Ghana, Togo, Senegal, Mali, Benin, Côte d'Ivoire) and Europe (Belgium and Holland) is limited. One of the most well-known local producers is ***Ferme Fadima***, a dominant firm in the country. The chicken VC diagram (Figure 3) focuses on local production. There are three types of producers: local village chicken producers, peri-urban improved chicken breed producers and peri-urban broiler producers. While village chickens are channeled through local markets, improved breeds and broilers are sold directly to supermarkets, hence their supply chain is short. Village chickens are first collected centrally in rural markets and then sent to live poultry markets in Ouagadougou, from where they are distributed to 'maquis' (street restaurants), hotels and households.

Figure 3: The chicken value chain.



2.1.1 Availability, consumption patterns and safety of ASFs

a. High-income households (HIHs)

The ASFs frequently consumed by HIHs comprise of chicken, fish, beef, mutton, goat, pork, milk, eggs and cheese. The frequency of consumption of these products differed by gender (Table 1). For example, women usually consume chicken **at home** on a weekly basis. On the other hand, men consume chicken **at home** almost three times per quarter, except during festive seasons when they increase at-home consumption in addition to their usual out-of-home consumption.

However, several men reported consuming chicken on a daily basis outside of their households in street restaurants known as 'maquis'. Adult women's out-of-home consumption of chicken is rare, and mainly occurs during festive days when they go out with friends for leisure. The main dishes cooked with chicken at home are chicken soup, fat rice and chicken[2], rice with tomato sauce and chicken, rice with peanut sauce and chicken, chicken with couscous and vegetables, braised chicken, stir-fried chicken, chicken skewers and chicken sandwiches.

Depending on their cooking method, some dishes are boiled, while others are cooked in the oven. Fried chicken is often accompanied with raw vegetables such as tomatoes, onions or cucumbers, sometimes a combination of two or more often served as a side dish. Chicken can also be cooked with vegetables (***poulet fourré aux légumes***[3]), in which case they are mixed with tomatoes, onions, cucumbers and cooked in the oven. The local village chicken is usually considered the tastiest, and is most preferred. However, it is more expensive.

> *'Every weekend, we get chicken for the family, but during the holidays, consumption increases. For personal consumption, one grilled chicken is sufficient, but for family consumption, we need at least two chickens. During the rainy season, we get freshwater fish.'*
>
> *Voice of a female consumer*

Table 1: Listing of home consumption of ASF in HIHs according to men and women.

Women								
ASF	Chicken	Fish	Beef	Sheep	Goat	Pork	Milk	Eggs or cheese
Frequency of home consumption	1-2 times per week	Daily	2 times per Week	2 times per Week	2 times per Week	1-2 times per month	Daily (at breakfast)	Daily (at breakfast)
NB: the consumption of chicken soup is often with the family, while grilled chicken is consumed mostly by husband and wife in the absence of the children (private gift from the husband in plastic bags)[4].								
Men								
ASF	Chicken	Fish	Beef	Sheep	Goat	Pork	Milk	Eggs or Cheese
Frequency of home consumption	3 times per quarter	4 times per week	3 times per week	3 times per week	3 times per week	2 times per month	Daily (at breakfast)	Daily (at breakfast)
Consumption of meat and fish is alternated in the household. Men consume chicken outside of their homes usually on a daily basis (on their way back from work)								

In terms of safety, chemical contamination (due to use of veterinary drugs and other chemicals applied on farms) has been the most widely cited aspect of concern when it comes to food safety. For example, consumers felt that local chicken is safer because they are not given much medication at the farm. Fish from fresh water is safer compared to frozen fish because the latter is imported from China, so is thought by consumers as likely to have received chemical treatments to improve shelf life. However, fish is perceived as safer to consume compared to other ASFs because participants assumed that they are not treated with many veterinary products or other chemicals.

[2] Raw vegetables are put in the abdominal cavity of the chicken carcass after evisceration and washing and cooked in the oven.

[3] With rice cooked with oil.

[4] The chicken cooked in the sauce is for all household members. Grilled chicken from street restaurants can be brought home by a husband but only for his wife/wives. This is considered a gift for the wife and is usually presented at night after children have had their dinner and gone to bed.

Pork is considered less safe because of its fat content, which consumers felt is one of the causes of many health problems, including high blood pressure. Finally, beef, mutton and goat meat are considered safer than other ASF because they are mainly processed in the slaughterhouse and are therefore supposed to have been inspected prior to sale in the market (Table 2).

Table 2: Ranking by men and women of the top five ASFs in HIHs.

Women and men FGD group					
ASF	Taste	Price	Convenience of cooking	Health/nutritional	Food safety
Chicken	Very good	Expensive	Easy	+++	Safer
Fish	Good	Cheaper	Very easy	+++	Safer
Beef	Good	Expensive	Difficult	++	Slightly safe
Sheep/goat meat	Good	Expensive	Easy	++	Slightly safe
Pork	Good	Expensive	Difficult	+	Less safe

b. Middle-income households (MIHs)

The ASF*s* reported to be consumed in MIH*s*, just like in HIHs, include mutton, goat, beef, pork, chicken, fish, eggs and milk. Consumption of chicken increased during social events and holidays, especially broilers and frozen chickens **since they are cheaper than the local village chicken**. However, according to participants, frozen chicken is less safe because they can still be sold after their expiry dates. Raw vegetables (lettuce, cucumber, tomato) are mostly eaten together with meat or chicken, but most of the time as a side dish. **MIH** home consumption of chicken was less frequent than that of HIH*s*, as men and women participants reported ***that they*** consumed chicken at home about twice in a month on average. Like those in HIHs, men in MIHs also consume chicken frequently outside of home (Table 3).

Table 3: Frequency of consumption at home of ASF by women and men from MIH.

Women and men groups							
ASF	Chicken	Fresh fish	Beef	Mutton/goat	Pork	Powdered milk	Eggs
Frequency of home consumption	2 times per month	3-4 times per week	2-3 times per year	1-2 times per week	1 time per quarter or during exceptional cases by men	Daily (at breakfast)	Daily (at breakfast)

NB: ASF and vegetables are cooked together and served on the same dish; lettuce is eaten with fish and meat.

*C*hicken-based dishes that are consumed by MIH*s* are made of rice and 'tô'[5] with chicken sauce, chicken soup, chicken spaghetti and lettuce.

The top five consumed ASF*s* by MIHs according to men and women are chicken, fish, beef, mutton and pork. Fish is also perceived as safer and more nutritious by MIHs, whereas pork is considered the least safe food because of the same reasons mentioned above, its high fat (Table 4).

Table 4: Ranking of the top five ASFs in MIHs according to men and women.

Women and men groups					
ASF	Taste	Price	Cooking convenience	Nutritional health	Food safety
Chicken	Very Good	Expensive	Easy	+++	Safe (local chicken is safer)
Fish (fresh/dry)	Good	Cheaper	Easy	+++	Safer
Beef	Good	Cheaper	Difficult	+++	Safe
Mutton	Good	Cheaper	Easy		Safe
Pork	Less good	Expensive	Very difficult	+	Less safe

[5] Local dish made from cereal flour

c. *Low Income Households (LIHs)*

Frequency of consumption of ASFs is lower in LIHs compared to HIHs and MIHs. ASFs reported to be more frequently consumed by LIHs are chicken, fresh fish, dry fish, beef, mutton, goat, milk (packed in small plastic bags) and eggs (Table 5). Here, dry fish is more common than fresh fish since it is cheaper and more adapted to long-term storage in the absence of refrigeration facilities at home. Consumers reported that consumption of chicken is occasional and is mainly offered during religious events and social ceremonies. Women consume more fish given that they remain at home with the children while men go out to work and out for leisure outside of the home, where they have access to meat during lunch time. Unlike HIHs and MIHs where vegetables are mainly a side dish, in LIHs, the most common dish preparation method is cooking meat with vegetables.

Table 5: Frequency of home consumption of ASFs in LIHs by women and men.

Women							
ASF	Chicken	Fresh fish	Dry fish	Beef	Mutton/ goat	Powdered milk	Eggs
Frequency of home consumption	During social events/ special occasions	2-3 times per week	Up to 7 times per week	During social events	During social events	Limited to children occasionally	Limited to children occasionally
Chicken and meat (mutton or chevon) consumption is occasional. It occurs during ceremonies and religious festivals.							
Men							
ASF	Chicken	Fresh/dry fish	Beef	Mutton/goat meat	Powdered milk	Eggs	Pork
Frequency of home consumption	Depending of social events/ special occasions	4 times per week	2 times per week	2 times per week	1-2 times per week	1-2 times per week	Limited to men who are formally employed

In LIHs, consumption of chicken outside the home is occasional because their purchasing power is lower. The five most consumed ASFs cited by LIHs include fish, beef, mutton, chicken and pork (Table 6). Pork is mainly consumed by the formally employed such as civil servants. There was no significant difference in the ranking of the top ASF by men and women.

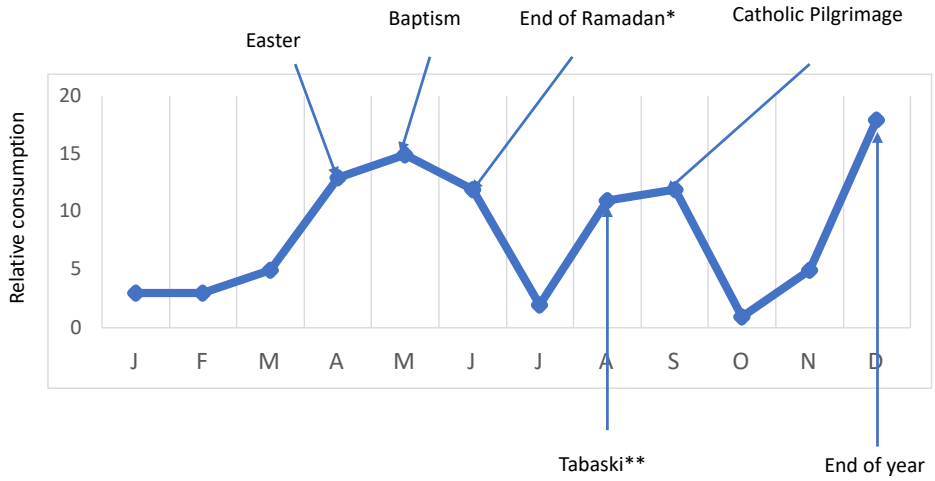
Table 6: Ranking of the top five ASFs in LIHs according to men and women.

ASF	Taste	Price	Cooking convenience	Nutritional health	Food safety
Fish	Good	Cheaper	Easy	++++	Safe
Beef	Good	Cheaper	Difficult	++	Safe
Mutton	Better	Expensive	Easy	++	Safe
Chicken	Very much appreciated	Expensive	Easy	++++	Safe
Pork	Less good	Expensive	Very difficult	+	Less safe (fat)

2.1.2 Seasonality of chicken consumption

There is no difference in the description of the seasonality of consumption of ASFs across households and by gender. They are consumed all year round with a significant increase during some periods of the year such as festive seasons including periods of social events, holidays and end-of-year festive days (Figure 4).

Figure 4: Reported relative chicken consumption over the calendar year.

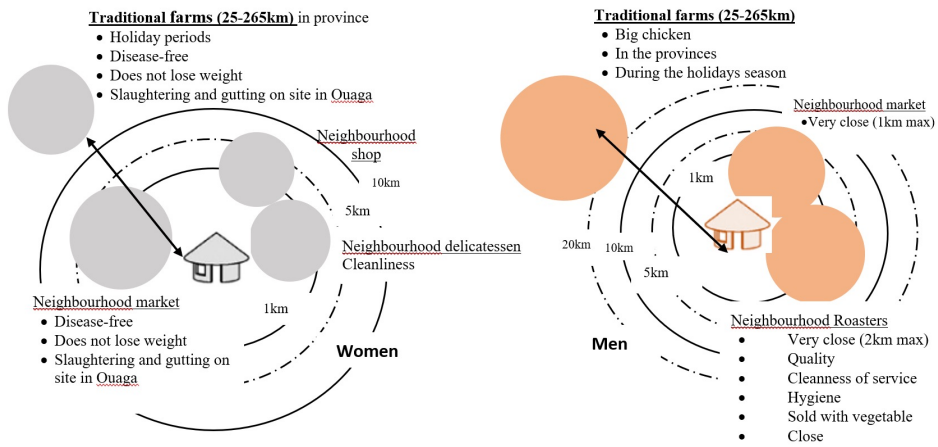


*Muslim fasting period
** Eid al-Adha or Eid al-Kebir is the most important of the Islamic festivals. It is called Tabaski in countries in West and Central Africa with a large Muslim community.

2.1.3 Sources of chicken supply based on consumers

The main source of live chickens for consumers in Ouagadougou are traders/retailers. The most common sites where consumers source local village chicken are Koubri, Kienfangué, Kinfangué, Yako, Dori, Pouytenga, Poa, Kouba, Zorgho, Mogtédo, Nagbangré, Kombissiri, Saponé and Kokologho. All these sites are located up to 265 km away from Ouagadougou. The live chickens are brought into the city and sold in markets. Most of the time, consumers purchase the chicken directly from the market. They prefer birds that have just arrived from the village since they look apparently healthy, as they believe that those birds have not yet contracted any illness or lost weight following starvation during transportation. The chickens are slaughtered at the market and the carcasses packed in plastic bags. The average time taken by the consumers to travel from market to their destination is 20–30 minutes depending on the means of transport (by motorbike or car) and distance. Sometimes, the consumers can phone the trader who selects and slaughters the chicken, sending the carcass to the client through their staff using a motorbike or the client's relatives collect the carcass at the market or farm. Home slaughtering is usually performed by LIHs where the head of the household (typically the man) brings a live chicken home during a special occasion. Almost all chicken consumed is either slaughtered at the market (for village chickens) or at the farm (for broiler chickens produced in the city). For the improved/broiler chicken, the different supply sites are within the city of Ouagadougou at various markets that supply food and fresh meat in the districts of Ouaga 2000, Karpala, Cité An II, Zone I, Dassasgho, Zone du bois, Kilwin, Patte d'Oie and Nagrin.

Figure 5: Venn diagrams showing sources of chicken for male and female consumers (location of purchase of chickens and distance from their household).



In the LIH category, women said that they were not aware of the sources of chicken supply as the husband buys the chicken and brings it home for cooking. As they did not know about the place of purchase no diagram was drawn. In addition, their husbands do not give them money o purchase chicken. Women in this category are only involved in the cooking.

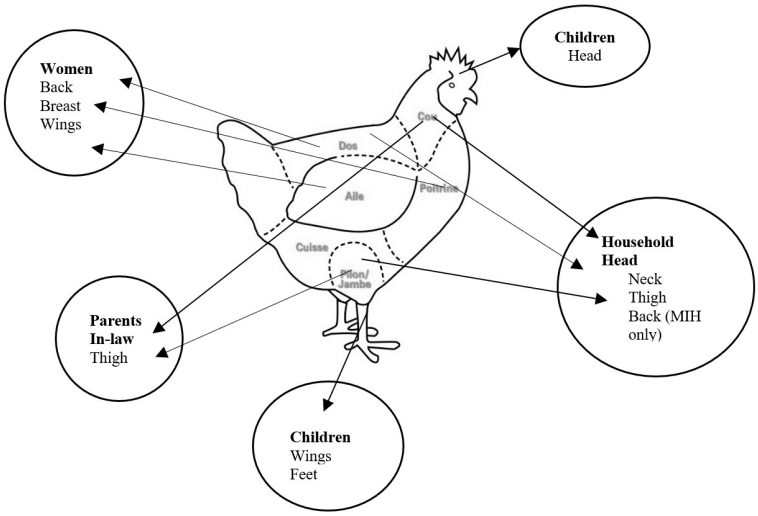
2.1.4 Chicken consumption flowchart

a. Home consumption

An estimated 30% of chicken meals eaten at home are cooked with vegetables. There is a hierarchical and symbolic distribution of the parts of the chicken among the household members (see Figure 2). **Household status and respect are the factors which determine allocation of chicken parts**. At this level, certain parts of the chicken are reserved for certain people depending on their rank and responsibilities in the home. For example, the thigh and neck are for the husband (head of household) and the parents-in-law (if they are living in the house or visiting). This is a symbol of respect and responsibility. The wing, back and breast are eaten by women (easy to prepare small pieces to share with children) while the head and feet are for children (less meat and enable long sucking). Men and women have roughly described the same pattern, except that in MIHs, some men prefer the back of the chicken, while it is a piece reserved for women in other groups. These consumption practices are more pronounced in MIHs and LIHs. This means that women and children in these households are disadvantaged as far as nutrition is concerned.

While in HIHs, although they recognize the traditional social construct around distribution of the chicken parts, they said that anyone can consume any part of the chicken without restriction. Some people do not consume chicken meat due to illness or allergies. In the traditional Mossi ethnic group for cultural reasons, the eldest child is not allowed to consume chicken until the death of one of his parents. Besides these restrictions, children can eat all other foods that adults consume.

Figure 6: Flowchart of chicken consumption trends in households.



b. Street consumption

Most chicken (90%) is consumed outside the home in street restaurants known as 'maquis'. There, chicken is grilled or roasted and eaten in prepared in different ways. Chicken dishes are eaten with raw vegetables such as onions or tomatoes, or without vegetables. An estimated 30% of chicken meals outside of the home are eaten with vegetables as a side dish. Chicken is often consumed with beer at the 'maquis', and for many men it is consumed daily in the evening after working hours.

2.1.5 Consumer concerns about food quality

According to consumers, during purchase, a good quality chicken is assessed by its shape, weight (heavy), health (alert, lively), price (affordable) and age (younger ones are preferred because they have softer meat and bones). To ensure that the chicken looks healthy even after enduring discomfort from transportation, some traders administer Tramadol (a restricted opioid painkiller) on arrival at the market, this risks medicinal residues being present in the consumed meat. Consumers said they have reservations about how birds are raised, although they don't have any control during the production stage. They mentioned the misuse of inputs such as drugs on farms and lack of quality control of farm inputs such as feeds.

> *'Even if the quality is good at first glance, the problem is that we do not know how it was nourished (the chicken)'*
>
> *Consumer FGD*

Thus, emerges the interest in quality criteria beyond organoleptic characteristics.

> *'With chicken, the problem is the feeding and vaccination practices, especially for broilers. There is also some concern about imported frozen chickens'*
>
> *Consumer FGD*

> *'For chickens there are feeds and vaccinations that can make them grow in a few days'*
>
> *Consumer FGD*

There is a fear of new technology, including new breeds and production systems, part of the reason for the preference for the low input traditional village scavenger chickens, another being the taste.

There is particular doubt about broilers and imported frozen chickens (though these are not widely consumed), as consumers have concerns about the poor quality of feeds and the use of poultry medicines, especially for broilers raised under intensive systems in peri-urban areas. **Consumers are aware of technologies that exist to boost the growth of chicken. However, they have no information on the potential impact of misuse of these on their health.** Nevertheless, they believe that the animals slaughtered are often of doubtful quality. A major cause of poor-quality and a risk for food safety is from allowing diseased birds to be slaughtered for consumption. Livestock slaughtered for consumption must be healthy.

For chickens processed outside the home (e.g., grilled chicken), cleanliness of the carcass, seasoning and how consumers are served has a major influence on the level of contamination of the food. Men regard the ritual/religious requirements at slaughter as an important quality criterion for slaughter (Halal, some of which has evolved from legitimate, historic food safety practices). According to participants, for home slaughter, a sick chicken is not normally consumed, except perhaps in the village. However, they said that people who do not want to spend on quality may eat sick or dead animals. All consumers may unknowingly eat meat from sick or dead chickens (i.e., already dead when presented for slaughter).

> ***'Butchers sell meat from sick or sometimes dead animals, if they can do that. This is because sellers of prepared chicken meat can do it too'***

For ready-to-eat meals everyone may consume meat from sick animals because they are unaware of how they are slaughtered. At restaurants, one cannot know the condition of the birds at the time of slaughter and processing, unlike at home where women who prepare the chicken are aware of the quality of the food consumed. Generally, those who eat dead or sick chickens deliberately are more likely to come from LIHs.

Consumers were very concerned about the potential health impacts arising from a lack of adherence to the required withdrawal periods of drugs given to animals and the processing of sick or dead animals in the food chain. In fact,

despite the presence of veterinarians at slaughter slabs in markets, the quality of meat remains questionable according to consumers. **Consumers expressed lack of trust in veterinarians.**

> *'It is as if they (veterinarians) are there just for the sake of being there; they deliberately favour some meat processors by not inspecting some meats of doubtful quality thoroughly. In return, they are given free meat by the processor (corruption)'*
>
> *Consumer FGD*

They also described the way the animals (cows, sheep and goats) are slaughtered, mainly pointing out welfare and safety issues.

2.1.6 Marketing and processing of chicken

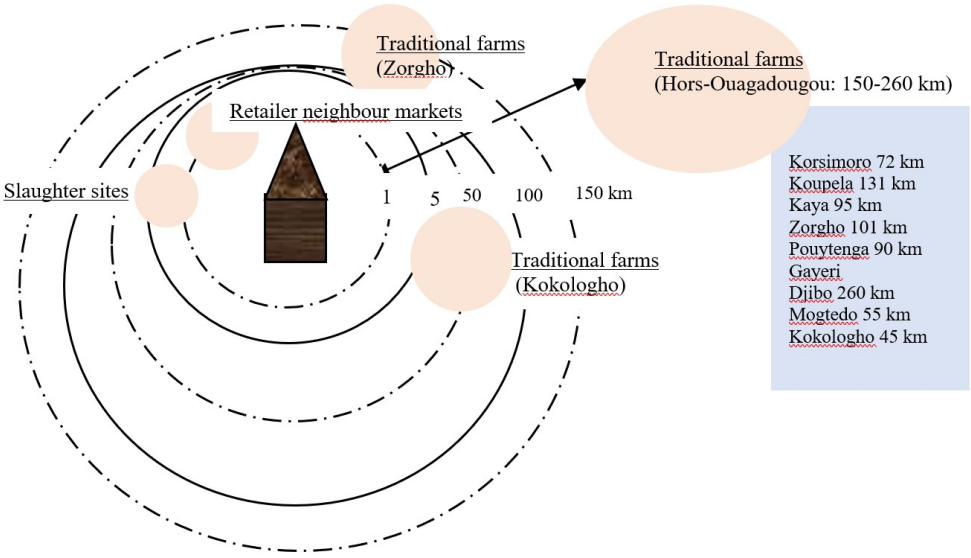
Marketing channels depend on the production system. Traditional poultry farming involves a variety of actors of varying importance. Typically, there are three types of live poultry markets:

- **Collection markets:** they correspond to the collection of poultry in villages by primary and secondary collectors. They are the most numerous and are located at the level of large villages and county towns.
- **Grouping markets:** these are the markets formed by collectors in big urban centres or close to major highways or along the railway. It is in these markets that wholesalers access their supplies for big urban centres using motorcycles, mopeds, trucks, public transport (coach, minibus, train, etc.) and to a lesser extent, private cars. The regrouping markets are usually located in the provinces or at large national crossroads.
- **Terminal markets:** they are usually located in cities such as Ouagadougou and Bobo Dioulasso, where large processors such as butchers, roasters and grillers who serve consumers directly are located.

2.1.7 Chicken supply sources

Live chicken retailers source animals from provinces including Korsimoro, Koupéla, Kaya, Zorgho, Pouytenga, Gayiri, Djibo, Mogtédo and Kokologho. A few of them source from intensive peri-urban producers around Ouagadougou for improved or exotic breeds (Figure 7). **Processors** source from live chicken markets in Ouagadougou. Each processor has at least two chicken suppliers from different markets within the city. This helps them to source enough stock. They are also in contact with collectors in the provinces who can supply them with chickens directly.

Figure 7: Venn diagram of chicken described by retailers in the city of Ouagadougou (location of purchase of live chickens and distance from the market).



2.1.8 Transportation of live chickens

On market days, live chicken retailers travel to the provinces. At the marketplace, village collectors, affiliated in groups or working alone, come to offer or deliver their products to these retailers. Retailers are in turn responsible for transporting their products to Ouagadougou. They use a range of vehicles, including motorbikes. The chickens are packed in cages or hung by the legs on public transport vans or trucks. The journey from the province to the final market in Ouagadougou can vary from one to five hours (Pictures 2 and 3).

Picture 2: Birds transported on a motorbike from the village to the city.

Picture 3: Birds hung on a public van going from the village to the city.

On arrival in Ouagadougou, the chickens are mixed with other birds stored in cages at the terminal market (Picture 5). Most of the time, the stock is sold within three days, especially during periods of high demand. In exceptional cases where the stock is not exhausted within seven days, retailers prefer to slaughter and store the chickens in a communal freezer (owned by the traders) at the market for subsequent sale to processors. This is to avoid losses or additional costs related to feeding and mortality.

Picture 4: Arrival of birds at the market in Ouagadougou. Picture 5: Chicken in cages at the market in Ouagadougou.

2.1.9 Handling and processing of chicken meat

At the time of purchase or order by a processor or household consumer chickens are slaughtered at the market and their carcasses are transported to the restaurant or homes for household consumption. For peri-urban production, mainly broilers (10% of the overall production), chicken is slaughtered on-farm and the carcasses collected by the client. It should be noted that the production of broiler chicken is usually timed to meet periods of high demand such as festival days. Thus, production is highly seasonal, unlike that of the village chicken value chain.

Picture 6: Slaughtering slab at the market.

Picture 7: Chicken being transported for slaughter at the market in Ouagadougou.

Picture 8: Packaging of chicken carcasses for delivery to the processor/maquis.

Picture 9: Plucking and washing of chicken carcass.

a. Home cooking

The process of home cooking of chicken from the time it arrives to the time it is served and eaten is described in the value chain map. It depends on the type of dish, ingredients used and the seasoning. The process is almost the same for all household income categories. Cooking time also depends on the dish and age of the chicken (cooking time younger chickens is reduced because the meat is softer) but does not exceed one hour on average (Figure 3). Usually, a whole chicken is consumed that same day. However, in the case where the dish is not all eaten on the same day (which may happen in HIHs), the rest is kept in the fridge for consumption the following day. Women reported the practice of adding paracetamol tablets to the cooking pot to speed up the cooking process, especially for beef.

b. Street restaurants

Chicken carcasses are collected from the retail market and brought to the restaurant for preparation. A few processors stock live chickens and slaughter at the restaurant on demand.

According to chicken processors, the best-selling products are grilled (or braised) and flamed chicken. The demand for roasted chicken called ***poulet télévisé*** (Picture 13) is lower since it is cooked with a lot of oil, which is perceived as unhealthy.

Picture 10: Live chickens stored in a street restaurant and slaughtered on demand.

The quantity sold is around 200–400 chickens per griller per day, with higher levels of sales during weekends. It should be noted that in the process of preparing flamed chicken in its traditional form, the carcass is usually not washed since it is plucked dry, so hygiene is substandard, and if not properly cooked the risk of contamination is very high. However, in the case of grilled chicken, it is typically plucked using hot water (scalding), washed and cooked at high temperatures. The dishes are difficult to prepare and are sold for the same price. There is a technique for controlling the fire and cooking method that must be mastered, as stated by processors.

> *'I have been grilling for nearly five years. It took me almost six months to learn how to grill properly and master the skill. Proper cooking requires two things: temperature and time'*
>
> *Chicken processor*

Most of the consumption is onsite at maquis and street vendors. To package the grilled chickens for home consumption ready-to-eat, processors say they now use aluminum foil, then put it in a plastic bag for the customer to take home. This practice became particularly common during the COVID-19 curfew.

Impact of COVID-19 on the poultry value chain

During the COVID-19 restrictions in 2020, live chicken markets were closed. However, some retailers smuggled live chicken to sell to consumers along roadsides or behind the market. Slaughtering of chicken at the marketplace became difficult, but processors managed to create new hidden slaughtering places, further compromising the quality since the process is fast-tracked to avoid police patrols. However, many consumers preferred to take the live chicken home. The demand for ASF dropped since consumers directed part of their expenditures to most urgent family needs such as other staple foods. Street restaurants reduced their level of operations since clients were scarce. Many consumers preferred to take away roasted chicken since early curfew did not allow them to gather. Many actors in the chicken food supply chain lost their jobs, which had a significant negative socio-economic impact on their families.

Table 7: Ranking of most common chicken preparations by processors.

Processed chicken	Taste	Food safety risk	Nutritional health	Cooking convenience	Price
Flamed chicken	Very good	More risk	+++	Difficult	3000 (USD 5)–4000 (USD 7) per unit
Grilled (or braised) chicken	Very good	Less risk	+	Difficult	3000 (USD 5)–4000 (USD 7) per unit

When buying live birds for slaughter, a processor mentioned that the most important criteria was apparent health of the chicken and age (young chickens are preferred).

'Customers like young chickens to enjoy with meat on the bone, because the bones are soft'.

> *'If our chickens are well cooked, they are then displayed in glass cases and customers are served from there. When grilled chickens are not all sold, unsold products do not exceed 20–30 carcasses'.*

Unsold chickens are refrigerated and mixed with the next day's batch after reheating. Chickens that are too large and old are not suitable for grilling and are worse for braising. In terms of taste, grilled and braised chicken are more popular. In terms of nutrition, the braised chicken is perceived as less nutritious than grilled chicken.

Picture 11: Chicken grilled with garlic.

Picture 12: Preparing grilled chicken.

Picture 13: Roasted chicken (poulet télévisé).

Picture 14: Fried chicken.

Picture 15: Ready-to-eat street chicken meal with raw onions, tomatoes and dry chili.

Picture 16: Ready-to-eat street chicken meal with raw onions, tomatoes and chili sauce.

2.1.10 Most important aspects of quality according to processors

Cleanliness of the cages where the live chickens are stored was considered very important by processors. They reported that the cages are regularly cleaned with soap and water. The means of transport from the farm to the terminal market was considered a cause of concern for live chickens since many did not survive in the cages at the market after a long trip. This is why retailers are keen to exhaust their stock as soon as possible to avoid losses. Processors prefer new arrivals since according to them such animals do not have time to contract diseases following poor storage practices at the terminal market. For processors, **proper cooking of the chicken is important and should include all the delicate sides of the wings, sides of the neck and thighs**, hence they like young birds that are not too big. For grilled chicken, they mentioned poor cooking and preservation of the meat.

For broilers if the chicken itself is not in good condition after purchase, they are usually returned it to the farm. In this situation, since the farms are within the city, it is easy for retailers to get in touch with the owner of the farm and establish a good business relationship, unlike for village production.

They (the processors) said, '*We are the ones who often go to remove and collect the chickens to be slaughtered that day*', meaning they select the chickens themselves at the market.

2.1.11 Challenges experienced by retailers

a. Retailers of live chicken

The constraints for live chicken retailers come down to lack of space for storing and selling chickens, waste management (chicken droppings) and the problem of repairing and restoring poultry cages. According to them, the organization of the sector, especially during the holiday season, means that many people practice this business activity during this current period. At that time, all kinds of poultry end up in the markets and flood the streets. Finally, there is unfair competition during festival periods when village producers and collectors become retailers by speculating on prices and selling their produce along the roadsides.

b. Chicken processors

At this level, the constraints are at two levels: lack of dedicated space for slaughter, and lack of training for processors on proper chicken cooking techniques.

> *'Today everyone has become a chicken griller without any prior training.'*
>
> *A processor interview in this study*

In principle, after cooking , the chicken should not be handled using hands; forks and tongs must be used for cutting, collecting and handling in order to avoid any contamination. However, this is not followed everywhere.

2.1.12 Chicken production

2.1.12.1 Species kept and farm description

Respondents were drawn from the peri-urban areas of Ouagadougou. Those from the area of Wayalghin were mainly tailors and students, but livestock was their key source of income. The farmers from Saaba were also civil servants, drivers, traders, a traditional healer and a photographer, and livestock was not the main source of their income. It also appears that none of the actors in the two focus groups practiced horticulture or other forms of agriculture on their farms. The chicken species kept by farmers were pure local chickens, local improved breed chicken (Poulet du Faso, bleus d'hollande), Sussex (with crossbreeding between laying hens and bleus d'hollande), brahmas, cochins cockerels (prestige chickens) and laying hens.

In addition, to chickens, they kept other farm animals such as quail, rabbits, turkeys, geese and even cattle. In terms of the average herd size (number of chickens kept), producers from Saaba had more animals compared to those from Wayalghin, except for one farmer who is a wholesaler of day-old-chicks. The herd size varies widely depending on the farm. On average, a breeder had 346 cockerels and bleus d'Hollande; for pure local chickens farmers had 29 chickens on average; for the local improved breed chicken known as 'Poulet du Faso' farmers had 63 chickens on average; while for laying hens they had 36 chickens on average. Farmers from the Wayalghin group had 185 chickens, on average, all species combined.

2.1.12.2 Husbandry practices

a. Village chicken production

Village chicken production accounts for the vast majority (90%) of the poultry raised in the country and provides an estimated 98% of poultry meat consumed. Traditionally free-range farming is the predominant way of keeping chickens, especially in the northern regions, with farmers keeping up to 25 animals with limited health care and feed. During the rainy season animals are occasionally confined in poor housing to protect them from the harsh weather. Majority of the poultry breeds are local and kept in this traditional, extensive scavenger production system. However, some farmers have adopted improved breeds. The birds are sold when they are 7–8 months old for an estimated carcass weight of 1 kg. However, semi-confinement is increasingly practised, thus boosting production targeting times of high market demand. Semi-intensive farming is more commonly practised in rural areas of the central, western and southern regions of the country. Here, farmers keep up to 100 animals providing improved health care, housing and feed. The carcass yield is estimated at 1 kg at 6 months.

Picture 17: Village chickens.

c. *Peri-urban chicken production*

Various types of housing are used depending on the materials; these include a combination of brick, wire mesh and tarpaulin (Picture 19). In the East and West they are built using bricks while in the North and South they use mesh reinforced with tarpaulin for better control of air flow. Prefabricated cages are used for poultry housing especially in the Wayalghin group (Picture 19). For this group all producers practice housing of chickens, even for local breeds.

Chickens are fed commercial or locally made feed depending on the age of the bird. Large farms can produce 10 bags of their own feed of 50 kg per formulation and can either use poultry feed providers or do their own mixing. According to Saaba producers, this on-farm formulation has a higher guarantee for quality. **In fact, according to them, quality is not always guaranteed when buying from feed providers due to long storage times**. However, they are unanimous about the good quality of feed sold by the Centre de Promotion de l 'Aviculture Villageoise (CPAVI), although it is more expensive compared to other sources. The water used for chicken watering is from the tap (water-network) or on-farm boreholes. Drugs and vaccines are often administered via the drinking water.

However, Saaba's actors use borehole water ONLY; they said, 'tap water is not recommended because it contains chlorine'. The most common feed supplement used by farmers is known as Amine Total (a combination of amino-acids and vitamins). In addition, various inputs are used in the treatment of chickens from the chick stage to slaughter. For Saaba producers, treatment is administered depending on the disease and type of chicken. Wayalghin farmers use drugs such as antibiotics, including Trisulmycine (Trimethoprim + Sulfadiazine) for cholera, Tetracolivit for intestinal infections and Newcastle disease, Oxyveto and Tylodox for pulmonary infections, Levalap for parasitic infections, King Humivet and Tipzanga (which means treat everything in Morée language) for all kinds of poultry diseases and Amine Total.

Picture 18: Chicken kept on farm in cages.

Picture 19: Chicken kept on farm mixed with guinea fowl.

Some farmers reported that chicken droppings are used to feed other animals such as pigs, livestock, fish and as fertilizer. They are sold at 500 XOF (USD 0.8) per bag and 3,000 XOF (USD 5) per cart. But one producer says he uses droppings to produce the worms, which in turn will feed the chicks. Chickens do not have access to latrines, since they are locked up. Participants reported combining traditional medicine such as black pepper (for sick chickens), sugar water (for one-day old chicks) and pharmaceutical products. The withdrawal period was reported as seven days after the last treatment before any slaughter. The withdrawal period is respected because these producers said they keep records. Some clients such as those in the mining industry sometimes perform quality checks on the product by carrying out laboratory analyses on chicken meat before confirming any order. Farmers reported that vaccinated layers stop laying eggs for a period of three days following vaccination mainly against cholera, Newcastle disease and infectious bronchitis. This is an indication of a completed withdrawal period.

2.1.13 Availability/seasonality of chicken production

The production cycle of chickens depends on the farmers' objectives – whether they want to produce broilers, eggs, pure local chickens or rear improved breeds. Thus, depending on the production type, the cycle can vary from 21 days (day-old chicks), 33–45 days (broilers), to 90–120 days (local improved breeds). Laying hens start laying eggs from

120 days. Periods of high production include the months of December, January, February, July, August and September for all producers, driven partly by demand for chicken at the end of the year. According to these producers, farming is very profitable at these times of the year. The periods of high sale, slaughter and consumption are mapped to religious or social events and the end of the year/New Year: December, March, April, June, August and September. Religious holidays include Easter, baptisms, confirmations, funerals, Ramadan, Tabaski, Christmas and end of year celebrations.

Table 8: Seasonal calendar of chicken production, Burkina Faso.

Event/Month	J	F	M	A	M	J	J	A	S	O	N	D
Social events (year 2019)				Easter	Catholic baptism period	Rama dan		Tabas ki	Catholic pilgrimage ceremony			Christmas, End of year
Chicken production and sales	+++	+++		+	+	+	+	+	+++	+++	+++	+
Marketing	+	+	+	+++	+++	+++	+	+	+	+	+	+++

+++ high; ++ medium; + low

2.1.14 Constraints experienced by poultry producers

Producers believe that challenges regarding food safety are mainly related to the poor quality of poultry feed, drugs and vaccines. They often find that feed and vaccines are kept by suppliers until the point that the vaccine changes colour (a sign of poor quality or expiry). Producers deplore the lack of relevant quality controls, especially on sold products. In addition, there is a lack of funding from micro-finance institutions to support this sector.

The high costs of equipment, feed and vaccines has forced producers to use rudimentary sub-standard methods. Added to this is the lack of supervision and professionalism of actors in the sector. Everyone uses their own techniques (rather than best practices) generally learnt on the job and without any prior training. Training is offered by individuals, whose skills should actually be reviewed. As a result, elementary concepts are reported as lacking among most producers.

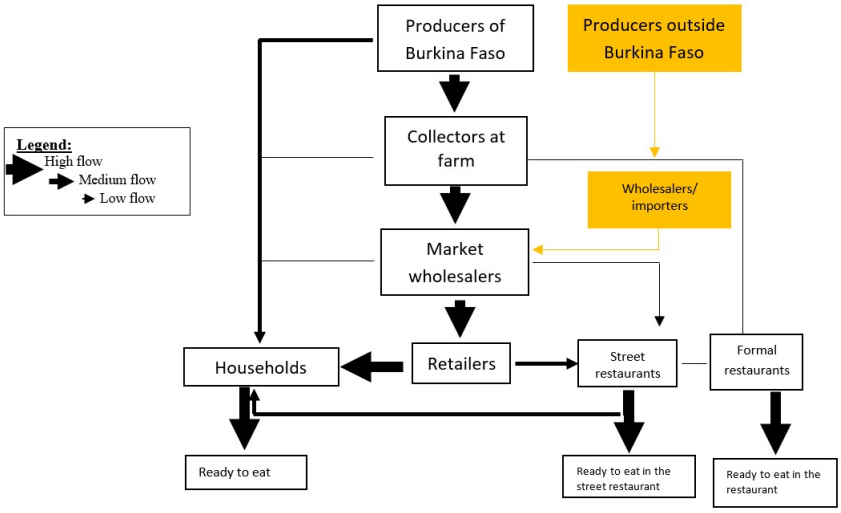
Chicken value chain

Commonly consumed ASFs include fish, chicken, beef, sheep and pork. However, fish seems to be the most consumed ASF because it is cheaper. While chicken and fish are perceived as very nutritious, fish is perceived as most secure because they do not receive chemical inputs such as drugs or vaccines during production. Chicken is mainly consumed in street restaurants (90% of overall consumption). Home consumption of chicken is occasional, and mostly limited to weekends in HIHs and MIHS or associated to social events in LIHs. Street restaurants are usually visited by adult men and young women, while women with children mainly eat chicken at home. Consumers are very concerned about the safety of the products they consume, but are more suspicious about the use of inputs at the production level. For consumers, processors and retailers, most important criteria for quality chicken are weight, appearance (look healthy), price and age. At home, women are the ones who process and prepare the chicken, hence they would detect any quality and safety issues. At the restaurant or among street-vendors, there is no way for consumers to detect poor quality prior to cooking of a chicken. The poor conditions of slaughtering and processing carcasses is worrying. There is need for improved hygiene and introduction and training in best practices among processors. Thus, there is high consumer interest in knowing more about farming conditions and the practices applied by producers in order to provide chicken meat that meets the quality demanded by the market. The persistence of certain pharmaceutical products, vaccines and inappropriate medication at farm level is perceived as a high risk to consumers.

2.2 The vegetable value chain

An estimated 90% of vegetable production is local. There are two types of production sites: village (outside of Ouagadougou) and peri-urban production. However, almost all the vegetables are consumed in Ouagadougou, although some of the production is exported to the sub-region (e.g., tomatoes and onions to Ghana, Togo, Côte d'Ivoire). Vegetables are also imported (e.g., onions from Niger, Côte d'Ivoire, Ghana and Togo; tomatoes from Ghana and Niger). Most consumption is within the household (60% of vegetables from retailers); while street consumption represents 30% of vegetable consumption (Figure 8).

Figure 8: The vegetable value chain map (onion and tomatoes).



2.2.1 Consumption of vegetables

2.2.1.1 Availibility and use of vegetable

There is little variation in the types of vegetables consumed across households. Common vegetables consumed include tomatoes, onions, carrots, African eggplant, lettuce, cabbage, cucumbers, parsley and garlic (Table 9). However, HIHs tend to consume more raw vegetables (especially salads) than MIHs and LIHs. Consumption patterns follow the production calendar of a specific vegetable, that is, consumption of certain vegetables is highest when they are in season. Consumption of onion leaves and okra were only reported in MIHs and LIHs, respectively. Onion leaves are usually consumed during lean times.

Table 9: Frequency of home consumption of vegetables.

HIH									
Vegetable	Tomatoes	Onions	Carrots	African eggplant	Lettuce	Cabbages	Cucumbers	Parsley	Garlic
Frequency of consumption	Daily	Daily	2 time a week in times of abundance	2 per week	Daily in times of abundance	2 per week in sauce	3 per week	Daily	Daily
MIH									
Vegetables	Tomatoes	Lettuce	African eggplant	Cabbages	Cucumbers	Onions	Onion leaves	-	-
Frequency of consumption	Daily	Daily in abundance period	5 times per week	3 to 4 times per week	3 to 4 times per week	Daily	Daily in abundance period	-	-
LIH									
Vegetable	Tomatoes	Lettuce	African eggplant	Cabbages	Cucumbers	Onions	Okra	-	-
Frequency of consumption	Daily	Daily in abundance period	2-4 times per week	2-4 times per week	Daily in abundance period	Daily	Daily in abundance period	-	-

Thus, consumers find that vegetables are used in all sauces. The vegetable dishes most consumed by HIHs are peanut sauce, vegetable soup and chicken with vegetables cooked in the oven; for MIHs, dishes that are mainly based on vegetable are 'tô' soup[6], vegetable sauce and peanut paste accompanied by rice. For LIHs common vegetable dishes include rice with peanut paste sauce and vegetable and leafy soup. However, some vegetable such as lettuce, tomatoes and cucumbers can be eaten raw as a dish or together with grilled chicken by all household categories. HIHs reported that when vegetables are in season, there is a tendency to replace some ASFs with vegetables, for example, ***attiéké***[7] can be eaten without fish, but with a lot of raw vegetables instead. Those who consume chicken outside the home (especially men), also consume a lot of raw vegetables, especially onions and tomatoes.

The top five most consumed vegetables are tomatoes, onions, lettuce, cucumbers and carrots (for HIHs), and tomatoes, onions, lettuce, cucumbers and African eggplants (MIHs and LIHs) (Table 9). Indeed, consumers find that all vegetables are affordable during periods of abundance, except onions which are usually expensive according to MIHs and LIHs. Vegetables are easy to prepare and are tasty, but tomatoes are reported to be the tastiest. Regarding assessment of food safety, all the vegetables mentioned according to consumers present a risk because of the use of pesticides. Consumers believe that tomatoes and onions are safer compared to lettuce because tomatoes and onions are usually cooked, and hence bacteria are destroyed. Cucumber is also relatively safe since it can be peeled to remove the outer layer which will reduce the risk of contamination. Lettuce is perceived as the riskiest vegetable to consume because it is eaten raw; it is also more difficult to wash given that they have many leaves and sufficient water is not always available.

However, all consumers agreed that consumption of raw products is more nutritious because they are not heated through the cooking process. Lettuce is regularly eaten in the home, especially in times of abundance, mainly in January. Women and children are the top consumers of this vegetable. Some say that their typical household food is basic because they add only salt, tomatoes and oil to the staple food, while HIHs and those in the catering sector also utilize eggs, mayonnaise and meat to further enrich their dishes. Vegetables are typically bought by women from neighbourhood markets. It should be noted that consumption of vegetables such as lettuce and cucumbers by men outside of households is very frequent. This is related to the consumption of street chicken.

The women group noted that when in season, lettuce is eaten almost every evening after being well washed, wrapped and kept in the refrigerator. In these times of plenty, lettuce and cucumbers are not bitter and are very popular.

Women noted that they found all vegetables tasty except the African eggplant. In terms of health and nutrition, they reported that tomatoes and onions are very nutritious vegetables and very good for health, but lettuce and cucumbers are more nutritious because they are green vegetables. They also find that they are easy to prepare, but are risky in terms of food safety. They noted that the risk is even higher for lettuce. This is reportedly due to the use of chemicals and wastewater (unclean water e.g., near hospitals or dumping grounds) in production of these vegetables.

For men, in times of abundance the consumption of raw vegetables increases but not for lettuce. Some men do not consume lettuce at all, while others consume it at most twice a month. They said that they avoid raw vegetables because they are unsure about the quality. Their main concerns were around production, particularly use of wastewater and chemical pesticides. Men believe that the tomatoes and onions are more nutritious and lettuce less safe and less nutritious, unlike the group of women. But all groups had reservations about vegetables.

> *'All vegetables pose a risk because chemicals which cause the vegetables to rot after a few days are used. However, lettuce is the riskiest because of dirty water and parasites.'*
>
> *Male consumer*

[6] 'Tô soup' is a sauce made with several types of vegetables. 'Tô ' can be eaten with okra+oignon+oil+chili+slat+soumbala.

[7] Local dish made with manioc.

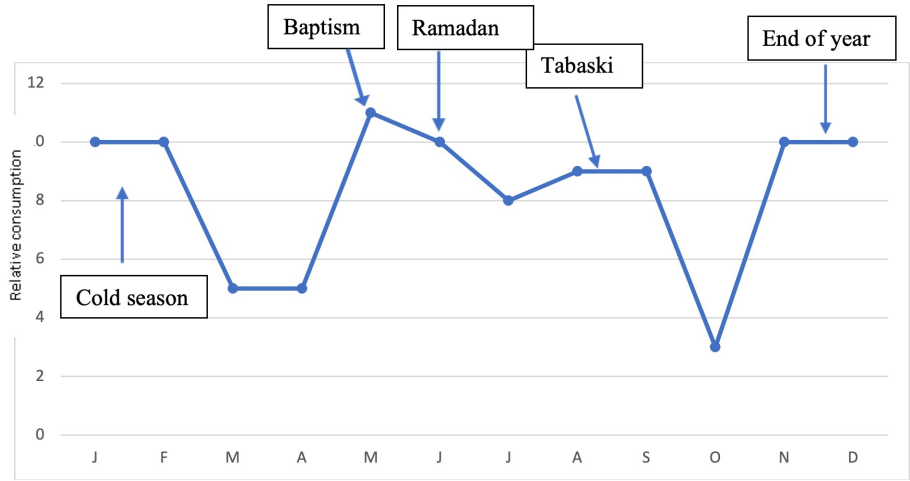
Table 10: Classification of the top *five consumed* vegetables by women and men.

HIHs					
Vegetable	Taste	Price	Cooking convenience	Nutritional health	Food safety
Tomatoes	Very good	Cheaper	Easy	+++	Higher risk
Onion	Good	Cheaper	Easy	+++	Lower risk
Carrot	Good	Cheaper	Easy	+++	Higher risk
Lettuce	Good	Cheaper	Easy	+	Greater risk
Cucumber	Good	Cheaper	Easy	+ ++	Lower risk
MIHs					
Tomatoes	Good	Cheaper	Easy	+	Higher risk
Onion	Good	Expensive	Easy	+	Lower risk
Lettuce	Good	Expensive	Easy	+++	Greater risk
Cucumber	Good	Expensive	Easy	+++	Lower risk
Local eggplant	Good	Expensive	Easy	+	Lower risk
LIHs					
Tomatoes	Good	Cheaper	Easy	+	Higher risk
Onion	Good	Expensive	Easy	+	Higher risk
Lettuce	Good	Expensive	Easy	+++	Greater risk
Cucumber	Good	Expensive	Easy	+++	Lower risk
Local eggplant	Less good	Expensive	Easy	+	Lower risk

++: high; +: low

Vegetables are available all year round, but more abundant at certain times of the year. The periods of abundance of vegetables are the cold season (from December to March) and rainy season (from July to September), as indicated in the seasonal calendar (Figure 9).

Figure 9: Relative availability of vegetables (tomatoes and onion).



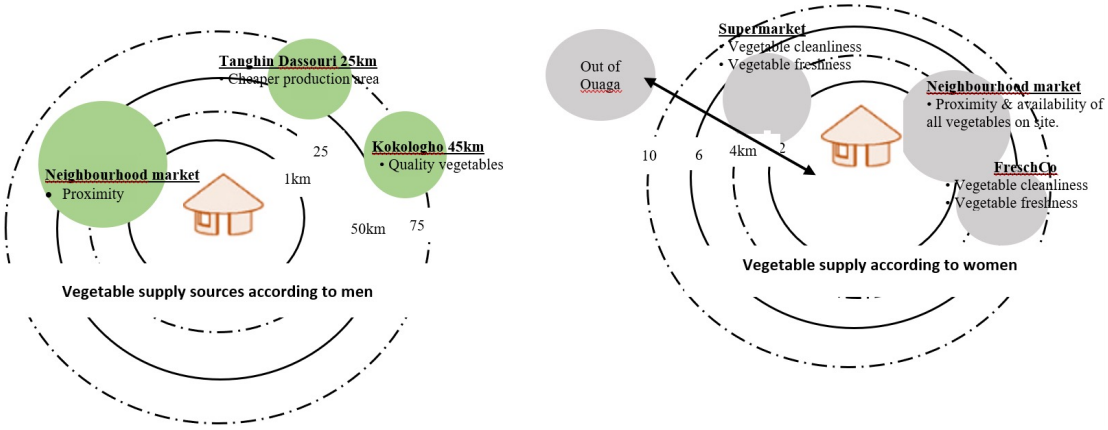
NB: Pests such as grasshoppers, black snail, and caterpillars are present year-round.

Several types of vegetables are consumed by all or most people except for those with specific intolerance due to illnesses or allergies. Some consumers claimed not to consume raw vegetables because of the use of chemicals. They only consume them if cooked. For children under five years, HIHs believe that consumption of fruits and vegetables is very important, especially raw vegetables such as tomatoes and carrots. They believe that over-cooking can destroy some nutrients in vegetables such as tomatoes and carrots. In addition to these raw vegetables, they eat yoghurt mixed with fruits. But they also claim that in general, beyond 18 to 20 months, children are already eating the same or a similar diet to the rest of the family.

2.2.1.2 Vegetable supply sources

There are various sources of vegetables for households. In the city of Ouagadougou, there are different markets; other sources are from the surrounding districts such as Kilwin, Boulmiougou, Karpala, Cité An II, Dassasgho, Zone du bois, Pagla Yiri, Zogona and Zone I. These places are the most frequented due to proximity to the homes. There is also FreshCo, a grocery store where vegetables and fruits are of good quality and are usually fresher and cleaner. Sources outside Ouagadougou include Koubri, Kienfangué, Tanghin Dassouri and Kokologho, located up to 45 km away. These are production areas where prices of vegetables are cheaper.

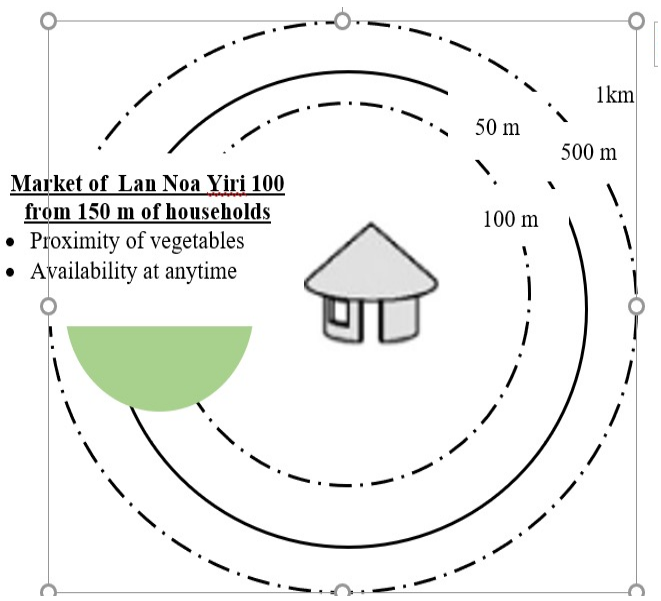
Figure 10: Venn diagram of household vegetables source by HIHs and MIHs (not considering out-of-home consumption).



The supply of vegetables in the city of Ouagadougou among HIHs households comes from various markets. The average time travelled between the market and home is 10–20 minutes depending on the means of transport. Sourcing of vegetables outside of Ouagadougou is done occasionally during business trips when consumers shop along the roads or from specific markets that offer cheaper prices. This also happens during preparation for ceremonies.

Women in LIHs source vegetables from the wet market in their neighbourhood, located 100–150 m from their homes. Time taken for the journey between the market and home does not exceed 5 minutes (Figure 11). In LIHs, men could not describe the household's sources of supply. It is important to note that in this household category, women could not provide the sources of chicken. This indicates a strong gender articulation of tasks related to supply and highlights their adherence to traditional norms.

Figure 11: Venn diagram for vegetables in LIHs (for women).



Consumers are very concerned about the safety of vegetables they eat, especially lettuce, cucumbers, tomatoes and onions. During discussions, they asked many questions about the production process, particularly the use of chemicals (pesticides) and wastewater. They noted that producers use seeds which allow them to harvest excessively large vegetables. According to them, producers use wastewater and chemicals that can harm consumers' health. Some people qualify imported onion as 'grass', and they suspect that these are GMOs.

2.2.1.3 Most important aspects of quality to consumers

Generally, the criteria when buying vegetables are first freshness, then size (not too big), because big is associated with GMOs. Firm vegetables are also preferred, especially for tomatoes which should not be punctured; for cucumbers the preference is for greener cucumbers that are quite shiny. Vegetables should not have black dots on their surface, since according to consumers black dots reflect the presence of chemicals. Common causes of poor quality vegetables are exposure to sewage water and pesticides which cause them to rot quickly.

2.2.1.4 Constraints raised by vegetable consumers

For vegetables, questionable quality is an issue for consumers. They highlighted the use of chemicals and wastewater on vegetables at all stages, especially those eaten raw. According to consumers, the use of chemicals is not without consequences. An additional concern is the use of poor-quality seeds and modified seeds (GMOs).

> *'Producers and retailers sell products early regardless of the required pre-harvest interval (after application of chemicals) to earn higher profits.'*
>
> *A consumer*

Added to this is the use of dangerous (pharmaceutical) products by consumers in the process of preparing certain slow-cooking foods such as meat, beans or cowpeas to reduce cooking time (paracetamol is reportedly used for this purpose).

2.2.2 Marketing and processing of vegetables

2.2.2.1 Availability of vegetables

The sale and marketing of vegetables varies from one retailer to another. Each retailer among those interviewed sells at least two types of vegetables. They believe that these foods are widely available, but some are more abundant than others at certain periods of the year. The prices of vegetables are negotiated between the producer and retailer, except for onions where producers set the price by mutual agreement and then sell at that price to retailers. Retailers estimated that the number of clients range from 30 to 100 per day. About 60% of them are regular customers. The busiest times of the day are very early in the morning and in the evening.

2.2.2.2 Packaging and criteria for purchase of vegetables by retailers

Ripeness and price of vegetables are the most important purchase criteria for retailers. Other criteria are agreed between the retailers and producers. In terms of packaging, retailers say that they use more polyester bags to package cabbage, cucumbers and the African eggplant. Plastic bags are used for the packaging of pepper, parsley and celery. Bags and nets are used for onions, while wooden crates and baskets serve as packaging for tomatoes.

All the vegetables are of good quality and nutritious according to the retailers.

Picture 20: Packing vegetables at a farm (picture online: Sidwaya).

> *'The cabbages are good…as are… the tomatoes, pepper and parsley. And they complement each other in the sauce; if one is missing it is not good … for the sauce, the onion comes first, then tomato and then cabbage. They are the fundamental basis of the sauce in terms of taste and consistency'*
>
> *Vegetable retailer*

> *'Cabbage, lettuce, onion, green beans, they all contain vitamins'*
>
> *Vegetable retailer*

According to retailers, all vegetables protect human health as long as they do not contain contaminants.

> ***'If not properly washed before cooking, it can cause some diseases, since vegetables are exposed to dust'***
>
> *Vegetable retailer*

In terms of price, the survey took place during a period (early December) when vegetables are not in season, and thus are more expensive. The small bag of onions of 50 kg cost XOF 17,500 (USD 30) while the big bag varied from XOF 60,000 (USD 104) to XOF 75,000 (USD 130).

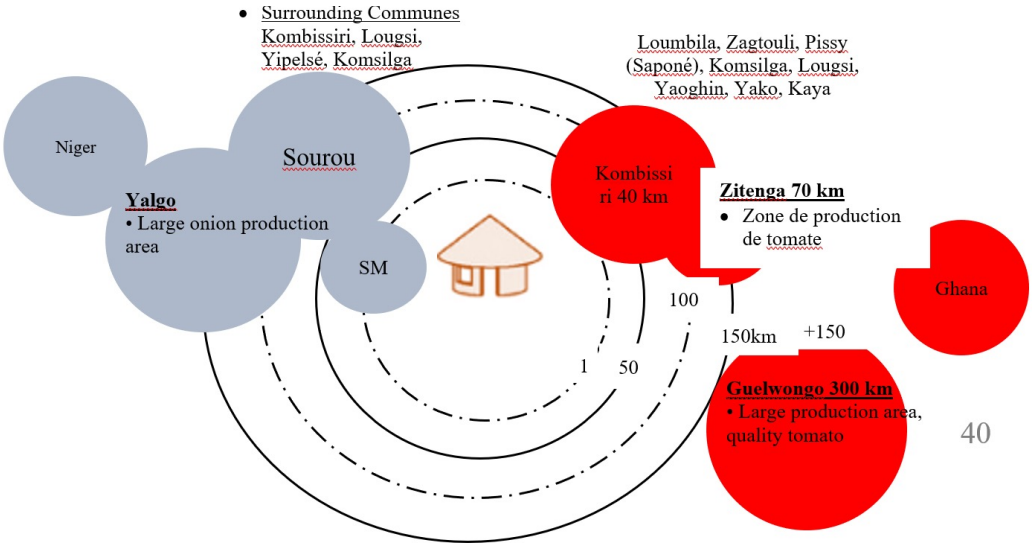
2.2.2.3 Vegetable supply sources to retailers

We described the supply of onion and tomato. There are many sources of supply for onions to Ouagadougou according to retailers. There are the markets of Cité An II and Larlé, besides the surrounding municipalities such as Kombissiri, Lougsi, Yipelsé and Komsilga. Upcountry sources include Sourou, Fada and Yalgo (which is the largest production area). Outside Burkina, there is Niger. There are also many production areas for tomatoes, such as Loumbila, Kombissiri, Zitenga, Zagtouli, Pissy (Saponé), Komsilga, Lougsi, Yaoghin, Kaya, Yako, Gwé and Guelwongo (in the peri-urban areas). Outside Burkina, there is Ghana. Retailers hire the services of collectors who travel to production sites to collect vegetables and transport to the market in Ouagadougou, for a cost of up to 5% of the value. There is no formal contract between the collectors and retailers, but each retailer has at least two collectors. Figure 12 presents the different sources of supply/production of onions and tomatoes.

The criteria used by retailers when purchasing onions are weight (heavy) and dryness. Producers are asked to ensure that the product is suitable for long-term storage.

> ***'When you press it, you shouldn't see any water coming out; this is an indication of moderate use of chemical inputs'***
>
> *Vegetable retailer*

Figure 12: Venn diagrams of onions (grey) and tomatoes (red).



For tomatoes, they should not be punctured. When the producer uses too many chemicals, the tomato perishes soon after purchase.

Picture 21: A vegetable retail market in Ouagadougou.

Impact of COVID-19 on the vegetable value chain

Closure of markets following COVID-19 restrictions began during the months of March and April, a busy season when there is lots of harvesting of perishable vegetables such as tomatoes and onions. Vegetable producers were worried because their products were beginning to rot in the farms. This situation could also delay payment of bank loans thus compromising the next cropping season.

2.2.2.4 Transport, storage, handling and processing of vegetables

Wholesalers use trucks, trailers, semi-trailers and other vehicles to transport their products from farms to wholesale markets. Once the vegetables (onions and tomatoes) arrive at the market, retailers buy and transport them using tricycles or carts to secondary retail markets. As soon as the vegetables arrive at the market, they are off-loaded and stored, without washing or disinfecting, as this could accelerate rotting due to the risk of high residual humidity. Products are stored in rooms or under sheds covered with tarpaulin during the marketing period.

Retailers said that they do not store the products for long, with roughly 40 bags of onions and six crates of tomatoes sold within three days. The retailers have strong views on the effect of inputs on the preservation of vegetables.

> *'White fertilizer is not good. Those who use it say that their products ripen fast and look very attractive on the outside. However, it rots pretty quickly. For example, if a vegetable takes 90 days (3 months) to ripen, with the white fertilizer, it will take about 70 days. But if a farmer mixes the two fertilizers, white and black, there is no problem'*
>
> *Vegetable retailer*

According to retailers, producers adapt to market demand by adjusting techniques used such as the type of fertilizer, which will influence the production cycle.

Picture 22: A truck transporting tomatoes to the urban centre of Ouagadougou.

Picture 23: A tricycle transporting cabbages to the retail market in Ouagadougou.

2.2.2.5 Most important aspects of quality to vegetable retailers

Onions must be heavy and dry, whereas tomatoes must be hard, firm and without bruises, and they must not perish rapidly (e.g., the next day). Retailers noted that the main causes of poor quality could be lack of water, misuse of inputs or use of poor-quality seeds. In addition, vegetables must look clean, as must the surroundings where they are stored; this is a requirement of some customers, especially those from HIHs. Vegetables of poor quality (soft, perforated) are sold to ready-to-eat food processors who usually cook them on the same day. However, if the level of spoilage is advanced, the vegetables are discarded.

'Sometimes the vegetables are not as rotten as we think, it is just the heat in the bag in which they are kept which causes them to wilt'

Vegetable retailer

2.2.2.6 Challenges experienced by vegetable retailers

According to vegetable retailers, customers are very concerned about safety and hygiene, thus, they must select the best quality products when purchasing. Knowing that consumers are interested in the appearance and quality of vegetables, producers use chemicals excessively in order to obtain blemish-free products. However, retailers who appear to understand the magnitude or detrimental effects of chemicals are trying to minimize the risk by adhering to the pre-harvest interval periods. Retailers are thus substituting the required pre-harvest interval with a sensory evaluation that only considers the smell of chemicals on the vegetables.

'When the products are mature, producers with whom we are in contact call us to come and buy. When buying, we make sure there is no chemical odour on the vegetables before harvest. If however, the vegetables still smell of chemicals, we wait at least a week before harvest.'

Vegetable retailer

2.2.3 Vegetable production

2.2.3.1 Vegetables produced

Common vegetables include cabbages, onions, tomatoes, lettuce, sorrel, sweet peppers, chilli, okra, local eggplants, carrots, cucumbers, zucchini, parsley and celery. However, there is variation from one location to another. For producers from Saaba (where the FGD was conducted), cabbages, onions and tomatoes were the most common; in Boulbi, it was eggplants, cucumbers and cabbages; in Boulmiougou-zongo, parsley, lettuce and cabbages and in Ouaga 2000, okra was the most common. The profitability of vegetables strongly depends on market supply and the yield of the vegetable concerned.

'It all depends on the price at the market which varies widely … growing tomatoes involves risks. A good part of the plot can rot but we do not always understand the cause. Out of 100 parcels (plots) of tomatoes, we can end up with only 20 to 50.'

Vegetable producer

In addition to these crops, some producers raise poultry, small and large ruminants, but on a very small scale.

In all the sites, producers claim that the main source of income is vegetable and crop farming for both men and women. For women, vegetable production provides an opportunity to generate income besides other farming activities.

'Among our women there are traders. We offer the same prices to other women who come from Ouagadougou. Often if our women do not offer a good price, we prefer to trade with those who come from Ouagadougou'

Vegetable male producer from Boulbi

In addition to growing vegetables, some producers work in other areas such as construction, mechanics, security or fishing.

2.2.3.2 Vegetable production practices

The market garden sites of Saaba, Boulmiougou and Boulbi (where the FGD was carried out) have dams and wells which are not currently operational. In Ouaga 2000, a river is used.

In the Boulmiougou site, producers said that they use the latrines of their homes located not far from the gardens; while in Saaba the latrines can be built about 50 m from the gardens. In Boulbi and Ouaga 2000 there were no latrines in the sites visited.

Producers mostly use seeds harvested during previous years, especially for lettuce. However, seeds of cabbage, onion, okra and others are also sourced from agrovet shops. Some farmers prefer to import cucumber seeds from abroad (e.g., France), which has a short cycle compared to local cucumber seeds. Fertilization involves the use of organic manure, cow, sheep, pig and poultry droppings, and chemical fertilizer, urea and nitrogen-phosphorus-potassium. Thus, producers from Boulbi noted that they preferred chemical fertilizers, which allows rapid growth of the plants. Organic fertilization is expensive and its effects are slow.

> *'The effect of organic fertilization is very slow. When we apply it, it can take more than a week before we see any change. However, with chemical fertilizers changes are evident within three days'*
>
> *Vegetable producer*

Regarding human manure, they all confirmed that they do not use it. On pesticides, the farmers from Saaba and Boulmiougou noted that they use pesticides such as Acarips, K-Optimal (Lambda Cyhalothrin and Acetamiprid), Attaks (for an attractive appearance) and Lamkangare (kills pests). The appearance of the product is important for the consumer.

> *'In general, the Burkinabè prefer beautiful vegetables, even if it carries diseases.'*
>
> *Vegetable producer*

The producers decide when to apply pesticides. Depending on the level of pest attack the frequency is every three, seven and 14 days. But for tomatoes, after 40 days and during the third and fourth month of the production cycle, more pesticides are applied. For cucumber according to the producers of Boulbi, treatment is done after each harvest, which occurs after every six days. However, for the producers of Ouaga 2000 who are affiliated to SAPHYTO[8], control is carried out by the municipality and international institutions and embassies in their neighbourhood, as they often ask to make sure it has no chemical residues[9]. This ensures that they pay close attention to the pesticides used.

> *'If we use pesticides with foul smelling odours, we attract the attention of the Office nationale d'identification (ONI) whose role is to control them.'*
>
> *Vegetable producer*

> *'Because of the smoke we once caused when … burning something, we had to deal with the US Embassy located in the vicinity.'*
>
> *Vegetable producer*

Saaba producers no longer apply chemicals after 40 days for onions. In Boulmiougou, after application of pesticides, women participants stated that the withdrawal period is 14 days before harvesting. However, the required withdrawal period is in fact 21–30 days for many pesticides. Those from Ouaga 2000 reported that the withdrawal period is two weeks after the last treatment as indicated on the packaging of SAPHYTO, which initiated training for them. In Boulbi, the harvest is done six days after each treatment, with treatment renewed if necessary. The latter said that they had also sensitized the wholesalers.

[8] Société africaine de produits phytosanitaires et d'insecticides.

[9] FGD was carried out around a residential area.

'Often, when they come to find that we have just sprayed, we tell them to come back two or three days later. It is true that we want money, but we also care about people's health.'

Vegetable producer

Some producers tend to undermine the potential impact of pesticides on humans.

'If you notice on the product label, we have a panoply of fruit on it, cucumber, lettuce, cabbage, … this product can't do anything to humans, it's targeted to fight flies and insects.'

Vegetable producer

Picture 24: A garden of lettuce and onions in peri-urban Ouagadougou.

2.2.2.3 Seasonality, mode of storage, conservation and transportation of vegetables

According to the producers, availability of vegetables is seasonal and depends on access to water points. But the most reported periods are the cold and rainy seasons for others (figure 9). Producers sell vegetables at farm-gate to wholesalers/retailers and no harvest is done before the plot is purchased. Harvesting is carried out on demand. In the case of cabbages, the client can harvest the whole plot at one go, since the quantity required depends on market demand. Lettuce remains on the plots until it is harvested, taking a maximum of three days per plot. At maturity the tomatoes remain on the plant until a buyer is found. Vegetables are packed as follows: baskets for lettuce, crates for tomatoes and polythene bags for cabbage, cucumbers, onions, zucchini and peppers. They are all transported using trucks, cars, tricycles, motorcycles and bicycles. Producers sell onsite, and wholesalers/retailers meet the transport costs. Household consumers and restaurateurs will get their supply either from markets or from street retailers.

2.2.2.4 Challenges experienced by vegetable producers

Activities of the vegetable producers are influenced by the behaviour of buyers. Thus, retailers, wholesalers and consumers largely consider the appearance and condition of vegetables as important criteria when purchasing. To achieve these results and meet the needs of customers, the use of chemical treatments is essential. If producers had a choice, they would minimize the use of these products for several reasons. Some reported having headaches after being exposed to chemicals, which led to illnesses and high treatment costs. In addition, there is the high cost of organic

products compared to the non-organic products. They also mentioned the challenge of acquiring good quality seeds and finance. This resulted in producers purchasing their inputs from inexpensive shops rather than from approved establishments. Numerous producers consider the health and safety of their clients to such an extent that they question the treatment techniques that they learned from the agents of the Ministry of Agriculture.

> *'The agricultural technician tells us not to spray the whole vegetable, but rather only the leaves. But as long as we do not spray the whole plant, we cannot reach the pests which attack our produce'.*
>
> *Vegetable producer*

Vegetable value chain

The main vegetables consumed with ASFs are onions, tomatoes, lettuce, cucumbers and cabbages. Most of the vegetables supplied are consumed in the home (60%). At home and street restaurants, only 30% of vegetables are consumed raw as a side dish. At home, vegetables are mainly cooked with staple foods such as maize or rice. Green vegetables are perceived as more nutritious when eaten raw by women; while men perceive onions and tomatoes as more nutritious. LIHs consider tomatoes less risky to consume (probably because of the mode of processing where they usually cook them), as opposed to HIHs and MIHs who consider tomatoes and onions as more risky (probably because they consume more raw vegetables). However, concerns towards the use of chemicals and wastewater was widely expressed regardless of gender or income category.

Two major sources of supply are peri-urban areas and villages. A good quality vegetable must have a nice appearance; tomatoes, cabbages and cucumbers must not have bruises. The cucumber must have a straight shape; a sign of the absence of pest attacks. The tomato should be firm and have a good taste, while cucumber must not taste bitter. Lack of fertilizer inputs, pesticides and plant care can result in poor quality vegetables. However, the level of use of inputs such as pesticides is a source of worry for conservative consumers and wholesalers to such an extent that they make it an important quality criterion.

Unfortunately, instead of the emergence of professionalism among producers which could improve food security, we see a divergence between the quality demands of consumers and practices of producers. For wholesalers, pre-harvest interval periods that should be observed conflict with their sales objectives. Poor quality vegetables are sold to households and popular restaurants, and their consumption seems to be attributed to poverty.

2.3 Gender issues in the poultry and vegetable value chains

The gender analysis was conducted using Harward's[10] grid which allows for the description of gender aspects through an activity profile, access and resource control profile and the determining factors.

2.3.1 Gender issues in the poultry sector

In peri-urban areas, farms are generally owned and operated by men. Youth and women, wives or mothers play a supporting role. Income from the farm is managed by the male head of the household who uses it to provide for the family. In rare cases the woman is remunerated for her inputs.

[10] An analytical framework that collects data that traces and organizes information that can be adapted to several situations as part of a gender analysis.

In rural areas, many women own poultry and they have a say on how the income should be utilized. In production, we noted a predominance of men in farms[11]. Women were rare in poultry farms especially in the peri-urban areas. The youth identified in the focus groups highlighted that their interest in poultry farming was from their childhood. In processing, males and the youth were the majority, from the slaughtering to preparation (Table 11).

On consumption, based on household income certain parts of the chicken are symbolically reserved for men (neck, thighs, gizzard) to mark their status and contribution to household resources.

> *'He is the one who buys the chicken'*
>
> *Woman producer*

In most LIHs the woman does not buy the chicken. However, in MIHs and HIHs, these social codes are fading and almost everyone has access to all parts based on their preference and women can buy chicken. It is also worth noting the massive difference in consumption of restaurant/street chicken which is largely done by men and some young women.

Table 11: Analysis of the poultry sector activity profile by gender.

Poultry sector				
Value chain	Men	Women	Youth	Children
Production				
Farm construction	+++	+	+++	-
Farm maintenance	++	+++	+++	-
Input suppliers	+++	-	+++	-
Purchase of inputs	+++	+	+++	-
Marketing				
Collectors/wholesalers	+++	-	+++	-
Carriers/transporters	+++	-	+++	-
Processing				
Slaughter/plucking	++	-	+++	+
Street cooking (grilling, frying)	+++	+	+++	-
Household preparation	-	+++	-	-
Household consumption				
Head and legs	-	-	+	+++
Neck	+++	+	+	+
Thighs	+++	++	++	++
Wings	+	+++	+++	+++
Wishbones	++	+++	+++	+++
Back	++	+++	-	-
Gizzard and liver	+++	+	-	++

Key: - (No), + (little), ++ (moderately), +++ (highly).

Children: (less than 14 years old), youth/teenager (14-18 years old), adult (18 years and more).

With the increasing demand for chicken in urban areas (around 50,000 chickens are consumed each day in Ouagadougou), we are witnessing the emergence of several value chains in the poultry sector. The traditional strengths of men allow them to dominate the different value chains. However, with the advent of modern farms, there are no legal restrictions blocking women from investing in farming, hence the shift in gender dynamics.

[11] Note that the FGD was carried out with farmers from peri-urban areas.

2.3.2 Gender issues in the vegetable sector

In the area of vegetable production, men are dominant while women mainly act as facilitators. Most women in the sector work as labourers in neighbouring villages. On the other hand, in marketing, women are dominant in the retail node and, in some cases, they can influence production through loans to producers. They have significant control over the distribution network, and in fact producers have confessed that they find it difficult to sell their products directly to markets. Consumption is open to everyone, but it should be noted that certain vegetables such as lettuce and cucumbers are mainly consumed by men outside the household (Table 12).

Table 12: Analysis of the vegetable sector activity profile by gender.

Vegetable sector				
Value chain	Man	Woman	Youth	Children
Production				
Farm construction	+++	++	+++	-
Farm maintenance	+++	++	+++	-
Input suppliers	+++	-	+++	-
Purchase of inputs	+++	++	+++	-
Production financing	+++	+	+++	-
Carriers/transporters	+++	+	+++	-
Marketing				
Market wholesalers	++	+++	+	-
Market retailers	+	+++	+	-
Consumption				
Raw vegetables	+++	++	+++	+

In the vegetable value chain, women benefit if they are wholesalers or retailers. This has been mentioned several times by market gardeners who find that women wholesalers earn bigger margins than the producers. For women market gardeners, the importance of income linked to market gardening is not retained by them, but simply contributes to household expenses.

For both vegetable and poultry value chains, socio-cultural codes partly determine gender roles. However, it must be noted that people in urban areas tend to be more progressive and less bound by socio-cultural codes than those in rural areas.

Gender perspective

From a gender perspective it is clear that chicken and vegetable production are dominated by men and young people. However, in rural areas, women play a critical role in poultry production since they invest a lot in the business. Nonetheless, in the marketing of vegetables, women are the decision-makers and benefit from a higher profit margin than producers, so that in some cases they finance production in return for exclusive rights to purchase the crop. Paradoxically in the marketing and processing of local chicken, men remain predominant. While women contribute to the household maintenance through family responsibilities, men are more flexible in using the income outside of the household.

This gender distribution results from traditional Moaga social roles, in which agricultural production is assigned to men, and home cooking, gathering and marketing of vegetables to women. However, with the advent of modern poultry farming, there is no ban on women who want to invest in it. In terms of both purchasing and distributing parts of the chicken in households, the increase in income seems to be associated with a diminishing of traditional societal codes and the emergence of new societal roles.

2.4 Recommendations by poultry and vegetable value chain actors to improve microbial food safety

In view of these practices and constraints, the following recommendations were proposed by respective value chain actors to improve food safety.

Table 13: Recommendations to respective value chains actors.

Level	Recommendations
Consumers	· Inform and educate consumers about the dangers linked to their perception of quality · Sensitize consumers on the purchase and consumption of healthy products
Chicken retailers (live and processed)	· Train all producers on good hygiene practices · Raise awareness of slaughterhouse workers about the impact of their practices on the health of consumers and train them on good storage and conservation practices · Promote appropriate packaging for raw chicken · Capacity support to processors: dressing equipment; construction of a suitable slaughterhouse for poultry
Vegetable retailers	· Sensitize retailers on the proper use of chemicals in vegetable production · Raise awareness among retailers on hygienic packaging, transport and marketing of vegetables
Poultry and vegetable producers	· Inform, train and sensitize producers on good farming (use of drugs) and vegetable production (use of fertilizers and chemicals) practices
Government	· Pay more attention to food safety issues · Define an operational policy for the development of food safety and hygiene · Regulate the import of relevant pharmaceutical products and poultry feed · Regulate use of pesticides and fertilizers in market gardens · Monitor the installation of market gardening sites · Control imports of all kinds of products, especially broiler meat · Recognize players in the two sectors as the key players in the urban food system · Disseminate standards on the quality of vegetables and poultry · Develop controls and monitoring at market gardening sites · Promote improved animal husbandry and animal products · Review the pricing of livestock products · Review the pricing and units of measurement used · Develop markets with improved hygiene infrastructure (hygiene and waste disposal) · Subsidize players in the value chain, especially market gardeners and poultry producers
Development partners	· Support the country in implementation of policies for the development of food safety · Develop projects in the field of food safety · Support actors in value chains on food safety

Level	Recommendations
Research	· Develop innovative approaches to improve food safety · Comprehensively translate and disseminate research results presenting the dangers linked to the use of pesticides, antibiotics and drug residues · Identify the practices of appropriation and the social constructions of quality that could potentially harm the health of value chain actors · Identify and characterize pharmaceutical products that could contribute to improving quality in the two value chains

Part III: Conclusion

The study of vegetable and chicken value chains in the city of Ouagadougou highlights a variety of actors involved in production, marketing, processing and consumption. The consumption of animal-source foods (chicken, beef, mutton, goat, fish and pork) and vegetables (tomato, onion, cucumber, lettuce, cabbage and carrot) is done throughout the year with periods of high consumption (end of year and religious holidays) and varies based on the level of household income (low, medium or high). Frequency and consumption practices also vary by gender.

In all household categories, consumption of chicken outside households is higher than consumption in the household, thus increasing the risk of exposure to foodborne diseases. The cooking methods for chicken outside the household are indeed quite varied (grilled chicken, braised, flambé, télévisé, etc.) mainly at the ***maquis*** and bars as well as in restaurants. As for vegetables, they are mainly consumed in households, especially in times of abundance with a higher consumption of raw vegetables in middle and high income households. Some vegetables, especially tomatoes and onions, are eaten raw or cooked with chicken outside the household.

The actors' perception of food safety is intimately linked to their level of knowledge of potential risks with a tendency to recognise chemical risks (use of drugs, phytosanitary products, storage products, etc.) and not microbiological risk. Based on the results of the study, the levels where food safety appears to be threatened are:

- Street restaurants (***maquis*** and bars) where there is a diversity of dishes based on chicken and/or vegetables in which the preparation practices do not adhere to rules of good hygiene
- Poultry markets in which chickens are stored, slaughtered, eviscerated, washed and transported to the grill points with unsatisfactory hygiene
- Market gardening sites which sometimes use wastewater and excessive phytosanitary products in order to ensure that they sell products that look attractive, taste good and are affordable
- Poultry production sites, mainly within the city, with often uncontrolled use of drugs
- Preparation in certain households with the use of certain non-recommended products and practices, e.g. creating cross-contamination risks, etc.

Given this situation, it is necessary to (i) conduct an in-depth study to quantify the level of risk at each level for each of the chicken and vegetable value chains and (ii) carry out targeted actions for actors (producers, traders, processors, consumers, regulators) while highlighting the high levels of risk.

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Annexes

Annex 1:Distribution of individual surveys according to categories

Targets	Categories	No of people
Consumers	Vegetable and poultry	100
Retailers	Chicken (live and meat), vegetable and ready to eat	51
Producers	Vegetable	24
	Poultry	22
TOTAL		197

Annex 2: Key informants in the poultry and vegetable value chain

Actor	Gender	Area/structure	Position
Poultry value chain			
Broiler retailer	Female	Farmer group	President of Timi Multi Services
Seller of grilled chicken	Male	Cissin	Griller
Poultry retailer	Male	Marché de Pissy	Live chicken vendor
Poultry retailer	Male	Marché de Bendogo	Live chicken vendor
Poultry retailer	Female	Pissy	Manager
Roasted chicken retailer	Male	Saaba	Griller seller
Ready to eat chicken retailer	Male	I'Union Des Transformateurs (UDT)	President; roasted chicken vendor
Poultry producer	Male	Bissighin	Local poultry producer
Poultry producer	Male	Wayalghin	Broiler producer
Large-scale poultry producer	Male	Koubri	Directeur General SOPRA
Poultry retailer	Male	Marché de 14 yard	Poultry trader
Poultry retailer	Male	Cité An II	Poultry trader
Consumer	Male	Kilwin	Journalist

Actor	Gender	Area/structure	Position
Consumer	Male	Tampouy	Advisor
Supermarket	Male	1200 logements	Farmer bio
Supermarket	Female	Nioko II	Manager
Vegetable value chain			
Vegetable producer	Male	Coopérative Maraîchère de la Commune de Saaba Kongo (Saaba)	President
Vegetable producer (market gardening space IPD AOS Certification SPG)	Female	CNA BIO Dassasgho	Promoter, member of the Office
Traditional market gardening space	Male	Pissy	President and Dean of producers of the Pissy Ste famille site
Large-scale market retailer	Female	Cité An II	Traditional wholesaler
Large-scale shop retailer bio.	Female	Boutique Bioprotect Kouritenga	Promoter
Vegetable retailer	Female	Pissy	Vegetable retailer
Vegetable retailer	Female	Saaba	Vegetable retailer
Vegetable retailer	Female	Bonheur ville	Vegetable retailer
Consumer	Female	Ouaga 2000 (Laa Noi Yiri)	Housewife
Consumer	Male	Dassasgho	Official
Supermarket	Female	Marina supermarket Gounghin	Vendeuse
Research centre	Male	IRSAT/DTA 1200 logements	Research officer

Annex 3: Distribution of participants in focus groups based on categories and gender

Targets	Categories		No of people
	Male group	Female group	
Consumers	Low income (11)	Low income (11)	22
	Middle income (10)	Middle income (07)	17
	High income (10)	High income (07)	17
Retailers		Vegetable retailers (11)	11
	Live chicken seller (11)		11
	Seller of grilled chicken (08)		08
Producers	Onion producer (09)	Various vegetable producer (08)	17
	Poultry producer (07)		07
	Poultry producer (10)		10
	Tomato producer (11)		11
	Cucumber producer (08)		08
TOTAL	95	44	139

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