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Assessing Rwandan restaurant preferences for procuring broiler and indigenous chicken: implications for the development of a sustainable poultry industry

RESEARCH ARTICLE

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Abstract

Public and private efforts have attempted to increase Rwandan smallholder broiler commercial production to help alleviate poverty and food insecurity. While these interventions have created economic opportunities for producers, many Rwandan consumers still prefer indigenous chicken over commercial broiler chicken. We examined restaurant preferences for purchasing Rwandan-produced broiler meat versus indigenous chicken meat by conducting face-to-face interviews in February 2022 with 100 restaurants in Kigali. Across specified price levels, 73% of restaurants were interested in purchasing broiler chicken meat compared to chicken meat from indigenous breeds. Probit regression results showed that female procurers were more likely to prefer broilers. If respondents considered supplier availability and reliability to be important, they were more likely to purchase broilers. If restaurants were more willing to take risks, preferred to purchase live birds, and considered healthiness and consistency to be important, they were less likely to purchase broilers. The relative price of the broiler compared to the indigenous chicken was not a significant determinant of a restaurant's decision to purchase broilers. This study provides insights into the factors that influence restaurant preferences for broilers and, hence, the likelihood of success for the domestic commercial poultry industry and smallholder Rwandan broiler farmers.

Keywords: broiler chicken, restaurant survey, smallholder farms, willingness to pay

JEL Codes: Q01, Q13

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1. Introduction

Rwanda has experienced remarkable economic growth with significant improvements in living standards despite being relatively small geographically, densely populated, lower-income, and landlocked with mostly hilly terrain. However, poverty and food insecurity among rural households continues to be a concern (Gill *et al.*, 2020; Weatherspoon *et al.*, 2019). Rwanda ranks 165 out of 191 countries according to the Human Development Index (United Nations Development Programme (UNDP), 2023). Almost 16% of the urban population and 43% of the rural population are living in extreme poverty (World Bank, 2020). According to the Global Hunger Index (GHI), Rwanda ranks 102 out of 121 countries with serious hunger concerns (GHI, 2022).

To address these concerns, the Government of Rwanda and supporting organizations have made investments to improve the agricultural sector, with a particular focus on improving livestock production and increasing domestic meat supply. Among the developments are increased investments in commercial broiler production. For instance, the U.S. Agency for International Development (USAID) funded Feed the Future Tworore Inkoko, Twunguke Project (Let's raise chickens and make a profit in Kinyarwanda) is aimed at increasing the capacity of smallholder broiler farmers in the Musanze District of Rwanda (Gill *et al.*, 2020). Investment in broiler operations is seen as having the greatest potential for addressing animal protein shortages since broilers require less land for production and have a higher feed conversion ratio compared to other livestock (Shapiro *et al.*, 2017). Broilers are also heavier and more dense than indigenous breeds (Dyubele *et al.*, 2010), have a relatively faster growth rate (Wattanachant *et al.*, 2004), and are generally cheaper than other meat sources (Dalle Zotte *et al.*, 2020). While both chicken production and imports have increased in Rwanda in recent years, per capita availability is still very low (1.5kg in 2020) when compared to the global average (Muhammad *et al.*, 2022). Overall meat availability is less than 10 kg/person, which is considerably lower than the annual recommended minimum of 50 kg/person (FAO, 2019).

The Rwanda Livestock Master Plan (LMP) explicitly mentions the transformation of the poultry sector from being dependent on small scale operations of “semi-scavenging crossbreds” (i.e., indigenous birds) to larger scale specialized broiler operations. The reason being is that indigenous chickens exhibit poor growth rates and low productivity when compared to broilers, which constrains the potential for the poultry subsector to address food insecurity and animal protein shortages (Kpomasse, 2022). While there have been investments in both large- and small-scale commercial broiler production in Rwanda (Gill *et al.*, 2020), little is known about the demand side of the market (Muhammad *et al.*, 2022). Therefore, it is important to understand consumers' preferences for broiler chicken meat compared to meat from indigenous birds. Past research throughout Sub-Saharan Africa mainly focused on broiler production efficiency (Cisse *et al.*, 2017), farmer profitability (Ike and Ugwumba, 2011), and characteristics of the broiler production systems (Mahoro *et al.*, 2017; Mbuza *et al.*, 2016, 2017a), with limited research on buying behavior and sales (Muhammad *et al.*, 2022). To ensure the long-term viability of broiler production in Rwanda, it is important to have a better understanding of demand-specific issues and buying behavior.

The overall goal of this analysis is to evaluate hotel and restaurant preferences for Rwandan-produced broilers and indigenous chickens.¹ In this study, we focus on restaurant demand since they are the largest buyers of commercial poultry when compared to other retail establishments (e.g., meat shops) (Muhammad *et al.*, 2022). In fact, the rise in the number of quick service restaurants over the last decade is considered a major factor driving the development of the poultry sector throughout the region (Vernooij, 2018). We conducted face-to-face interviews with 100 restaurant owners and operators in Kigali and used the survey results to conduct a probit regression analysis of restaurant preferences for Rwandan-broilers compared to indigenous chickens.

¹ For the remainder of the article, we will refer to hotels and restaurants as simply restaurants.

The development of the commercial broiler sector and issues affecting poultry production in Sub-Saharan Africa have been previously studied. Birhanu *et al.* (2022) conducted a baseline survey, cluster-randomized study, and market survey to evaluate the feasibility of TROPICALLY ADAPTED IMPROVED BREEDS (TAIBs) of chicken in Sub-Saharan Africa. They reported that the majority of the smallholder farmers preferred TAIBs to indigenous chicken. They also found that TAIB chicken-based production systems improved the status of producers' consumption and income generation. Vernooij *et al.* (2018) conducted a study on regionalization in poultry development in Eastern Africa. They found that there is steady growth in chicken consumption across East African countries mainly due to rapid urbanization, a growing middle class, increases in disposable income, advancements in farming techniques, and the rise of quick service restaurants. Dyubele *et al.* (2010) conducted a study in South Africa to evaluate the consumer sensory characteristics of broiler and indigenous chicken meat. They found that consumers gave a higher score for most broiler meat attributes. The consumers also gave higher sensory scores, except for flavor and off flavor, from meat from broilers as opposed to indigenous chickens. Therefore, this analysis will contribute to the literature by examining restaurant demand for Rwandan-produced broilers compared to indigenous birds in Rwanda.

2. Methods

To determine the willingness of restaurants to purchase and offer Rwandan broilers, a survey was conducted in Kigali, the largest city and capital of Rwanda. Kigali is an important cultural, economic, and transportation hub in Rwanda. The survey was programmed onto a tablet using the Harvest Your Data (2023) platform and questions appeared in both English and Kinyarwanda. A non-government agency, Three Stones International (2023), was hired to administer the survey through 100 face-to-face interviews.² A face-to-face survey was utilized since it has been found to yield a greater response rate than alternative survey methods (Christensen *et al.*, 2014). The survey took approximately 20 minutes to complete and had full University of Tennessee, Knoxville, USA, Institutional Review Board (IRB) approval. The survey was completed in February 2022.

2.1 Contingent Valuation method

There exist various methods for assessing consumer preferences and willingness to pay (WTP) for food products, such as discrete choice experiments (Lewis *et al.*, 2016a, 2017; Syrengelas *et al.*, 2018), contingent valuation (CV) methods (Dobbs *et al.*, 2016; McKay *et al.*, 2019) and incentive-compatible experimental auctions (Lewis *et al.*, 2016b). We chose to utilize the CV method to determine restaurants' preferences for Rwandan broilers compared to indigenous chickens, provided it is similar to how restaurants make meat procurement decisions. Dobbs *et al.* (2016) and McKay *et al.* (2019) also used the CV approach to determine restaurants' preferences for sourcing local meat. We implemented a CV instead of a choice experiment because we were not interested in determining WTP estimates for various poultry attributes which is what choice experiments evaluate. Instead, we were interested in estimating the factors affecting a restaurant's decision to serve Rwandan broilers. Given the logistical challenges associated with implementing a survey in Rwanda during the aftermath of COVID-19, we did not utilize an experimental auction, which would have been a more labor intensive and costly endeavor. Ultimately, we opted to implement a CV, since this was the most efficient and straightforward way to answer our research question.

There are various approaches to implement CV methods including open- and closed-ended questions. Open-ended questions involve directly asking respondents to provide their estimates of WTP for goods and services. However, open-ended methods are vulnerable to different biases that can impact their accuracy (Dahal *et al.*, 2021; Hoyos and Mariel, 2010). Hoyos and Mariel (2010) reported that the closed-ended approach is more reliable. Among the closed-ended approaches, there are three types: single-bounded, double-bounded, and one-and-one-half-bounded (Hoyos and Mariel, 2010). Consistent with the methodology employed by

² We surveyed 100 restaurants provided by McKay *et al.* (2019) and found significant results with sample sizes of 90 and 107 for their study, and given our budget constraints.

McKay *et al.* (2019), we adopted to use the single-bounded CV method. This method was also used since it most accurately reflects the actual scenario of how farmers and middlemen distributors engage restaurants (Miklyaev *et al.*, 2017).

One potential concern in consumer preference studies is the presence of hypothetical bias. Since our data collection approach closely resembles the way in which farmers and wholesalers engage with restaurants in Rwanda, hypothetical bias is likely less of a problem with our study versus surveying general consumers. Furthermore, we explicitly informed the respondents that our study aimed to “better assess the market for Rwandan Broiler Chicken.” Thus, we also took measures to minimize hypothetical bias by carefully structuring the survey to make it consequential to the respondents, thereby ensuring they understood the potential impact of the survey results on valued outcomes (Herriges *et al.*, 2010; Lewis *et al.*, 2016; McKay *et al.*, 2019).

2.2 Survey flow

The flow of the survey appears in Figure 1, the variables from the survey are defined in Table 1, and the exact survey questions appear in Appendix A. The survey began with screening questions to ensure the respondent was qualified to take the survey. To qualify for the survey, the restaurant had to serve meat products. Further, individuals answering the survey had to be 18 years or older and the primary decision maker regarding food procurement. If the restaurateur qualified to take the survey, they then completed a consent form and

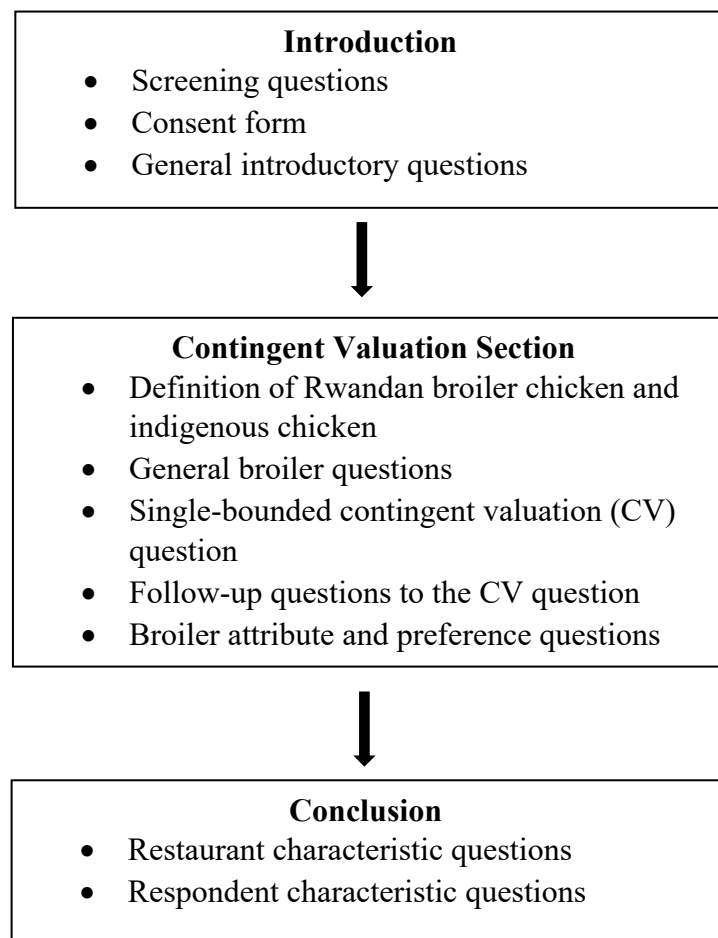


Figure 1. Survey flow.

Table 1. Variable names and definitions

Variable	Variable definition
Dependent variable	
Rwandan Broiler	1 if the respondent chose the Rwandan Broiler Chicken; 0 if they chose the Indigenous Chicken
Independent variables	
Broiler attributes and preferences	
Price	Price of the Rwandan broiler chicken (RWF 2000/kg; RWF 2750/kg; RWF 3500/kg; RWF 4250/kg)
Availability	Availability influences choice to offer Rwandan Broiler Chicken (1=not at all and 5=extremely)
Healthy	Healthy influences choice to offer Rwandan Broiler Chicken (1=not at all and 5=extremely)
High quality	High quality influences choice to offer Rwandan Broiler Chicken (1=not at all and 5=extremely)
Sustainable	Sustainable influences choice to offer Rwandan Broiler Chicken (1=not at all and 5=extremely)
Reliability	Reliability of supplier influences choice to offer Rwandan Broiler Chicken (1=not at all and 5=extremely)
Consistency	Consistency influences choice to offer Rwandan Broiler Chicken (1=not at all and 5=extremely)
Profitable	1 if believes offering Rwandan Broiler Chicken would make restaurant more profitable; 0 otherwise
Live	1 if the respondents prefers to receive the Rwandan Broiler Chicken live; 0 otherwise
Restaurant characteristics	
Seating capacity	Seating capacity of restaurant
Years in business	Number of years the restaurant has been in business
Respondent characteristics	
Age	Age of respondent in years
Female	1 if the respondent is female; 0 otherwise
Risk	Willingness to take risks from 1 to 10 (1=not willing and 10=very willing)
Variables not included in the probit regression	
Broiler familiarity	How familiar respondent is with Rwandan Broiler Chicken (1=not at all, 2=slightly, 3=moderately, 4=very, 5=extremely)

answered general introductory questions (Figure 1). The restaurateur was then provided with definitions of the Rwandan broiler and the indigenous chicken as follows:

“Rwandan Broiler Chicken” declares that the chicken is “a young, tender chicken; less than 10 weeks of age and is from Rwanda. “Local Bird” declares that the chicken is “a mature bird of indigenous breed” from Rwanda.”

Next, participants were asked how familiar they are with Rwandan broiler chicken from (1=not at all to 5=extremely) and whether or not they believed offering Rwandan broiler chicken products would make their restaurant more profitable (yes or no). A single-bounded CV question was then posed to the primary purchaser as follows:

“Assume you are purchasing chicken for your restaurant. Which type of chicken would you choose? Please select the choice that is most representative of the decision you would really make for your operation:

- (A) Whole Local Bird costing RWF 4900/bird. Assume a 1.4 kg dressed weight. Thus, it costs RWF 3500/kg dressed.
- (B) Rwandan Broiler Chicken costing RWF 2000/kg dressed.
- (C) Neither”

The indigenous chicken was always offered at the same price to all restaurants (i.e., RWF 3500/kg dressed) while the Rwandan broiler was offered at one of four price levels (RWF 2000, 2750, 3500 and 4250/kg). Each of the four price levels were randomly offered to 25 restaurants. Local bird (indigenous chicken) and broiler prices were based on Rwandan market prices at the time of the survey provided by Zamura (2023). Zamura is a limited full-service commercial livestock feed manufacturer that also produces broiler chickens in Rwanda. Through conversations with poultry experts at Zamura, we also designed the CV question such that the indigenous chicken was marketed as a whole bird while the broiler was marketed on a per kilogram basis since this is how they are respectively sold. Because the local bird is always sold as a whole bird, the question provided an assumed weight and conversion, so respondents knew its market price on a per kilogram basis allowing for an accurate price comparison between the two options.

If a respondent chose the indigenous chicken compared to the broiler, they were asked the following open-ended question, “Why did you choose the Whole Local Bird instead of the Rwandan Broiler Chicken?” Next, all restaurateurs were asked how much they agreed that the following factors (availability, healthy, high quality, reliability of supplier, consistency of product, sustainability) would influence their choice to offer Rwandan broiler chicken at their restaurant (with 1=not at all to 5=influence extremely). They were then asked whether they would prefer the Rwandan broiler chicken as a live bird (yes or no). Finally, the survey concluded with questions about how many years the restaurant had been in business, seating capacity of the restaurant, and respondent characteristics (gender, age). The respondents’ risk preferences were also elicited following Dohmen *et al.* (2011) by asking their willingness to take risks from 1=not at all willing to 10=very willing.

2.3 Conceptual and econometric framework

A consumer will purchase one product over another when their utility gained from that product is greater than their utility for the other product. In this decision scenario, the random utility framework is often used to model the decision regarding a consumer’s willingness to purchase (McFadden, 1994). Since we are interested in the decision of a restaurant, not a consumer, we follow the framework of McKay *et al.* (2019) who extended this framework to a restaurant’s purchasing decision. Since a restaurant is maximizing profits, and not utility, a restaurant, r , would choose the Rwandan broiler chicken (RB) over the indigenous chicken (IC) if the expected profit from purchasing the RB ($E(\Pi_{rRB})$) is greater than its expected profit from purchasing the indigenous chicken ($E(\Pi_{rIC})$), such that $E(\Pi_{rRB}) > E(\Pi_{rIC})$.

Estimating the probability (Pr) that a restaurant will choose the RB relates to the probability that the expected profit from serving the RB will exceed the expected profit from serving the indigenous chicken. Thus,

$$\Pr(Y_{rRB} = 1) = \Pr(E(\Pi_{rRB}) > E(\Pi_{rIC})) = \Phi(\beta_0 + \beta\mathbf{x} + \alpha P) \quad (1)$$

where β_0 is an estimated intercept term, \mathbf{x} is a vector of independent variables hypothesized to affect a restaurant’s preferences for the type of chicken they prefer to serve, P is the price of the RB, β is the vector of coefficients to be estimated for the variables other than price, α is the price coefficient to be estimated, and Φ is the cumulative normal distribution (Stata, 2023a). The vector \mathbf{x} consists of respondent characteristics, characteristics of the restaurant, and restaurant broiler attributes and preferences (Table 1). The latent model depicting the restaurant’s choice can be specified as follows:

$$Y_{rRB}^* = \mathbf{x}' \boldsymbol{\beta} + \alpha' P + \varepsilon \quad (2)$$

$$Y_{rRB}^* = \begin{cases} 1 & \text{if } Y_{rRB}^* > 0, \\ 0 & \text{otherwise} \end{cases} \quad (3)$$

The restaurant's choice of purchasing the broiler instead of the indigenous chicken is a binary dependent variable that takes the value of zero if the respondent chooses to purchase the indigenous chicken and one if they choose to purchase the broiler. Since the dependent variable is binary, and following similar studies (e.g., Dobbs *et al.*, 2016; McKay *et al.*, 2019), we utilize a probit regression for estimating the factors associated with the decision of a restaurant, r , to purchase the RB as outlined in equation (1).³

The probit log-likelihood function and maximization are described in Stata (2023a). The probit regression was estimated in Stata 17 using the probit command with robust standard errors (Stata, 2023a). Associated average marginal effects for discrete and continuous variables were estimated using the Stata 17 margins command (Stata, 2023b). Using Stata 17, the condition indexes were estimated for the independent variables along with a correlation matrix to examine whether multicollinearity was present. The Stata command `coldiag2` was used to estimate the condition indexes. If the condition number of the independent variables is lower than 30, then collinearity issues are not present (Belsley, 1991).

We also estimated the average WTP for RBs using the results of the probit regression with the formula:

$$\widehat{\text{WTP}}_{\text{RB}} = \frac{-\hat{\beta}_0 + \mathbf{z}' \hat{\boldsymbol{\beta}}}{\hat{\alpha}} \quad (4)$$

where $\hat{\beta}_0$ is the estimated intercept of the probit regression, $\hat{\boldsymbol{\beta}}$ is the vector of estimated coefficients except for price, \mathbf{z} is the vector of independent variables excluding price, and $\hat{\alpha}$ is the estimated price coefficient of the broiler. A similar method for estimating WTP was used by Dobbs *et al.* (2016) and McKay *et al.* (2019).

2.4 Explanatory variables and hypothesized results

Table 1 shows the dependent and independent variables in the probit regression. A likelihood ratio test was utilized to determine which variables to use as independent variables. Following demand theory, we hypothesize that as the price of the Rwandan broiler decreases, restaurants would be more likely to purchase the broiler chicken (Table 1). As restaurants consider availability, healthiness, quality, sustainability, reliability of the supplier, and consistency more important, they may have an increased preference for broilers or indigenous chickens (Table 1). Previous research also found the importance of these factors to affect product preferences (Steinhart *et al.*, 2013; Van Loo *et al.*, 2010; Erdem and Swait, 1998; Saleem *et al.*, 2015). It is expected that those believing Rwandan broiler chickens would make the restaurant more profitable would be more likely to choose broilers. Rwandan restaurants likely also have different preferences for how they procure chicken meat, and this will affect their preferences for broilers compared to indigenous birds. For example, indigenous chickens are typically supplied live while broilers are provided in a variety of available cuts (Table 1).

Previous research has documented that individual attitudes and demographics affect food purchasing decisions and that certain restaurant characteristics, like seating capacity, could influence a restaurant's decision to offer local beef (Carpio and Isengildina-Mass, 2009; Dentoni *et al.*, 2009; Dobbs *et al.*, 2016; Duram and

³ As pointed out by a reviewer, we could have also utilized a logistic regression instead of a probit regression. The difference between the two models is that if the error term is distributed normally, then the probit model results; alternatively, if the error term is distributed as a logistic, then the logit model results (Kennedy, 2008).

Cawley, 2012; McKay *et al.*, 2019; Selfa and Qazi, 2005; Starr *et al.*, 2003; Telligam *et al.*, 2017). Therefore, it is hypothesized that seating capacity, years in business, and the primary poultry decision maker's age and gender could affect their decision to purchase broilers (Table 1). Risk has been found to be a predictor of decision making behavior (Angulo and Gil, 2007; Mitchell, 1998); thus, it was hypothesized to influence the decision to offer broilers.

3. Results

3.1 Rwandan restaurant preferences for Rwandan Broiler Chicken

Among the 100 surveyed restaurants in Rwanda, 97 of the surveys were completed face-to-face and three were completed over the phone.⁴ Of the 100 restaurants completing the survey, 83 of them answered all the questions used in the probit regression. Figure 2 shows the percentage of restaurants selecting the broiler compared to the indigenous chicken at the different price levels for the entire sample, and only the observations used in the probit regression. All restaurants either chose to purchase the broiler chicken or the indigenous chicken and none selected the "neither" option in the CV question. The indigenous chicken was priced at RWF 3500/kg in all scenarios and the broiler ranged from RWF 2000 to 4250/kg.

Across the entire sample, at the lowest broiler price (RWF 2000/kg), 68% of the respondents chose to purchase the broiler. At the highest price (RWF 4250/kg), 80% of the restaurants chose the broiler (Figure 2). Results were similar when analyzing only the observations used in the probit regression. For both the entire sample, and when analyzing only the observations used in the probit regression, *t*-tests revealed there

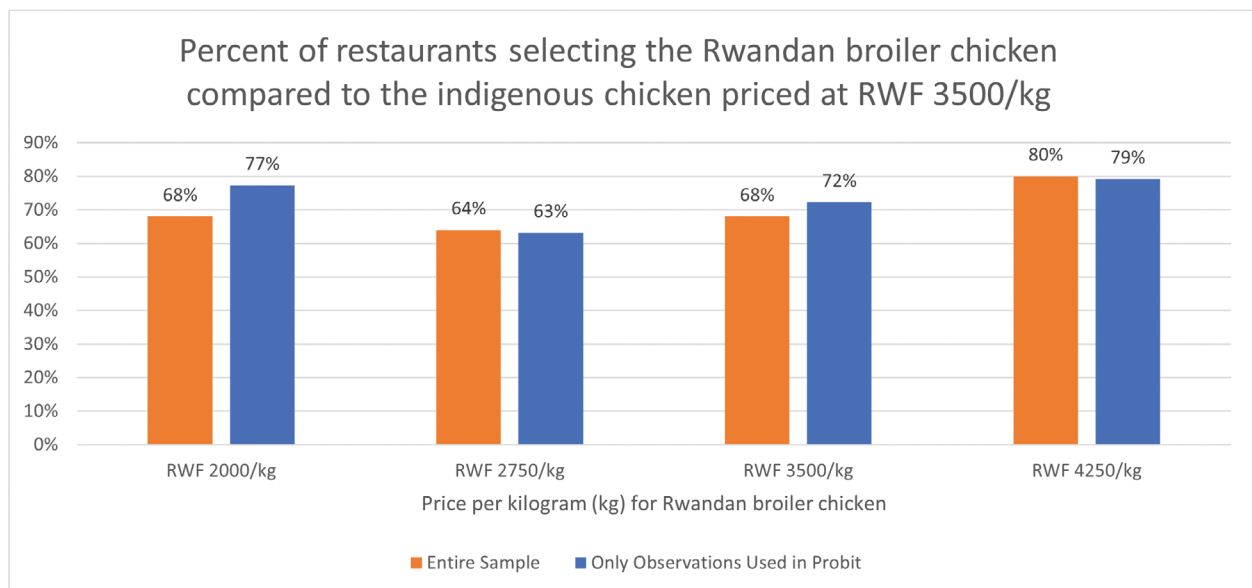


Figure 2. Student's *t*-tests revealed no significant differences for the percentage of restaurants' selecting the Rwandan broiler chicken across the four price levels when all observations were used and when only the observations used in the probit were used. The number of observations for each price level was 25 for the entire sample, and the numbers of observations using only the observations in the probit were 22, 19, 18 and 24 for the RWF 2000/kg, 2750/kg, 3500/kg and 4250/kg price levels, respectively.

⁴ Provided the survey required the primary poultry purchaser to answer it, in some cases this person was not at the restaurant, so they were contacted by phone to complete the survey.

were no significant differences among the percentage of restaurants selecting the broilers compared to the indigenous chickens at the different price levels. This indicates that a restaurant's decision to offer broilers was not sensitive to price, which is contrary to demand theory. Therefore, results of the probit regression will help determine the factors that do influence a restaurant's decision to offer broilers.

Table 2 presents the descriptive statistics of the variables used in the probit regression model, how they vary across those who selected broilers versus those who selected indigenous chicken, and the level of familiarity respondents had with broilers.⁵ Among the respondents who answered all the questions, approximately 73% chose the Rwandan broiler over indigenous chickens. The average offered price for the Rwandan broiler in the CV question was RWF 3,147/kg. With an average mean score higher than 3.9, the respondents considered availability, healthy, high quality, sustainability, reliability, and consistency as very influential factors in their choice to offer broilers at their restaurant (Table 2). Those who selected broilers considered reliability of supply as significantly more influential at an average mean of 4.59 compared to 4.09 among those who selected indigenous chicken ($p < 0.10$). Approximately 93% of the respondents believed that offering broilers would make their restaurant more profitable and the perceived profitability of broilers was greater among

Table 2. Variable means and standard deviations

Variable	All observations in probit ($n=83$)		Those who selected broilers ($n=61$)		Those who selected indigenous chicken ($n=22$)	
	Mean	SD	Mean	SD	Mean	SD
Dependent variable						
Rwandan Broiler	0.73	0.44	1.00	0.00	0.00	0.00
Independent variables						
Broiler attributes and preferences						
Price	3147.59	879.16	3168.03	903.37	3,090.91	825.72
Availability	4.27	1.09	4.39	1.00	3.91	1.27
Healthy	4.23	1.02	4.30	0.92	4.05	1.25
High quality	4.67	0.59	4.75	0.43	4.45	0.86
Sustainable	4.25	1.14	4.39	1.02	3.86	1.36
Reliability	4.46	0.85	4.59*	0.67	4.09*	1.15
Consistency	3.95	1.21	4.03	1.12	3.73	1.42
Profitable	0.93	0.26	0.98**	0.13	0.77**	0.43
Live	0.22	0.41	0.08***	0.28	0.59***	0.50
Restaurant characteristics						
Seating capacity	125.04	140.19	101.93*	88.38	189.09*	220.40
Years in business	6.00	4.73	5.64	3.67	7.00	6.89
Respondent characteristics						
Age	36.12	8.53	35.90	8.60	36.73	8.51
Female	0.40	0.49	0.43	0.50	0.32	0.48
Risk	7.88	2.01	8.03	1.54	7.45	2.97
Variables not included in the probit regression						
Broiler familiarity	4.01	0.61	4.03	0.58	3.95	0.72

Number of observations=83. SD, standard deviation. *, ** and *** represent that the variable mean of those selecting broilers was significantly different from those selecting indigenous chicken at the 10, 5 and 1% level of significance.

⁵ Respondent familiarity with broilers was not an independent variable used in the probit regression provided its inclusion did not improve the model fit (i.e., a likelihood ratio test was used to determine which independent variables were used in the probit model).

restaurants that selected broilers (98%) than those who selected indigenous chickens (77%) ($p < 0.05$). On average, only 22% of respondents preferred live broilers compared to processed cuts; this percentage was significantly higher among those who selected indigenous chicken (59%) compared to broilers (0.08%) ($p < 0.01$) (Table 2).

The average seating capacity of the restaurants was approximately 125. The average seating capacity among restaurants that selected indigenous chickens was significantly higher than those who selected broilers at 189 seats compared to 102 ($p < 0.10$). On average, the restaurants were in business for six years. The average age of the respondent was approximately 36 years and almost 40% of the respondents were female. With a mean score of 7.88, the respondents had a high willingness to take risks. On average, respondents were “very” familiar with Rwandan broilers.

3.2 Factors affecting restaurant preferences for Rwandan Broiler Chicken

The condition number of the independent variables was 37.27, which is slightly higher than the ideal cutoff value of 30 (Belsley, 1991). However, as shown by the correlation matrix in Table 3, no two variables had a correlation of greater than 0.70. Together, this suggests that multicollinearity is not an issue (Dancey and Reidy, 2004).

Table 4 presents the probit regression coefficients and marginal effects for the factors affecting a restaurant’s willingness to offer Rwandan broiler chicken compared to indigenous chicken. The estimated probit regression had a pseudo R^2 of 0.57, and the Wald χ^2 of 43.92 was significant ($p < 0.001$). The marginal effects provide the probability of a restaurant choosing the broiler compared to the indigenous chicken given a one unit increase in an independent variable (for continuous variables) or the change in a binary variable from zero to one. Given that marginal effects are easier to interpret than the coefficients, the following discussion focuses on the marginal effects presented in Table 4.

As expected from viewing Figure 2, the price of the broiler compared to the indigenous chicken did not have an effect on a restaurant’s preference for the broiler. As a respondent considered availability ($p < 0.01$), high quality ($p < 0.10$), and reliability ($p < 0.01$) to be more influential factors in their choice to offer broilers, they were more likely to select the broiler. For example, as a respondent considered reliability one-unit more influential, they were nearly 22% more likely to select the broiler. This may indicate that restaurants consider the sourcing of broilers to be more reliable and broilers to be of higher quality. Consistent with expectations, if a restaurant believed offering broilers would make the restaurant more profitable, they were nearly 60% more likely to choose the broiler ($p < 0.01$).

Meanwhile, as restaurants considered health benefits ($p < 0.01$) and consistency ($p < 0.01$) more influential factors in their choice to offer broilers, they were less likely to select the broiler. For example, as respondents considered consistency as one-unit more influential, they were approximately 12% less likely to purchase the broiler. This may indicate that restaurants consider broilers to be not of as consistent quality or as healthy as indigenous chickens. If a restaurant preferred live broilers, they were 27% more likely to prefer the indigenous chicken ($p < 0.01$), which makes sense considering indigenous chickens are more likely to be sold live than broilers.

Results indicated that time in business ($p < 0.05$) and seating capacity ($p < 0.10$) decreased the likelihood of choosing broilers over the indigenous bird. If a restaurant was in business one year longer, they were 1% less likely to choose the broiler. If a restaurant had 10 more seats, it was 1% less likely to choose the broiler. Thus, newer and smaller restaurants were more likely to purchase broilers. If the primary poultry purchaser was a female, they were nearly 20% more likely to purchase the broiler ($p < 0.01$). A plausible explanation for this is that more females are involved in poultry production and processing in Sub-Saharan Africa (Aboki *et al.*, 2013). Thus, they might be more knowledgeable about the benefits of broiler chicken. If the primary poultry

Table 3. Independent variable correlation matrix

	Age	Female	Risk	Seating capacity	Years in business	Price	Availability	Healthy	High quality	Sustainability	Reliability	Consist-	Profitability	Live
Age	1													
Female	-0.13	1												
Risk	0.14	-0.11	1											
Seating capacity	-0.04	-0.10	-0.27	1										
Years in business	0.27	-0.02	0.02	0.16	1									
Price	0.20	0.03	0.04	-0.07	0.38	1								
Availability	0.23	-0.15	0.55	-0.20	0.09	0.25	1							
Healthy	0.25	-0.06	0.37	-0.32	0.05	0.10	0.44	1						
High Quality	0.17	-0.05	0.32	-0.35	0.14	0.17	0.19	0.56	1					
Sustainable	0.15	-0.16	0.38	-0.41	0.11	0.18	0.48	0.58	0.58	1				
Reliable	-0.05	-0.30	0.41	-0.14	0.05	0.20	0.28	0.43	0.43	0.48	1			
Consistency	0.17	-0.19	0.40	-0.18	0.04	0.20	0.57	0.54	0.42	0.66	0.58	1		
Profitable	0.06	-0.06	0.19	0.03	0.07	0.13	0.37	0.25	0.16	0.06	0.21	0.38	1	
Live	0.00	0.05	-0.22	0.25	0.04	0.09	-0.13	-0.24	-0.26	-0.20	-0.22	-0.12	-0.19	1

Table 4. Probit coefficients and marginal effects for factors affecting restaurants' decision to offer Rwandan Broiler Chicken

Variable	Coefficient	SEM	Marginal effect	SEM
Broiler attributes and preferences				
Price	-0.0003	0.0003	-0.0001	0.0001
Availability	0.740**	0.367	0.101**	0.048
Healthy	-0.732***	0.284	-0.100***	0.034
High quality	0.649*	0.347	0.088*	0.048
Sustainable	0.415	0.335	0.057	0.045
Reliability	1.577***	0.452	0.215***	0.063
Consistency	-0.896***	0.285	-0.122***	0.039
Profitable	4.376***	0.862	0.596***	0.124
Live	-1.980***	0.653	-0.270***	0.065
Restaurant characteristics				
Seating capacity	-0.005*	0.003	-0.001*	0.0004
Years in business	-0.080**	0.040	-0.011**	0.005
Respondent characteristics				
Age	0.037	0.030	0.005	0.004
Female	1.429***	0.508	0.195***	0.062
Risk	-0.435***	0.146	-0.059***	0.021
Constant	-7.297***	2.150		

Number of observations=83. The probit regression had a pseudo R² of 0.5674 and a Wald χ^2 of 43.92 ($p < 0.001$). *, ** and *** indicate level of significance at the 10, 5 and 1% level of significance. SEM, standard error of mean.

purchaser was more risk-seeking, they were more likely to choose the indigenous chicken ($p < 0.01$). This result could be explained by broilers typically being more available and cheaper than indigenous chickens (Dalle Zotte *et al.*, 2020).

3.3 Qualitative analysis

Respondents who chose the indigenous chicken over the broiler were asked a follow-up question of, “why did you choose the Whole Local Bird instead of the Rwandan Broiler Chicken?” The qualitative responses to this question are provided in Table 5 to confirm the results of the probit regression. The reasons why about 25% of restaurants preferred the indigenous chicken over the broiler can generally be classified among a few main themes. In general, according to the responses of those preferring indigenous chickens, they believed indigenous chickens have the following attributes: nutritious/more healthy, delicious, high quality, and most preferred by customers (Table 5). Overall, these results conform to the probit regression findings. For example, regression results revealed that as respondents considered health benefits and consistency more influential in their broiler decisions, they were more likely to prefer the indigenous chicken. This is consistent with the qualitative analysis showing that among those who selected indigenous chickens, they were considered more nutritious, healthy, and delicious. Meanwhile, regression results indicate that as availability and reliability were more influential factors in broiler decisions, broilers were more likely to be preferred. This is consistent with the qualitative results indicating that broilers are easier to source than indigenous chickens. Further, regression results indicated that price was not an important factor in poultry purchasing decisions, which is consistent with the explanations in Table 5.

Table 5. Qualitative explanations for choice of indigenous chicken compared to the Rwandan Broiler

Selected qualitative explanations	Broiler price level
Because the local bird is very nutritious and has very good quality	RWF 2000/kg
It is very delicious and high quality in terms of nutrients	
It has good nutritious quality	
Because it has quality nutrients	
It is very delicious and it is most preferable by the customers	RWF 2750/kg
Everyone in my restaurant will ask for Rwandan chicken, they like Rwandan then others	
My customer likes it the most	
Rwandan chicken are originals and good quality	
Because we serve what the customers mostly like to order and they prefer local birds it is just they are scarce compared to broiler chicken	
We serve a lot of Chinese dishes and we make them with local birds so we like to purchase local birds more than broiler chicken	
Because we have a high demand of local birds than broiler chicken. Local birds are more delicious than broiler chicken.	
Because we have a high demand of local birds chicken than broiler chicken here in Kigali.	
This is because I have a high demand of local birds so I don't sell broiler chicken	
This is because I don't consider the price, I just follow the client's preference. So our clients like to eat local birds and that is why I can prefer to choose it no matter the price	
Because it has a high demand compared to broiler chicken	RWF 3500/kg
The most clients like to order local birds than broiler chicken	
Local birds have a high demand than broiler chicken	
We do not provide broilers, we prefer local birds as they are liked by our customers	
Most our customers choose local birds rather than broilers	
Most our customers prefer local birds	
Most people prefer local birds	
Most our customers prefer local birds as they taste good.	
Local birds taste better than broilers	
Local birds are very nutritious, taste good and are healthy	
Our clients prefer local birds because they don't cause disease and also our hotel has special dishes which we serve local birds	
The reason is that we often follow the wishes of the customers, they prefer whole local bird than broiler chicken	
Because most customers prefer this kind of whole local bird	
Because our customers prefer local bird the most than broiler chicken	
Because we follow the needs from many customers, they like more local bird instead of broiler chicken	
Because we follow wishes from our customers, it is our specialty.	

If the respondent chose the indigenous chicken compared to the Rwandan broiler, they were then asked, "Why did you choose the Whole Local Bird instead of the Rwandan Broiler Chicken?" Responses to this question are in this table. Sample size=100.

3.4 WTP

The mean WTP for broilers was estimated to be RWF 6141/kg, which is RWF 4141/kg higher than the lowest price offered (RWF 2000/kg) to the respondents and RWF 1891/kg higher than the highest price offered (RWF 4250/kg). The mean WTP for broilers is also RWF 2641/kg higher than the provided price of indigenous chicken. This high value for the estimated broiler WTP is likely because price has no significant impact on demand for broilers in the probit regression, and restaurants still preferred broilers over indigenous chicken

80% of the time even at the highest provided price level (RWF 4250/kg). Moreover, Dyubele *et al.* (2010) reported that consumers in Africa gave higher sensory scores to broilers compared to indigenous chicken. This indicates that restaurants would be willing to purchase broilers at prices even higher than market prices (i.e., up to RWF 6141/kg).

4. Discussion and conclusions

Broiler production in sub-Saharan Africa has become increasingly popular as a means to increase protein consumption while also providing income to rural smallholder farmers. Broilers are often more efficient and cheaper to produce than indigenous chickens; thus, broiler systems have the potential to be an effective way to decrease rural poverty and simultaneously increase protein consumption among producers and the general population by increasing the supply of chicken meat. While previous studies evaluated various characteristics of broiler production systems, such as production efficiencies, smallholder broiler sales, and profitability in Sub-Saharan Africa, few studies have examined consumer preferences for broilers. Therefore, this study examined Rwandan restaurant preferences for sourcing Rwandan broiler chickens compared to indigenous chickens and the factors predictive of a restaurant's choice to purchase broilers compared to indigenous chickens. Restaurants are an important marketplace where poultry is consumed, and previous research has examined restaurant purchasing behavior to examine the feasibility of new products.

Results from implementing a face-to-face survey with the primary purchasing decision maker of 100 restaurants in Kigali found that about 75% of restaurants preferred broilers compared to indigenous chickens regardless of if the broilers were priced higher or lower than the indigenous chicken. In fact, when broilers were priced at a premium of RWF 750/kg over the indigenous chickens, 80% of restaurants still chose the broiler.

A probit regression was utilized to determine the factors affecting a restaurant's preference to purchase broilers over indigenous chickens. Broiler price was not found to be significant in the model and did not affect broiler or indigenous chicken adoption by restaurants. Female poultry purchasers, smaller restaurants (in terms of seating capacity), and newer restaurants all preferred broilers compared to indigenous chickens. If a restaurant considered availability, high quality, and reliability influential factors when purchasing broilers, they were more likely to prefer broilers. Restaurants that thought serving broilers would increase their profitability were also more likely to purchase broilers. Meanwhile, restaurants that preferred live poultry and considered consistency and healthiness as influential factors when purchasing chicken were more likely to prefer indigenous chickens.

Restaurant average WTP for broilers was estimated from the coefficients of the probit regression at RWF 6141/kg, which was higher than the market broiler price in Rwanda at the time of the survey. Thus, there exists strong demand for broiler chickens in Rwanda and broiler price was not a significant factor in determining demand. Despite broilers being vastly preferred over indigenous chickens among the surveyed restaurants, there was a clear pattern of factors that emerged for restaurants that were resistant to adopting broilers and instead still preferred indigenous chicken. The 25% of restaurants that preferred indigenous chickens were asked why they preferred them. Qualitative analysis of this question found that the primary reasons for this preference was the perception that indigenous chickens are more nutritious/healthy, delicious, high quality, and preferred by the restaurant's customers. The qualitative results closely follow the probit regression results.

Taken together, results show the majority of restaurants prefer broilers and price is not a deciding factor in the decision to procure broilers or indigenous chickens at their establishments. While most restaurants prefer broilers, likely because they are readily available and reliable, those that prefer indigenous chickens have strong views about indigenous chickens tasting better and being healthier for consumers. The lack of price sensitivity observed in this study indicates that indigenous chickens and broilers are currently not likely seen as substitutes. Thus, restaurants who currently purchase indigenous chickens will not be swayed to purchase broilers regardless of how cheap they become relative to indigenous chickens. Rather, restaurants

currently purchasing indigenous chickens will continue to do so until their clientele no longer prefers them, which is demonstrated by the qualitative analysis. It is possible that when broilers were first introduced to the market, relative prices caused restaurants to begin serving broilers instead of indigenous chickens. However, among our sample, the remaining restaurants serving indigenous chickens were not influenced by relative prices to convert to sourcing broilers. There are other purchasing attribute differences between broilers and indigenous chickens that support their lack of substitutability. For example, in our study restaurants that preferred live birds overwhelmingly preferred indigenous chickens since they are typically sourced live while broilers are not.

Overall, this research found that most restaurants prefer broilers. This bodes well for the growing broiler industry in Rwanda. However, this study is not without limitations. For example, other methods could be utilized to further examine differences in Rwandan preferences for indigenous chickens compared to broilers. Provided the qualitative analysis revealed the restaurants serving indigenous chickens considered their taste and nutrition to be superior to that of broilers, a choice experiment or experimental auction with sensory analysis could be conducted to further examine how preferences are correlated with the actual taste and nutrition of the products. For example, Dyubele *et al.* (2010) found that consumers in South Africa scored broiler meat attributes, including flavor, higher than indigenous chickens. Future research should examine whether this type of sensory study would produce consistent results in Rwanda, especially among consumers frequenting restaurants that prefer to source indigenous chickens. Future studies should also examine the acceptability of broilers among rural Rwandan communities and consumers to see if results of this study are specific to Kigali restaurants, which likely serve wealthier and urban clients that are not necessarily representative of the average Rwandan citizen. Future research could also survey general consumers to determine which consumer demographics (e.g., household income, geographic location, gender) affect preferences for broiler versus indigenous chicken meat.

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Appendix

Survey instrument

1. Ni kukihe kigero umenyereye inyama z’inkoko? How familiar are you with Rwandan broiler chicken?
 - a. Habe na mba/Not at all
 - b. Gacyeya/slightly
 - c. Mu rugero/moderately
 - d. Cyane/very
 - e. Bikabije/extremely

2. Utekereza ko gucuruza ibikomoka ku nyama z’inkoko byatuma restora yawe yunguka kurushaho? Do you believe that offering Rwandan Broiler Chicken products would make your restaurant more profitable? (Select one)

Yego / Yes

Oya/No

3. Tekereza ko ugiye guhahira restora yawe inkoko. Ni ubuhe bwoko bw’inkoko wahitamo? Gerageza ukore amahitamo agaragaza ikemezo wafata by’ukuri mu gikorwa cyawe. Assume you are purchasing chicken for your restaurant. Which type of chicken would you choose? Please select the choice that is most representative of the decision you would really make for your operation.
 - A. Inkoko y’inyarwanda yuzuye igura RWF 4900. Ibiro 1.4 ni iby’inkoko ibaze. Ubwo igiciro ni RWF 3500 ku kiro cy’inkoko iteguye Whole Local Bird costing RWF 4900 per bird. Assume a 1.4kg dressed weight. Thus, it costs RWF 3500/kg dressed.
 - B. Inkoko (itari inyarwanda) ku giciro cya RWF 2000 ku kiro (inkoko ibaze). Rwandan Broiler Chicken costing RWF 2000/kg dressed (or RWF 2750/kg; RWF 3500/kg; RWF4250/kg)
 - C. Nta n’imwe. Neither

- 3A. If answered (A) to question 3

Ese kuki wahisemo inkoko y’inyarwanda yuzuye/yose aho guhitamo inkoko (itari inyarwanda) yuzuye/yose?. Why did you choose the Whole Local Bird instead of the Rwandan Broiler Chicken?

4. Ni kukihe kigero wemera ko izi mpamvu zikurikira zishobora kugira uruhare mu gufata ibyemezo byo guhahira restora yawe inkoko z’inyama? Mbwira niba buri mpamvu mvuze isobanura icyemezo cyawe 1, Nta ruhare na mba; 2=Uruhare ruto; 3=Uruhare rugereranije; 4=uruhare runini; 5=uruhare runini cyane. /How much do you agree that the following factors would influence your choice to offer Rwanda Broiler

Chicken at your restaurant? Please tell me whether each factor I name would explain your choice 1, Not at all; 2=influence slightly, 3=influence moderately, 4=influence a lot or 5=influence extremely

	Not at all (Nta ruhare na mba)			Influence extremely (Uruhare runini cyane)	
	1	2	3	4	5
Availability/Kuboneka kw'innyama					
Healthy/Ni byiza ku buzima					
High quality/Ubwoko bwiza					
Reliability of supplier/Ikizere kubatanga inyama					
Consistency of product/Kudahinduka					
Sustainable/Iramba					

5. Would you prefer to receive Rwanda Broiler Chicken products as a live bird (select one)? Ni gute wakwifuza kwakira inyama z'inkoko cyangwa se ibizikomokaho ari nzima (hitamo imwe).

Yego/Yes

Oya/No

6. Restora yanyu imaze imyaka ingahe ikora. How many years has your restaurant been in business?

7. Ese restora yanyu yicaramo/yakira abantu bangahe? What is the seating capacity of your restaurant?

8. Nifuzaga gusuzuma uburyo ubushake bwawe bwo guhitamo ibyemezo bigoye. Ku kigero cyo kuva kuri 1 kugera ku 10, 1 ikaba ari "Kutifuza guhitamo ibigoye namba", 10 ikaba Kwifuza cyane guhitamo ibigoye, ni uwuhe mubare ugarazaza uko ufata ibyemezo bigoye muri rusange.

I'd like you to assess your willingness to take risks. On a scale of 1 to 10, with 1 being not at all willing to take risks and 10 being very willing to take risks, what number would you assign to yourself and your willingness to take risk generally?

Nta bushake na busa/Not at all willing					Ndabishaka cyane/Very willing				
1	2	3	4	5	6	7	8	9	10

. Imyaka yawe ni ingahe? (Ushobora guhitamo kutayivuga). What is your age? (You can decline to answer this if you prefer not to answer)

10. Igitsina cyawe. What is your gender? (Select one)

A1. Gabo/Male

A2. Gore/Female

A3. Ntango nifuza kubivuga/Prefer not to answer.