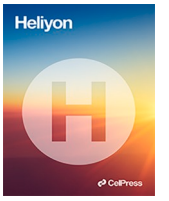
Heliyon 10 (2024) e40208

Contents lists available at ScienceDirect

Heliyon

journal homepage: www.cell.com/heliyon



Research article

Branding locally produced chicken in Ghana: An application of discrete choice experiment

Helena Oppong-Kyeremeh [a,*], Richard Kwasi Bannor [a], James Osei Mensah [b]

[a] Department of Agribusiness Management and Consumer Studies, University of Energy and Natural Resources, Sunyani, Ghana
[b] Department of Agricultural Economics, Agribusiness and Extension, Kwame Nkrumah University of Science and Technology, Kumasi, Ghana

ARTICLE INFO

Keywords:
Discrete choice experiment
Lancaster theory
Broiler farmers
Branding
Local brands

ABSTRACT

Branding is gradually becoming an essential component of successful agribusinesses and a significant motivation to boost modern agriculture. The study aimed to investigate broiler farmers' choices and preferences for branding locally produced chicken in Ghana. Primary data was collected from 562 broiler producers using a multistage sampling technique. The Discrete Choice Experiment model, which comprises random parameter logit and conditional logit models, was used to analyse farmers' preferences for branding attributes and willingness to brand locally produced chicken. Branding attributes of brand source, production claim, form of branded chicken, percentage of farm use, and price were analysed. Averagely, farmers were willing to pay US$0.59 to brand 1.9 kg of processed chicken. Further, household size, brand source, production claim, form of branded chicken, percentage of farm use, and membership of a farmer-based organisation positively influenced farmers' willingness to brand locally produced chicken. In contrast, price negatively influenced farmers' preference for branding. Farmers should produce brands with these unique attributes to boost sales, improve income and enhance the competitiveness in the poultry industry.

1. Introduction

The massive contribution of the poultry industry to livelihoods, poverty alleviation, employment, income generation, food and nutrition security, as well as the resilience of millions of people worldwide cannot be overemphasised [1–3]. Chicken is the most preferred meat globally, preceding pork and beef [4]. Nevertheless, the industry is faced with a plethora of challenges deterring it from attaining its utmost potential. Predominantly among these challenges is the enormous importation of chicken products. Ghana spends over US$ 300 million (about 180,000 mt) in importing chicken annually, which is equivalent to 5 million chickens per week [5]. The continuous import of cheaper chicken from the United States and European markets, especially after the exemption of import tariffs, led domestic broiler production to huge competition [7–10]. As a result, many broiler farms in Ghana have collapsed due to their inability to compete with imported chicken [3]. Imported chicken has unique characteristics that make it preferable to the locally produced chicken. For instance, they are sold in processed forms that are convenient to the consumer, such as ready-to-cook, pre-cut, and ready-to-eat, having desired sensory characteristics [1,2,7], whereas the locally produced chicken is usually sold as a live bird [11]. Besides, unstable work schedules, income, swift urbanisation, market liberalisation, and changes in technology for production

* Corresponding author.
E-mail addresses: helena.oppong-kyeremeh@uenr.edu.gh (H. Oppong-Kyeremeh), richard.bannor@uenr.edu.gh (R.K. Bannor), mojemmy@gmail.com (J.O. Mensah).

https://doi.org/10.1016/j.heliyon.2024.e40208
Received 22 February 2024; Received in revised form 5 November 2024; Accepted 6 November 2024
Available online 8 November 2024

have made chicken the leading 'convenience' food in several West African countries [12]. Therefore, domestic producers need to adopt strategies that provide these 'convenience' qualities to meet consumers' needs and remain competitive. Previous studies have revealed several marketing strategies to boost the broiler industry's competitiveness domestically. For example [3,13], proposed contract farming. These strategies focused on selling live birds to prospective customers but not necessarily selling processed chicken in various forms convenient to the consumer. [11] indicated that processing locally produced chicken into cut parts gives an added competitive advantage and attracts premium prices.

Additionally, consumers are willing to pay premium prices for safe, healthy, fresh, whole-dressed, cut-parts and antibiotic-free chicken [1,7,11]. Therefore, farmers need to take advantage of this opportunity to produce chicken and provide attributes that meet the needs of consumers, thereby attracting premium prices and eventually boosting their businesses. One plausible way is that farmers should apply innovative and value-addition means such as branding chicken as a marketing strategy to enhance competitiveness through proper targeting of niche markets that offer higher prices to match the higher cost of domestic production [3]. In light of these reasons [7], proposed branding of local chicken as a marketing strategy for poultry producers. Branding is significant in consumers' food choices [14], ensuring differentiation [15,16] and attracting niche markets that pay more for the product's attributes [15]. Through the development of agricultural brands by producers, incomes are enhanced, and the quality of agricultural products is improved [17]. For instance, the olive oil industry in Greece confirmed that branding boosted the industry through enhanced competitiveness, projecting its qualities and making it appealing to long-term consumers [18]. Similarly, a study in Nigeria showed improved income for cassava farmers due to branding [19]. It is worth noting that brands hold the key to the future of many businesses since they have a significant potential to improve businesses' competitiveness and capacity for growth and profitability [20].

Notwithstanding the contribution of branding to firms, studies on branding concepts in Ghana have often focused on other sectors rather than the agricultural sector, particularly the poultry industry, which could be gleaned to improve farmers' competitiveness. For example [21], researched in the telecommunication industry how branding influences consumer behaviour. Likewise [22], studied the effect of branding on customer loyalty in the banking industry. Similarly, a study was conducted on consumer attitudes and corporate branding in the banking sector [23]. Also [24], investigated the effect of branding on hotel customer loyalty. Apart from the fact that these studies were conducted in other sectors, they are customer and consumer-oriented. To the best of the researchers' knowledge, no studies on branding locally produced chicken by farmers have been conducted in Ghana.

Moreover, previous studies on branding focused on different methods of analysis, with none applying the Discrete Choice Experiment (DCE) to brand chicken products. For instance, logit and Tobit regression models were used to analyse the willingness to participate in branding programmes [15,25]. Similarly [26], applied an ordered probit regression model to assess the effect of brand equity on the willingness to pay premium prices for fresh vegetables with private brands, whereas another study employed the structural equation model [26] to brand agricultural products for export. In variance, this study applied a more robust and reliable method [1,6], the Discrete Choice Experiment (DCE), to analyse the willingness to brand chicken. Meanwhile, none of these studies focused on the poultry sector, which is crucial for supplying animal protein to individuals. Furthermore, literature on the branding of chicken is scarce, making this study very vital for a modest contribution. Thus, it is of policy relevance to explore the options available for farmers to brand locally produced chicken.

In light of those mentioned above, this study investigated the determinants of branding locally produced chicken and the amount farmers are willing to invest in branding locally produced chicken in Ghana for the poultry industry in Ghana to remain competitive.

2. Literature review

2.1. Branding of agricultural products

The application of branding strategies to market agricultural products is gradually gaining attention [18,27–29]. There are product branding [18,30], farmer-owned branding [15], place or regional branding [29] and retail branding [28]. Branding leads to product differentiation while ensuring food quality [31] and food safety [30]. Similarly, branding agricultural products ensures the sector's sustainability, leading to food security [32]. Branded agricultural products are sold in high-value markets, attracting premium prices [27]. Similarly, branding fresh vegetables attracted premium prices from consumers, aiding farmers in increasing their incomes [26]. [17] revealed that product branding essentially improves the incomes of farmers and is fundamental to increased market share, has a significant influence on the market, and enhances value addition. Consequently, branding has become necessary in modern agriculture, especially as commercialisation advances in a competitive environment, providing a pathway for targeting niche markets [28]. Considering the increasing consumer demand for branded agricultural produce due to food quality, safety and choices, branding agricultural products has become essential for the various commodities in the sector.

2.2. Theoretical and conceptual framework

2.2.1. Theoretical framework

Many poultry firms face the challenge of remaining in competition due to the influx of large quantities of imported chicken. As a result, farmers have adopted several strategies, such as branding their products, to ensure they reach the consumer whilst remaining in business. Similarly, various theories have been developed to explain the behaviour of farmers towards branding their products as well as their willingness to brand: for instance, the Theory of Planned Behaviour, Reputation Theory and the Theory of Reasoned Action [33–35]. Nevertheless, in the sphere of the Discrete Choice Experiment (DCE), the Lancaster Theory and the Random Utility Theory are the main economic theories applied [6,36].

Consequently, this study is anchored on the Lancaster's Theory. The idea put forth by Ref. [37] states that utility is generated from a package of characteristics other than the product itself. Typically, a good will have multiple features, and many other goods will have these characteristics (or attributes) [37]. Accordingly, a good's worth is established when the value of all of its attributes is put together. The idea of Lancaster's characteristics approach, in other words, maintains that the desirability of consuming a good or service may be divided into the satisfaction derived from the goods or service's attributes [38]. For a better understanding of consumer preferences, this method has been used in various marketing research [7,39,40]. The researchers posit that the choice of broiler producers' preferences and willingness to brand depend on the attributes or characteristics of the branding package available. As a result, the study considered production source, production claim, the form of branded chicken, percentage of farm use, and price of branded chicken as branding attributes presented to farmers. In establishing farmers' choices, a single package comprising a combination of these attributes was presented to respondents to obtain their preferences.

2.2.2. *Conceptual framework*

Following the Lancaster Theory, the researchers conceptualised that broiler farmers can practice branding their produce subject to the branding attributes. However, the researchers argue that demographic characteristics could play a crucial role in farmers' willingness to pay (WTP) and brand their produce in addition to the branding attributes. Therefore, based on expert consultation and literature, the predicted attributes that could influence farmers' WTP include production source, production claim, the form of branded chicken, percentage of farm use, and price of branded chicken [1,2,26,41]. Again, the demographic characteristics considered to influence farmers' WTP for branding were age, household size, educational level, membership of a farmer-based organisation, farming experience and knowledge of branding. A summary of the conceptual framework is presented in Fig. 1. [17] identified educational level as a factor that influences farmers' WTP to brand their produce. In similar studies [15], revealed that age was crucial in predicting farmers' WTP for branding agricultural products. They indicated that an increase in age negatively affected farmers' decision to brand their products. In contrast, farmers' experience and knowledge in branding positively influenced the WTP to brand their products [27]. In this study, educational level, farming experience, knowledge in branding and household size were expected to positively influence WTP for branding locally produced chicken. On the contrary, age was expected to have a negative influence on farmers' WTP for branding locally produced chicken. That is, younger farmers are more likely to embrace innovations such as branding their produce than their older folks; hence, they would pay more for it [15]. Besides demographic factors, studies revealed that production claim (antibiotic or antibiotic-free) and the percentage of farm use (25 %, 50 % and 100 % of the number of birds) are essential predictors of branding among farmers [1,41]. It was thus expected that farmers would prefer to brand their chicken using the antibiotic claim since most farmers are familiar with production using antibiotics. It is worth noting that farmers will commit to branding their produce if the cost involved in branding is low, leading to a relatively high price for chicken [6]. Production source (individual or group) and form of branded chicken (whole dressed or cut parts) were also expected to influence WTP for branding [2,26,35]. A combination of these attributes and demographic factors were expected to influence farmers' WTP for branding and the amount to pay in branding locally produced chicken.

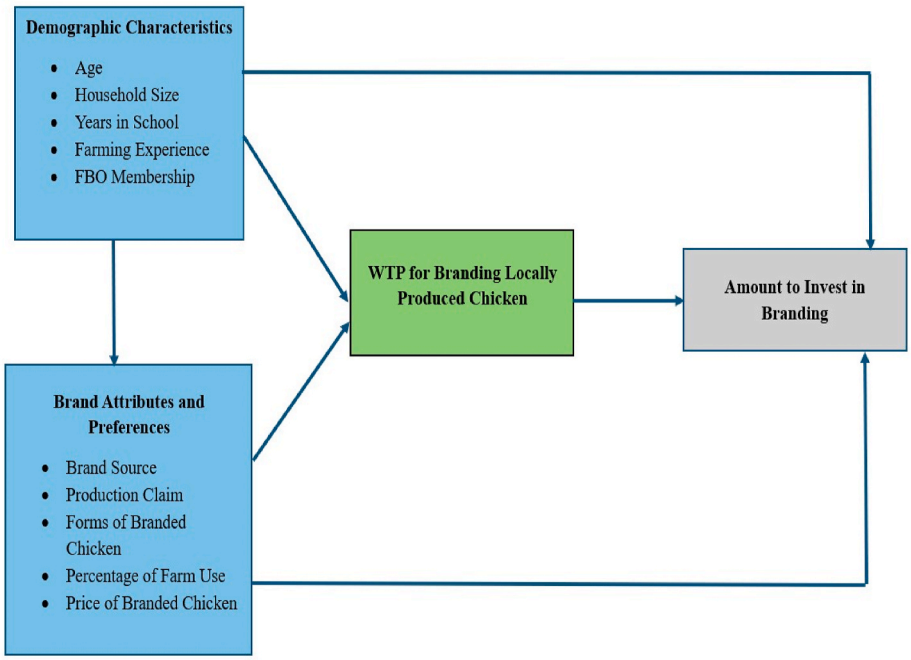


Fig. 1. Conceptual framework of the study.
Source: Author's illustration

3. Methodology

3.1. Study area

The Ashanti and Bono regions of Ghana were chosen as the study areas for this research. The two regions were purposively selected due to their high rates of commercial poultry production, contributing more than fifty per cent (50 %) of Ghana's poultry production [10,42]. From the Bono Region, Dormaa West District, Dormaa East District and Dormaa Municipal were selected. The area is noted to be one of the largest poultry production centres in the country and regionally [3,6] and the most prominent commercial poultry production area in the Region [42]. Further, the area is the highest poultry production centre in the Bono Region of Ghana [2,6]. Also, the study area is noted as one of the best poultry production areas [10,43] and the commercial hub of Ghana's poultry production [6]. In the Ashanti Region, Atwima Nwabiagya South Municipal and Atwima Nwabiagya North District were selected. The study area has the most significant comparative advantage for the poultry industry in the Region [42].

3.2. Sample size and data collection

A multistage sampling technique was adopted to collect primary data from the respondents. Firstly, the Bono and Ashanti regions were purposely selected based on their notable poultry production skills. Secondly, purposive sampling was employed to select five (5) districts with large numbers of poultry farms and broilers; that is, two (2) districts from Atwima Nwabiagya and three (3) districts from the Dormaa area. Thirdly, using the simple random sampling technique to select poultry farmers, a sampling frame was obtained from the Veterinary Service Directorate and the Poultry Farmers' Association in the respective study areas. The number of respondents attained was based on the proportional distribution of poultry farmers across the various communities of the study area. Respondents were interviewed face-to-face using a semi-structured questionnaire with the help of Open Data Kit (ODK) and Kobo Collect applications. The section on the choice experiment was printed in pictures and presented to the respondents.

Using Yamane's (1967) formula for sample size determination, ($S = \frac{M}{1+Me^2}$) where S is the sample size, M represents the population size of 1500 broiler farmers, and e^2 denotes the margin of error at 3.35 %. Primary data was collected from a total of 562 broiler farmers who were interviewed for this study. It is worth noting that a pretest of the data collection instrument was conducted on 15 broiler producers, and corrections were made before the final collection of data. Before the data collection, the questionnaire and the research attained ethical approval from the Research and Grant Committee of the Department of Agribusiness Management and Consumer Studies of the University of Energy and Natural Resources, with ethical clearance certificate number DAMCSTH1-001-2022. Also, after explaining the research to the participants, they were informed to opt-out if they were unwilling to participate in giving out any information regarding this study at any point in time. Participants were also assured of anonymity and of their information being solely used for academic purposes during analysis for the research.

3.3. Data analysis method

3.3.1. Discrete choice experimental (DCE) design

Farmers' preferences for broiler production attributes and the stated preferences for the average willingness to pay (WTP) for broiler production were investigated using the discrete choice experiment (DCE). This technique was employed due to its popularity in analysing food attributes' values [1,6], especially in settings where market data are unreliable or not in existence [1,6], for instance, in the situation of broiler production in Ghana. Likewise, this method can simultaneously value the multiple attributes of a product (non-existing or existing) and have similarities to real-life decisions on purchasing any product [6]. The attributes with their respective levels were identified through pre-survey and literature. However, they were prioritised and validated through expert opinions. Also, the market price of branded chicken was used during the data collection period. There is an extensive application of the DCE in the areas of agriculture, marketing, health and environmental economics literature [44–47].

3.3.2. Selection of attributes

The choice experiment has been used by many authors in empirical research. For example [48], used the choice experiment approach in the Northern European Union (EU) to analyse farmers' willingness to pay for agricultural insurance for crop production. Similarly [49], estimated product differentiation by processing and marketing cooperatives in the United States of America using a choice experiment. Also, the relationship between food safety labels and brands among Chinese consumers for fresh foods was analysed using the DCE [50]. Further, the choice experiment was adopted by Ref. [41] to understand the payment of environmental services (PES) among farmers in Costa Rica. In Ghana, the DCE was applied to examine farmers' preferences and willingness to pay (WTP) for climate-smart cowpea varieties [45]. Again [51], examined heterogeneity among farmers for soybean quality in northern Ghana. Likewise [1], employed the DCE to analyse consumers' preferences for locally produced chicken in Ghana. Similarly, this method was employed to investigate poultry farmers' risk management and agricultural insurance choices in Ghana [6]. Again, this method was applied to a study on farmers' willingness to participate in cocoa pension schemes [44].

In a choice experiment, market and production settings are simulated by investigators and given to respondents in a hypothetical scenario. Following this, respondents were presented with a choice set and asked to make multiple decisions out of the respective alternatives. Typically, three or two alternatives make a single scenario characterised by various attributes taking on respective levels. Further, respondents make a choice out of the alternatives by indicating what they deem their preferred alternatives.

In this study, the set of attributes was given to broiler farmers for the experimental design. The attributes presented to farmers include brand source, production claim, the form of branded chicken, price, and percentage of farm use, which are the most critical characteristics among poultry farmers for branding locally produced chicken. These attributes are a reflection of the general preferences among broiler producers. In a choice set, fewer attributes are required for a farmer to make a real choice, eliminating the possibility of a farmer to overlook one or more of the experiment's critical attributes. This situation is known as attribute non-attendance (ANA) [6,45,52]. The various attributes and corresponding levels presented to broiler farmers are summarised in Table 1. The attributes for the choice set were also selected based on the Lancaster Theory as well. Therefore, in accordance with the theory, the bundle of attributes in a specific branding set would determine farmers' preferences.

Brand source: this signifies the source of production brands farmers prefer. Some farmers prefer to produce brands under their own businesses (company name), while others prefer to produce brands as a group [26,35].

*Production claim***:** poultry farmers often use antibiotics to manage bacterial diseases in performing their management and production practices. However, a growing section of consumers prefers antibiotic-free chicken [1]. Therefore, farmers were asked if they would produce their chicken without antibiotics to meet the demand of these health-conscious consumers and get a substantial income after sales. This attribute had two levels—that is, production with antibiotics or antibiotic-free production—for farmers' preferences.

Form of branded chicken: in Ghana, the sale of chicken is typically live bird and processed chicken on a few occasions, and the latter is sold as wholly dressed or cut parts. The focus of this study is for farmers to process chicken so that consumers can buy them in forms just like imported chicken. The cut parts could be in thighs/drumsticks, breasts, wings, backs and gizzard [1,2].

Percentage of farm use: this represents the number of birds farmers were willing to allocate to their branding activities. More often than not, farmers trying new ideas and innovations are likely to start with few birds and adjust when they are used to the market or trend of sales. Therefore, there were three levels (25 %, 50 % and 100 %) presented to farmers to make a choice [41].

Price of branded chicken: the market price of locally produced branded chicken during the data collection period was applied in determining the levels for this attribute. The attribute price was specified at three levels: GHS20, GHS50 and GHS80. The low and high levels were determined by adding and deducting GHS30 from the existing market price, respectively [45]. The price attribute is crucial given that Ghanaians are price-sensitive [7]; hence, farmers would choose branding at a lower cost since that would help them gain market and enhance local competition with imported chicken. Notwithstanding [6], emphasised that price is an essential attribute for households that sell most of their products and have market accessibility.

3.3.3. Design of choice sets

In establishing the optimal experimental design using SAS, the OPTEX procedure was adopted, considering the attributes and their corresponding levels, as presented. The probable combinations for broiler production attributes as well as their respective levels were 72 ($2^3 \times 3^2$). Thus, two broiler production attributes varied across three levels, while the other three attributes deferred across two levels. Consequently, a design of D-optimal having a search algorithm, which is a modified Federiv and a comprehensive factorial design, was used to constitute the candidature set. Overall, two blocks were produced, with each block constituting eight choice sets, generating 16 choice sets (row). Each respondent in a choice set was randomly presented with one block representing the eight independent choice sets for a choice to be made. Again, every block was classified into three choice set scenarios to include the opt-out (none of these) option. The option "opt-out" in the choice set prevents it from being conditional, but it allows for estimating actual demand models rather than conditional ones [1,6,53]. One of the choice scenarios is presented in Fig. 2, having illustrations to make room for the various levels of literacy among the broiler producers.

3.3.4. Econometric Model for DCE

To understand respondents' choice of goods, Lancaster's Theory of Value [37] underpinned the theoretical framework for modelling preference-elicitation investigations [51]. In estimating marginal values for characteristics of particular services or goods comprising non-market services and goods, the researcher can use choice modelling based on Lancaster Theory [6,45]. According to

Table 1
Attributes and levels for choice experiment.

Brand Attributes	Levels			Preference/Description	Reference
	1	2	3		
Brand source	Individual	Group		The source of producing branded local chicken. Individual brands are preferred to group brands.	Masuda and Kushiro (2017); Sellers-Rubio et al. (2017)
Production claim	No antibiotics	Antibiotics		Refers to claims of whether antibiotics were used or not to raise the chicken. The use of antibiotics is mainly preferred.	Asante-Addo and Weible (2020)
Form of branded chicken	Wholly dressed	Cut parts		The form in which branded chicken is sold. Farmers usually prefer whole-dressed chicken.	Osei Mensah et al. (2022)
Percentage of farm use	25 %	50 %	100 %	Indicates the percentage of total chicken produced used for branding. Usually, a low percentage is preferred.	Allen and Colson (2019)
Price of branded chicken (GH'/1.9 kg)	20	50	80	The amount of money earned by the farmer from the sale of 1.9 kg of branded chicken. GH'50/1.9 kg is the expected market price of locally produced branded chicken.	Bannor et al. (2023)

US$1 = GH'7.52 (Bank of Ghana, 2021).

Please check (✓) the option (A, B or C) that you are most likely to choose

Attributes	Option A	Option B	Option C
Brand Source	 Group	 Individual	Do not like neither option A nor option B (Opt-out)
Production Claim	 Antibiotics	 No antibiotics	
Form of branded chicken	 Cut parts	 Wholly dressed	
Percentage of farm use	 25%	 50%	
Price of branded chicken (GH¢ / 1.9 kg)	 GH¢ 20	 GH¢ 50	
I will choose…	☐	☐	☐

Fig. 2. A sample of scenarios of choice sets presented to farmers.

the framework of Lancaster Theory, a person makes decisions on the various options available depending on the attributes that go along with each option and not just the choice per se. The utility that an individual derives has been put into two categories, namely, random (unexplainable) and systemic (deterministic) components. The systemic components provide the attributes for the alternatives of the choice set as well as the features of the individuals making the decision, whereas the random component represents all unidentified or uncertain factors that influence choices [1,6,53].

In this study, farmers' behaviour was modelled in the setting of utility maximisation, where the expected benefit from branding locally produced chicken is maximised by selecting a combination of broiler production qualities within a set of potential alternatives subject to budget constraints. Following [51], let us assume that the utility a farmer *w* expects to attain while selecting a branding

attributes' alternative d is specified as:

$$EU_{wd} = V(G_d, M_{wd}) + \varepsilon_{wd,} \quad (1)$$

where G_d is a vector of attributes for branding connected to alternative d (brand source, production claim, form of branded chicken, percentage of farm use, and price); M_d is a variable interacting between branding-specific factors (production and demographic factors) as well as choice parameters; and $\varepsilon_{wd,}$ represents the error term which is unobserved by the investigator.

Also, the marginal rate of substitution (MRS) of one another is derived from any two of such marginal utilities' ratios. Suppose price is the coefficient of the *Yth* attribute, say β_Y (marginal disutility of price), then the WTP for a particular characteristic (referred to as the marginal rate of substitution) is stated as:

$$WTP = -\frac{\beta_y}{\beta_Y}, \mathrm{y} \in [1, Y-1] \quad (2)$$

where β_y is the parameter projected for the *yth* attribute. In line with the claim of [6,51], the marginal utility of income and the marginal disutility of cost have an inverse relationship, hence the negative sign, which guarantees that the desirable (undesirable) attributes have marginal utility as positive (negative).

Table 2
Personal and production characteristics of broiler producers in Ghana.

Variable	Description	Test Statistics	Aggregate Data
Sex	Male	14.31***	85.77
	Female		14.23
Age	Mean	82.51***	42.33
	Standard deviation		11.98
	Minimum		18
	Maximum		72
Residential status	Indigene/native	26.23***	61.57
	Settler/permanent		36.12
	Migrant/temporary		2.31
Years of schooling	Mean	63.43***	10.28
	Standard deviation		3.54
	Minimum		0.00
	Maximum		18.00
Household size	Mean	49.11***	6.14
	Standard deviation		2.77
	Minimum		1.00
	Maximum		15.00
Number of poultry farms	Mean	21.08***	1.23
	Standard deviation		0.65
	Minimum		1.00
	Maximum		7.00
Number of broilers	Mean	8.80***	2067.39
	Standard deviation		5558.74
	Minimum		80.00
	Maximum		80000.00
Land ownership for poultry farm[a]	Inherited	16.99***	7.65
	Purchased		64.41
	Rented		30.96
	Others		0.18
Years in poultry production	Mean	28.20***	11.44
	Standard deviation		9.19
	Minimum		1.00
	Maximum		50.00
Off-farm job	Yes	7.85***	25.98
	No		74.02
Poultry extension services	Yes	13.70***	81.11
	No		18.89
Source of poultry extension services[a]	Private/input dealers	11.27***	26.37
	Government/veterinary		87.25
	NGO		13.41
	Experienced farmer		9.67
Distance from poultry farm to sale centre (kilometres)	Mean	11.51***	108.86
	Standard deviation		53.34
	Minimum		0.00
	Maximum		650.00

Note: denotes statistical significance at 1 %.
[a] do not add up to 100 % due to multiple responses.
Source: Field data, 2022.

For each of the production attributes, a normal distribution is defined because of its flexibility and ability to permit both positive and negative coefficients for a particular attribute. Also, deciding on the direction (signs) for every production attribute in this regard is difficult. This study, therefore, applied the coefficient on price parameterisation [51] attained by defining the coefficient on the inverse of price as having a zero variance with a log-normal distribution. Nevertheless, there is a normal variation for all corresponding coefficients to the constant and any of the other attributes. Applying the simulations of the maximum likelihood of having 1000 Halton draws, the RPL model was estimated. Following [45], for each attribute's WTP, the confidence interval was estimated using the Delta Method.

Equation (3) indicates the adjusted average marginal willingness to pay, accounting for a correction for the possible variations among the respondents surveyed not being a representation of the demographic factors of the study area generally [51]. Consequently, the MWTP was computed as:

$$MWTP = -\left(\frac{\beta_{ATT}}{\beta_{COST}}\right) \tag{3}$$

where *ATT* refers to attribute.

In this study, farmers' preferences for broiler production attributes were modelled using the models referred to as the Random Parameter Logit (RPL) as well as Conditional Logit (CL). However, given that the CL model is dependent on the assumptions of Independence of Irrelevance Alternatives (IIA), the RPL is the preferred choice [54]. This study hypothesised that broiler producers were not homogenous but rather heterogeneous; hence, their preferences for attributes of broiler production might have also not been homogenous.

The model included the different attributes with their respective levels and the opt-out option known as the ASC in the final specification. The function for utility is devised and empirically specified as indicated below:

$$EU_{bc} = \beta_1 BrandSource + \beta_2 ProdClaim + \beta_3 MeatForm + \beta_4 Farmuse + \beta_5 Price + \varepsilon_{bc} \tag{4}$$

where BrandSource, ProdClaim, Price, MeatForm and Farmuse represent the levels of attributes as depicted in Table 1. The CL and RPL models' parameter estimates offer information used to compute the WTP.

4. Results and discussion

4.1. Demographic and production characteristics

The result for respondents' production and demographic characteristics is presented in Table 2. The test statistics indicate that sex, age, residential status, years of schooling, household size, number of poultry farms, number of broilers, off-farm jobs, poultry extension services, and source of poultry extension services were significant at 1 %, suggesting differences in the personal and household characteristics of the respondents.

From the table, 85.8 % of the respondents were males, and 14.2 % were females. These results for gender distribution suggest that males are dominant in poultry production, which corroborates the results of other studies [2,13,43]. This finding implies that poultry production is time-consuming and capital-intensive; however, due to societal, economic and cultural reasons, males have more of such resources than females. Similar findings were revealed in a study on contract farming among broiler producers by Ref. [3]. Nevertheless, in other farming activities or trading of eggs, many females support them [55].

The residential status of the respondents revealed that 61.6 % of the poultry farmers were indigenes or natives, while 36.1 % and 2.3 % of the respondents were settlers/permanent residents and migrants/temporary residents, respectively. Meanwhile, the mean for respondents' years of education was 10.8 years; therefore, most poultry farmers had formal education. The high years of education of broiler farmers imply that most of them can read and write. Hence, they can access information on marketing strategies that improve business growth and income levels. The possible implication is that educated farmers generally accept new ideas and innovations; hence, they are likely to brand their locally produced chicken to boost sales and competitiveness in the poultry industry [56]. The standard deviation for years of education for poultry farmers was 3.5. Regarding household size, the mean was 6.14, and the standard deviation was 2.77 for the aggregated data.

The ages of respondents ranged from 18 to 72 years old, whereas the mean age was 42.33 years. The finding is suggestive that poultry farmers are within the middle age group and are, thus, economically active [57] and should be given the needed support to make the poultry business lucrative enough to enhance competitiveness. [13] found similar results in a study on the impact of broiler contract farming in Ghana. Likewise [9], reported similar results in a study on processed poultry meat preferences in Ghana.

Further, Table 2 provides the results for production characteristics. Broiler farmers who owned land through inheritance were 7.6 %, broiler farmers who had poultry farms on lands they purchased were 64.4 %, and about 31 % of broiler farmers had their farms on rented lands. Those who had farms on other lands, such as idle land, also represented 0.2 %. Some respondents with more than one farm had different land ownership systems. For instance, a farmer could operate on purchased land and on inherited land for poultry production at different locations. The study area has vast lands for poultry farming expansion and its related activities [43]; therefore, farmers who have the capacity to expand their businesses could take advantage of this opportunity. As expected, most farmers (74 %) were not involved in off-farm jobs. However, about 26 % of the respondents were engaged in off-farm jobs, including driving, teaching, trading, carpentry, masonry and plumbing. The involvement in off-farm jobs provides additional earnings to support the livelihood of poultry farmers in performing their responsibilities.

About 81.1 % of the poultry farmers had access to extension services, whereas 18.9 % did not have access to extension services on poultry. The results corroborate with previous studies by Refs. [3,13], which revealed (in their study on contract farming among broiler producers in Ghana) that most broiler farmers had access to extension services. Expectedly, the primary source of poultry extension services was government or veterinary services, representing 87.3 %. This was followed by private or input dealers (26.4 %), non-governmental organisations (NGOs) such as GIZ's SME-Loop (13.4 %), and experienced farmers (9.7 %). Further, 66.3 % of the poultry producers belonged to a poultry farmer association, while 33.7 % did not have any poultry farmer association membership. [43] opined that poultry farmers who belong to an association attained higher sales than their non-member counterparts; therefore, they should be encouraged to join an association since the benefits are enormous. This is because these associations or farmer-based organisations (FBOs) offer training to their members and are thus introduced to innovative ways of marketing their produce to attain higher returns and become competitive.

Regarding the number of poultry farms owned by respondents, the mean was 1.23. The number of broilers averaged 2067.4 birds, suggesting that broiler producers generally fall within the medium-scale classification of poultry production, that is, >500 to ≤5000 birds [6]. Again, the respondents' mean years of experience in poultry farming was 11.4. On average, the distance from poultry farms to sale centres was 108.9 km. Broiler producers transport their birds to other regions within the country at long distances, provided the buyers pay higher prices. This finding corroborates the results of [3], who opined in their study that poultry farmers sell their birds in various regions of the country.

4.2. Brand attribute preferences for broiler producers

Table 3 presents the results for the preferences of brand attributes by the broiler producers, which were estimated using random parameter logit (RPL) and conditional logit (CL) models. The simulations of the RPL model were estimated from the Halton 1000 draws, generating stable results. The findings for CL as well as RPL illustrate signs that are consistent but the mean values differ. The presence of standard deviations in the RPL models agrees with the preference for the heterogeneity hypothesis, signifying differences in the choices of broiler farmers. The inability to account for heterogeneity among the preferences of poultry farmers could result in invalid inferences on the preference of branding attributes among farmers. The CL values are provided in the table as Model 1, whereas the estimates for RPL are shown as Model 2, Model 3, Model 4 and Model 5. Specifically, the RPL estimates that were without non-random parameters are shown in Model 2 and Model 3.

In Model 2, the results are estimates that do not account for correlation among the attributes, while Model 3's estimates show that there exists a correlation among the attributes. Similarly, in Models 4 and 5, the estimates of the RPL model were with non-random parameters. Nonetheless, the results do not consider the correlation between the branding attributes as presented in Model 4. On the

Table 3
Brand attribute preferences for respondents.

Variables	Conditional Logit (CL)	Random Parameter Logit (RPL)			
	Model 1	Model 2	Model 3	Model 4	Model 5
ASC (opt-out)	−0.992*** (0.081)	−0.396*** (0.133)	−0.590*** (0.202)	0.632 (0.859)	0.339 (0.857)
Brand source (Individual)	0.784*** (0.047)	0.966*** (0.057)	0.982*** (0.067)	0.976*** (0.059)	0.996*** (0.067)
Production claim (Antibiotics)	0.759*** (0.049)	0.980*** (0.079)	1.012*** (0.096)	0.992*** (0.081)	1.046*** (0.098)
Form of branded chicken (Wholly dressed)	0.101** (0.050)	0.159*** (0.061)	0.195*** (0.075)	0.160*** (0.061)	0.189** (0.074)
Percentage of farm use (25 %)	0.332*** (0.058)	0.418*** (0.080)	0.391*** (0.094)	0.419*** (0.079)	0.376*** (0.092)
Price (GH' 50/1.9 kg)	0.488*** (0.027)	−0.698*** (0.073)	−0.796*** (0.097)	−0.685*** (0.070)	−0.728*** (0.180)
Non-random parameters					
Age (Years)				−0.011 (0.013)	−0.011 (0.013)
Household size (Number)				0.083** (0.042)	0.100** (0.043)
Years in school (Years)				−0.040 (0.025)	−0.023 (0.027)
Experience (Years)				−0.005 (0.017)	−0.005 (0.018)
FBO (1 = Yes, 0 = Otherwise)				0.813*** (0.247)	0.779*** (0.252)
Knowledge in branding (1 = Yes, 0 = Otherwise)				−0.760*** (0.264)	−0.589** (0.266)
Standard deviation					
ASC		0.468*** (0.122)	3.306*** (0.237)	0.460*** (0.119)	3.037*** (0.232)
Price		2.099*** (0.170)	0.753*** (0.090)	1.992*** (0.164)	0.603*** (0.092)
Brand source		0.235 (0.193)	0.347*** (0.128)	0.347** (0.139)	0.324*** (0.093)
Production claim		1.166*** (0.089)	1.456*** (0.284)	1.168*** (0.091)	1.442*** (0.143)
Form of branded chicken		0.000 (0.687)	0.233 (0.206)	0.058 (0.483)	0.159 (0.337)
Percentage of farm use		0.042 (0.612)	0.209 (0.274)	0.020 (0.767)	0.147 (0.370)
Number of choice observations	4496	4496	4496	4496	4496
AIC	8372.5	7759.6	7674.5	7738.3	7655.8
Log likelihood	−4180.24	−3867.79	−3810.23	−3848.17	−3791.88

***, ** and × indicate significant levels @1 %, 5 % and 10 %, respectively. ASC is the Alternate Specific Constant.
Source: Field data, 2022.

other hand, Model 5 provides results that consider a correlation among the attributes under discussion. The results for CL and RPL illustrate that the coefficients possess signs that are consistent for all the attributes in the corresponding models and are statistically significant. This suggests that the selected attributes applied in this study were appropriate for the choice experiment. However, there were variations in the mean values of the CL and RPL models such that the estimates for the means of the CL model were lower than those of the RPL models [44]. This result is an indication of the probable effects of underestimation identified in Model 1 [45]. Further, the standard deviation results for the RPL models were significant, supporting the hypothesis of variation that preference heterogeneity was present among the preferences of broiler farmers for brand attributes in the study area. In contrast, invalid assumptions could occur under circumstances where there is a failure to account for preference heterogeneity among the brand attributes of broiler farmers.

Further, comparing the RPL models, Akaike Information Criterion (AIC) estimates and the log-likelihood estimates indicate that Model 5 had relatively lower values, hence the best fit for the data. As a result, the discussion in this section focuses on Model 5. The attributes considered by broiler producers in branding locally produced chicken include the brand source (individual versus group), production claim (no antibiotics versus antibiotics), the form of branded chicken (whole chicken versus cut parts), percentage of farm use (25 % versus 50 % versus 100 %), and price (GHS20 versus GHS50 versus GHS80). Hence, in accordance with the Lancaster Theory, the attributes' combination in a specific branding set would influence farmers' preferences.

From the findings, all the other attributes were normally distributed, while price had a log-normal distribution. The attribute price is negative and statistically significant, implying that the likelihood of farmers branding locally produced chicken will decrease if the cost of branding chicken increases. This result is consistent with other studies [27,33,35] that indicated that price is a significant element for branding. The coefficient for brand source was estimated to be positive and significant at 1 %. [35] argued that firms belonging to a group brand, while also involved in an individual brand, might attain higher price premiums compared to a firm with only an individual brand. This suggests that a firm belonging to both brand sources is likely to attain the optimal benefits the two sources provide concurrently. Nevertheless, their study revealed that an individual brand might achieve the highest premium price when it invests in a high advertisement while creating a solid brand image appealing to the consumer. Therefore, broiler producers who prefer individual branding should develop strong product brands such as producing antibiotic-free local chicken and processing chicken into whole-dressed or cut parts, which serve the convenience needs of the consumer. By so doing, an impressive brand image is created in the minds of consumers to continue purchasing the same brand, which can lead to brand loyalty.

The production claim attribute was significant at 1 % and positive. Poultry farmers usually use antibiotics to control bacterial infection, which has been the usual practice. Farmers could be trained on other methods of controlling bacterial diseases (that affect the birds), which are more natural and safer for the consumer. Consumers have become health-conscious and prefer to pay premium prices for chicken which is antibiotic-free [1,39]. As such, farmers can switch to producing chicken using probiotics or other natural means [58–60] to meet consumer needs since this will attract premium prices.

Regarding the attribute 'branded chicken form', it was positively significant at 1 %. When chicken is processed into convenient forms for the consumer, higher prices are commanded; hence, the consumer is willing to pay more. Imported chicken is sold as wholly dressed or cut parts (like wings, breasts, thighs, and drumsticks, among others), which saves a lot of time for the busy consumer. Therefore, these added values make imported frozen chicken advantageous over locally produced chicken (usually sold as live birds) [7,11]. The preference for locally produced chicken processed as wholly dressed or cut parts by the consumer is high, and they are willing to pay premium prices for them [11]. In light of this, poultry farmers should take advantage of this available niche market to produce locally branded chicken which is sold wholly dressed or in cut parts to meet the needs of consumers willing to pay premium prices.

Again, the percentage of farm use results was positive and significant, implying that farmers are willing to use some portion (number of birds) of the farm for branding their chicken. The results align with a study by Ref. [41], who asserted that farmers selected the option of using a lesser portion of their land for environmental services payments. The reason could be that farmers, when trying new things, might not want to risk their entire business but would instead want to start small and expand with time if their expectations are met.

The non-random parameters applied to the RPL model included age, household size, years in school, experience in poultry farming, membership in a farmer-based organisation and knowledge of branding. However, household size, farmer-based organisation membership and knowledge of branding were significant socioeconomic variables. Household size was positive and significant, implying that larger households were willing to brand locally produced chicken. Membership of farmers in a farmer-based organisation was also positively significant. The findings suggest that farmers belonging to FBO were willing to brand their locally produced chicken. One reason for this finding is that FBOs organise training sessions for farmers and introduce them to new and innovative marketing methods [3,13], including branding locally produced chicken for a niche market. Unexpectedly, knowledge of branding showed negative but significant results. One plausible reason is that broiler producers with knowledge of branding might not have the resources to participate fully in branding activities since most broiler producers operate under small-scale production. This finding is consistent with the assertion that firms with more resources are better positioned to implement competitive marketing activities such as branding [61].

4.3. Willingness to pay (WTP) estimates for branding

The willingness to pay (WTP) estimates among broiler farmers for this study are represented in Table 4. About 42 % of the respondents studied were willing to pay from less than GHS1 to GHS2.5, 48 % were willing to pay between GHS2.51 and GHS4.50, while about 10 % of farmers were willing to pay between GHS4.51 and GHS6.5 to brand 1.9 kg chicken. Averagely, from the aggregated data,

farmers were willing to pay GHS4.47 to brand 1.9 kg of chicken. The results suggest that poultry farmers are willing to commit at least GHS4.47 (US$0.59) of their resources to brand their products. Similar results were found in a study by Ref. [15]. Essentially, the study supports the Lancaster Theory of decision-making that, even though broiler producers may be willing to brand locally produced chicken, their willingness to brand is not based on the chicken per se but other attributes associated with the branding. Therefore, brand source, production claim, the form of branded chicken, percentage of farm use, and price influenced farmers' choices.

5. Conclusion

The preference attributes such as brand source, production claim, the form of branded chicken, percentage of farm use, and price were essential attributes influencing farmers' branding choices. Given that, there was heterogeneity among farmers' preferences, as depicted in the random parameter logit model results, farmers have different preferences for branding their produce. Thus, farmers look at the various resources available at their disposal to make a choice. Among the five models estimated, Model 1 provided conditional logit results, which is restrictive and does not show heterogeneity, hence focusing on random parameter logit models. Also, for the random parameter models, Model 5 was the best-fit model due to the relatively lower estimates for the Akaike Information Criterion (AIC) and log-likelihood values. The non-random parameters significant under Model 5 included household size, membership in a farmer-based organisation and knowledge of branding. On average, farmers were willing to brand every 1.9 kg of chicken at an amount of GHS4.47 (US$ 0.59), considering other branding attributes. In summary, findings from this study have given insights into the preferences and choices of farmers in relation to branding locally produced chicken, adding to the sparse literature on the application of DCE in the broiler sector.

CRediT authorship contribution statement

Helena Oppong-Kyeremeh: Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Richard Kwasi Bannor:** Validation, Supervision, Software, Methodology, Formal analysis, Conceptualization. **James Osei Mensah:** Validation, Supervision.

Recommendations for policy, practice and future research

In relation to policy, the Government of Ghana should introduce sustainable brands such as green labels in the poultry sector to encourage antibiotic-free production and processing of chicken in whole-dressed and cut parts. Similarly, extension agents of the Ministry of Food and Agriculture, who engage farmers, need to enhance their services by introducing marketing strategies such as branding locally produced chicken to them. This will guide farmers in making informed decisions on developing individual or group brands to market their chicken after production.

Regarding the implications for practice, broiler producers should come together to produce regional brands with unique attributes, such as production under antibiotics-free, whole-dressed processed chicken and chicken processed into cut parts. This will give them more significant returns, expand their market base, and make them more competitive. Similarly, non-governmental organisations (NGOs) and other stakeholders in the poultry industry should train and support farmers to produce their own brands of poultry products. Having their own brands can aid farmers to expand their market share and remain in business once consumers' ready-to-pay premium prices are properly targeted.

Further, the study reaffirms the significance of the Lancaster Theory in considering the willingness of broiler producers to brand locally produced chicken. Thus, the theory revealed the significance of product attributes on farmers' willingness to brand locally produced chicken. However, hypothetical attributes (possible hypothetical biases challenges) were employed for the DCE; therefore, future studies should consider the experimental auction approach to validate the estimates of WTP provided by this study. The results from the experimental auction method could be more revealing since it is a non-hypothetical approach to choice experiments. Again, future studies on DCE could explore other models, such as Latent Class Modelling, to further explain farmers' preferences and heterogeneity regarding willingness to pay for branding attributes since it will help validate the findings of this study.

Data availability

Data will be made available on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.heliyon.2024.e40208.

Table 4
Willingness to pay (WTP) estimates to brand 1.9 kg chicken.

Amount willing to pay (GH')	Ashanti Region		Bono Region		Aggregated	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
≤1–2.50	90	42.06	147	42.24	237	42.17
2.51–4.50	104	48.60	165	47.41	269	47.86
4.51–6.50	20	9.35	36	10.34	56	9.96
Average willingness to pay (GH')	4.30		4.59		4.47	

Source: Field data, 2022.

References

[1] C. Asante-Addo, D. Weible, Is there hope for domestically produced poultry meat? A choice experiment of consumers in Ghana, Agribusiness 36 (2) (2020) 281–298, https://doi.org/10.1002/agr.21626.
[2] E. Mensah, R.K. Bannor, H. Oppong-Kyeremeh, S.K.C. Kyire, An assessment of postharvest losses to support innovation in the egg value chain in Ghana, AJSTID 14 (4) (2022) 947–959. https://hdl.handle.net/10520/ejc-aa_ajstid_v14_i4_a947.
[3] H. Oppong-Kyeremeh, R.K. Bannor, E.D. Yeboah, Contract farming as marketing strategy to improve the poultry agribusiness in Ghana, IJVCM 13 (4) (2022) 360–382, https://doi.org/10.1504/IJVCM.2022.127824.
[4] OECD-FAO (Organization for Economic Cooperation and Development and the Food and Agri-culture Organization of the United Nations), OECD agriculture statistics (database): OECD-FAO agricultural outlook (edition 2017). Paris: OECD Publishing. https://doi.org/10.1787/d9e81f72-en.
[5] Poultry World, Millions invested to revive Ghana's poultry sector. https://www.poultryworld.net/poultry/millions-invested-to-revive-ghanas-poultry-sector/, 2020.
[6] R.K. Bannor, H. Oppong-Kyeremeh, B. Amfo, J.K. Kuwornu, S.K.C. Kyire, J. Amponsah, Agricultural insurance and risk management among poultry farmers in Ghana: an application of discrete choice experiment, J. Agric. Res. 11 (2023) 100492, https://doi.org/10.1016/j.jafr.2022.100492.
[7] R.K. Bannor, S. Abele, J.K. Kuwornu, H. Oppong-Kyeremeh, E.D. Yeboah, Consumer segmentation and preference for indigenous chicken products, JADEE 12 (1) (2022) 75–93, https://doi.org/10.1108/JADEE-08-2020-0162.
[8] USDA, United States Department of Agriculture, Ghana poultry report annual, Global Agricultural Information Network Reports (2017) 8006. https://fas.usda.gov/data/ghana-2017-ghana-poultry-report-annual.
[9] R. Takyi-Mensah, R.K. Bannor, Determinants of demand of locally processed poultry meat in Greater Accra region of Ghana, IJRM 2 (2) (2015) 36–45, in: https://www.academia.edu/11157595/Determinants_oF_Demand_oF_Locally_Processed_Poultry_Meat_in_Greater_Accra_Region_of_Ghana.
[10] Food and Agriculture Organization FAO. Poultry sector Ghana, FAO Animal Production and Health Livestock Country Reviews, vol. 6, 2014, pp. 1–69. http://www.fao.org/3/a-i3663e.pdf.
[11] J. Osei Mensah, S. Etuah, E.F. Musah, F. Botchwey F., A.L. Oppong, K. Owusu, Consumers' preferences and willingness to pay for domestic chicken cut parts in Ghana: evidence from the Kumasi metropolis, JADEE 12 (1) (2022) 126–141, https://doi.org/10.1108/JADEE-05-2020-0105.
[12] E.A. Woolverton, S. Frimpong, Consumer demand for domestic and imported broiler meat in urban Ghana: bringing nonprice effects into the equation, BJMS 1 (3) (2013) 16–31.
[13] R.K. Bannor, Y. Gyekye, Unpacking the nexus between broiler contract farming and its impact in Ghana, Eur. J. Dev. Res. 34 (2022) 2759–2786, https://doi.org/10.1057/s41287-021-00489-8.
[14] C. Grebitus, J. Dumortier, Effects of values and personality on demand for organic produce, Agribusiness 32 (2) (2016) 189–202, https://doi.org/10.1002/agr.21445.
[15] D. Tselempis, P. Karipidis, D. Tzimas, I. Karypidou, Factors that impact farmers' engagement in local food brand development, EuroMed J. Bus. 15 (1) (2019) 86–101, https://doi.org/10.1108/EMJB-06-2019-0079.
[16] C. Bravo, A. Rubio, A. Spiller, The homemade food market: an empirical analysis of potential factors determining consumer behaviour, JADEE 4 (1) (2014) 32–58, https://doi.org/10.1108/JADEE-03-2013-0013.
[17] H. Tang, X. Liu, M. Li, Research on the influencing factors of Chinese agricultural brand competitiveness based on DEMATEL-ISM, Sci. Rep. 14 (1) (2024) 11363, https://doi.org/10.1038/s41598-024-62068-1.
[18] S. Baziana, E. Tzimitra-Kalogianni, Branding influence on consumer behaviour regarding olive oil, Outlook Agric. 48 (2) (2019) 152–156, https://doi.org/10.1177/0030727019841.
[19] E.N. Ikporah, Branding Strategy for Effective Agricultural Marketing in Nigeria, Unpubished Masters Thesis Submitted to the Department of Marketing, University of Nigeria, 2012.
[20] A. Engku, Understanding and Promoting Small and Medium Enterprises' Business Growth within the Food and Beverages Sector in Terengganu: Malaysia. An Unpublished Doctoral Thesis, Lancaster University, United Kingdom, 2022. https://www.proquest.com/openview/d3e516003413d0fb38a9c013189cbd3c/1?pq-origsite=gscholar&cbl=2026366&diss=y.
[21] E.B. Kyei, Assessing the Effect of Branding on Consumer Behaviour in Telecommunications in Ghana, Kwame Nkrumah University of Science and Technology, Ghana, 2016. Unpubished Masters Thesis submitted to, https://ir.knust.edu.gh/items/f88608f3-f811-43c0-bed2-cb845c5cb561.
[22] K. Aning. Branding and Customer Loyalty in the Ghanaian Banking Industry: The Mediating Role of Brand Image, 2015. Unpublished Masters Thesis Submitted to the University of Ghana, Legon, Accra, http://ugspace.ug.edu.gh/handle/123456789/22580.
[23] M.N. Amoako, Corporate Branding and Consumer Attitude: the Mediating Role of Brand Positioning, Unpublished Masters Thesis submitted to the University of Ghana, Legon, Accra, 2017.
[24] I. Tah, A. Darko, Investigating the effectiveness of branding on customer loyalty in some selected hotels in Accra, Ghana, Glob. J. Educ. Stud. 4 (2) (2018) 38, https://doi.org/10.5296/gjes.v4i2.13576.
[25] E. McLeod, K. Jensen, A. Griffith, K. Delong, Tennessee beef producers' willingness to participate in a state-branded beef program, JAAE 50 (4) (2018) 579–601, https://doi.org/10.1017/aae.2018.16.
[26] K. Masuda, S. Kushiro, Influence of brand equity on the price premium for private labels in fresh produce: a contingent valuation survey, Agribusiness 34 (2) (2018) 338–350, https://doi.org/10.1002/agr.21498.
[27] P. Rutsaert, J. Donovan, M. Murphy, V. Hoffmann, Farmer decision making for hybrid maise seed purchases: effects of brand loyalty, price discounts and product information, Agric. Syst. 218 (2024) 104002, https://doi.org/10.1016/j.agsy.2024.104002.
[28] E. Wang, Z. Liu, Z. Gao, Q. Wen, X. Geng, Consumer preferences for agricultural product brands in an E-commerce environment, Agribusiness 38 (2) (2022) 312, https://doi.org/10.1002/agr.21732.
[29] P. Chuenban, P. Sornsaruht, P. Pimdee, How brand attitude, brand quality, and brand value affect Thai canned tuna consumer brand loyalty, Heliyon 7 (2) (2021) e06301, https://doi.org/10.1016/j.heliyon.2021.e06301.
[30] O. Shikhova, M. Selina, O. Barinova, Experience in branding producers-processors of agricultural products to ensure food security in the region, in: BIO Web of Conferences, EDP Sciences, 2020 00031, https://doi.org/10.1051/bioconf/20202700031, 27 (2020.
[31] H. Treiblmaier, M. Garaus, Using blockchain to signal quality in the food supply chain: the impact on consumer purchase intentions and the moderating effect of brand familiarity, IJIM 68 (2023) 102514, https://doi.org/10.1016/j.ijinfomgt.2022.102514.

[32] Y. Xin, Y. Xu, Y. Zheng, Y. A, Study on green agricultural production decision-making by agricultural cooperatives under government subsidies, Sustainability 16 (3) (2024) 1219, https://doi.org/10.3390/su16031219.
[33] M.U. Majeed, S. Aslam, S.A. Murtaza, S. Attila, E. Molnár, Green marketing approaches and their impact on green purchase intentions: mediating role of green brand image and consumer beliefs towards the environment, Sustainability 14 (18) (2022) 11703, https://doi.org/10.3390/su141811703.
[34] Y.H. Shin, S.E. Jung, J. Im, K. Severt, K. Applying, An extended theory of planned behavior to examine state-branded food product purchase behavior: the moderating effect of gender, JFBR 23 (4) (2020) 358–375, https://doi.org/10.1080/15378020.2020.1770043.
[35] R. Sellers-Rubio, F. Mas-Ruiz, F. Sancho-Esper, Firm reputation, advertising investment, and price premium: the role of collective brand membership in high-quality wines', Agribusiness 34 (2) (2017) 351–362, https://doi.org/10.1002/agr.21526.
[36] I. Khan, H. Lei, I. Muhammad, M. Zhao, Do residential localities matter? Revisiting preference heterogeneity and ranking of ecological attributes of an inland river basin, Sci. Total Environ. 763 (2021) 142970, https://doi.org/10.1016/j.scitotenv.2020.142970.
[37] K. Lancaster, A new approach to consumer theory, J. Pol. Econ. 74 (2) (1966) 132–157. https://www.journals.uchicago.edu/doi/abs/10.1086/259131.
[38] S. Narrei, M. Ataee-pour, Estimations of utility function and values of sustainable mining via the choice experiment method, J. Clean. Prod. 267 (2020) 121938, https://doi.org/10.1016/j.jclepro.2020.121938, 2020.
[39] C. Ragasa, K. Andam, S. Amewu, S. Asante, Consumer Demand and Willingness to Pay for Safe Food in Accra, Ghana: Implications for Public and Private Sectors' Roles in Food Safety Management, IFPRI, 2019. https://cgspace.cgiar.org/server/api/core/bitstreams/5f5de0b9-cad9-4539-aaae-3f77b48c7653/content.
[40] Y. Adegbola, N. Ahoyo, S. Adekambi, R. Zossou, E. Sonehekpon, F. Assogba, E. Djossa, E. Consumer, Preferences for fresh tomatoes in Benin using a conjoint analysis, JIFAM 31 (1) (2019) 1–21, https://doi.org/10.1080/08974438.2018.1469448.
[41] K. Allen, G. Colson, Understanding PES from the ground up: a combined choice experiment and interview approach to understanding PES in Costa Rica, Sustain. Sci. 14 (2) (2019) 391–404, https://doi.org/10.1007/s11625-018-00653-w.
[42] Ministry of Food and Agriculture, Veterinary services directorate (VSD) in 2011. http://mofa.gov.gh/site/?page_id=10049, 2022.
[43] T. Sarpong, Factors Influencing the Performance of Small and Medium Scale Enterprises (SMEs) A Case Study of Dormaa Poultry Farmers, University of Ghana, Legon, Ghana, 2017. Unpublished Master's Thesis submitted to Department of Economics.
[44] K.B. Richard, O.K. Helena, A. Bismark, A, J.K.M. John, M. Edward K.C.K. Samuel, O. Daniel, N. Lydia, Willingness to participate in a cocoa pension scheme in Ghana: an application of discrete choice experiment, COGENT Bus. Manag. 9 (1) (2022) 2132611, https://doi.org/10.1080/23311975.2022.2132611.
[45] E. Martey, P. Etwire, D. Adogoba, T. Tengey, Farmers' preferences for climate-smart cowpea varieties: implications for crop breeding programmes, Clim. Dev. 14 (2) (2022) 105–120, https://doi.org/10.1080/17565529.2021.1889949.
[46] T. Holmes, W. Adamowicz, F. Carlsson, Choice experiments, in: P. Champ, K. Boyle, T. Brown (Eds.), A Primer on Non-market Valuation, Econ. Non-Mkt Goods Res., 2017, pp. 133–185, https://doi.org/10.1007/978-94-007-7104-8_5.
[47] D. Hensher, Hypothetical bias, choice experiments and willingness to pay, Trans. Res. B Methodol. 44 (6) (2010) 735–752, https://doi.org/10.1016/j.trb.2009.12.012.
[48] P. Liesivaara, S. Myyrä, Willingness to pay for agricultural crop insurance in the northern EU, AFR. 74 (4) (2014) 539–554, https://doi.org/10.1108/AFR-06-2014-0018.
[49] J. Grashuis, A. Magnier, Product differentiation by marketing and processing cooperatives: a choice experiment with cheese and cereal products, Agribusiness 34 (4) (2018) 813–830, https://doi.org/10.1002/agr.21551.
[50] S. Yin, W. Hu, Y. Chen, F. Han, Y. Wang, M. Chen, Chinese consumer preferences for fresh produce: interaction between food safety labels and brands, Agribusiness 35 (1) (2019) 53–68, https://doi.org/10.1002/agr.21585.
[51] E. Martey, N. Gatti, P. Goldsmith, Assessing the performance of regional soybean prices in Ghana, IFAMR 23 (2) (2020) 267–281, https://doi.org/10.22434/IFAMR2019.0138.
[52] D. Hensher, W. Greene, Non-attendance and dual processing of Common Metric attributes in choice analysis: a latent class specification, Empir. Econ. 39 (2) (2010) 413–426, https://doi.org/10.1007/s00181-009-0310-x.
[53] J. Louviere, T. Flynn, R. Carson, Discrete choice experiments are not conjoint analysis, JOCM 3 (3) (2010) 57–72, https://doi.org/10.1016/S1755-5345(13)70014-9.
[54] A. Benson, R. Kumar, A. Tomkins, A. On the relevance of irrelevant alternatives, in: Proceedings of the 25th International Conference on World Wide Web, International World Wide Web Conferences Steering Committee, 2016, pp. 963–973, https://doi.org/10.1145/2872427.2883025.
[55] A. Mensah-Bonsu, N. Lartey, J. Kuwornu, Gender-segregated analysis of the poultry value chain in Ghana, Gend, Technol. Dev 23 (2) (2019) 130–164, https://doi.org/10.1080/09718524.2019.1661611.
[56] A. Mutanyagwa, A. Isinika, A. Kaliba, The factors influencing farmers' choice of improved maise seed varieties in Tanzania, Int. J. Sci. Res. 6 (4) (2018) 55–63, https://doi.org/10.18535/ijsrm/v6i4.ah01.
[57] Ghana Statistical Service, GSS, Ghana Living Standards Survey Round 6 (GLSS 6): Poverty Profile in Ghana (2005-2013), GSS, 2014. https://www2.statsghana.gov.gh/docfiles/glss6/GLSS6_Poverty%20Profile%20in%20Ghana.pdf.
[58] Y. Mehdi, M. Létourneau-Montminy, M. Gaucher, Y. Chorfi, G. Suresh, T. Rouissi, S. Godbout, Use of antibiotics in broiler production: global impacts and alternatives, Anim. Nutri. 4 (2) (2018) 170–178, https://doi.org/10.1016/j.aninu.2018.03.002.
[59] T. Popova, Effect of probiotics in poultry for improving meat quality, Curr. Opin. Food Sci. 14 (2017) 72–77, https://doi.org/10.1016/j.cofs.2017.01.008.
[60] S. Latha, G. Vinothini, D. Calvin, D. Dhanasekaran, D. In vitro probiotic profile-based selection of indigenous actinobacterial probiont Streptomyces sp. JD9 for enhanced broiler production, J. Biosci. Bioeng. 121 (1) (2016) 124–131, https://doi.org/10.1016/j.jbiosc.2015.04.019.
[61] R. Odoom, P, Mensah, Brand orientation and brand performance in SMEs: the moderating effects of social media and innovation capabilities, Manag Res Review 42 (1) (2018) 155–171, https://doi.org/10.1108/MRR-12-2017-0441.