

Research Application Summary

Consumer preferences and willingness to pay for edible mushrooms: An evidence from a choice experiment study in Ghana

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Abstract

In many developing countries including Ghana, governments are promoting the production of mushrooms as agribusiness enterprise. However, less is known about consumer preferences and willingness to pay for alternative mushroom attributes. This study therefore examined consumer preferences for mushrooms in Ghana. Using a choice experiment data on consumer preferences for mushrooms, our findings indicate that consumers prefer mushrooms that are locally produced and affordable. Further, consumers prefer the straw mushroom as opposed to shiitake mushroom or oyster mushroom. It is therefore recommended that the Government of Ghana introduces strategies for improving production of mushrooms so that they become affordable to consumers. Also, awareness creation should be conducted to promote the nutritional benefits of mushrooms among consumers.

Key words: Consumer preference, Ghana, Shiitake mushroom, straw mushroom

Résumé

Dans de nombreux pays en développement, dont le Ghana, les gouvernements encouragent la production de champignons en tant qu'entreprise agroalimentaire. Cependant, on sait peu de choses sur les préférences des consommateurs et leur disposition à payer pour les attributs alternatifs des champignons. Cette étude a donc examiné les préférences des consommateurs pour les champignons au Ghana. En utilisant les données d'une expérience de choix sur les préférences des consommateurs pour les champignons, nos résultats indiquent que les consommateurs préfèrent les champignons qui sont produits localement et pas chers. En outre, les consommateurs préfèrent le champignon de Paris au champignon shiitake ou pleurote. Il est donc recommandé que le gouvernement ghanéen mette en place des stratégies pour améliorer la production de champignons afin qu'ils deviennent abordables pour les consommateurs. En outre, une campagne de sensibilisation devrait être menée pour promouvoir les avantages nutritionnels des champignons auprès des consommateurs.

Mots clés : Préférence des consommateurs, Ghana, champignon Shiitake, champignon de Paris.

Introduction

Recently, mushrooms have become an integral component of continental dishes because of their taste, flavour, medicinal and nutritional value, and these have promoted their cultivation. Mushroom production has therefore become common commercial agribusiness enterprises in many developed and developing countries (Kortei *et al.*, 2018). In 2016, the United States was the third largest producer of mushrooms in the world behind China and Italy (Chakrabarti *et al.*, 2019). In Ghana, mushrooms are being promoted as a viable agribusiness enterprise for the unemployed youth and to serve as an alternative source of livelihood for farmers.

Despite the promotion of mushrooms as a viable agribusiness venture, not much research has been conducted in the area of consumer acceptance of the produce and their corresponding willingness to pay. However, consumer preference and perceptions of mushrooms are important to develop appropriate methods to promote their production based on locality. Some documented studies to date that have examined consumer preference for mushrooms include those of Mahantesh *et al.* (2014) and Chakrabarti *et al.* (2019). Mahantesh *et al.* (2014) examined mushroom consumption and purchasing behaviour among selected respondents in India and found that there was less consumption of mushrooms than expected. The study further identified factors such as colour, shape and size of the mushrooms as critical to their consumption among the respondents. Chakrabarti *et al.* (2019) investigated consumer preference and willingness to pay for mushrooms in Connecticut in the United States and found that there were different segments of consumers with preferences for different mushroom attributes. In Ghana, there is no known study on consumer preferences for mushrooms. In this study, a choice experiment approach was used to elicit consumer preferences and willingness to pay for mushrooms in Ghana. The choice experiment approach was adopted because it enables one to examine commodities with multiple attributes. We used a mixed logit model, an advanced discrete choice experiment method that has the flexibility of accounting for heterogeneity among consumers (Hole and Kolstad, 2012). Using a choice experiment data from sampled consumers in Cape Coast metropolis we used econometric modelling to examine consumer preferences for different types of mushrooms in Ghana.

Study description

Choice experiment design. Identification of attributes and their levels represent the starting point of choice experiment studies. Thorough literature search and experts' interviews, we identified the following attributes: mushroom variety, mushroom form, label, location and price per kg. The mushroom variety attribute was of three types-straw, shiitake and oyster. There were also four other levels of mushroom form attribute-fresh, frozen, dried and canned. The label and the location attributes were of two levels: wild and cultivated for the label attribute, and local and imported for the location attribute. The price attribute had three levels-15 GHS, 30GHS and 50GHS corresponding to straw, shiitake and oyster prices.

After identifying the attributes and their corresponding levels, an efficient choice experiment design was generated in STATA 14 with priors obtained from a pilot study conducted in the University of Cape Coast. Efficient design is more suitable because it is cost effective and increases sampling (Bliemer and Rose, 2010). The final design had 30 paired choice sets that were randomly grouped into 10 scenarios. Each choice set was composed of two alternatives (A and B), and a third alternative, that represented none of the options.

The target population included consumers in the Central region of Ghana. Respondents were selected using a multistage sampling technique. In the first stage, Cape Coast metropolis, was purposively selected. This was followed by the selection of the communities within the metropolis-Duakro,

Amamoma and Ayensu. The overall sample for the study comprised 100 respondents, with 30 each from Duakro and Ayensu, and 34 from Amamoma. The data collection was conducted in September 2019. The survey comprised information on the socio-economic characteristics of the respondents, and the choice experiment. Each respondent was asked to choose his/her preferred mushroom alternative in 10 choice situations.

Econometric framework. The discrete choice experiment technique was based on Lancaster's characteristic theory of value, which states that an individual obtains utility from the characteristics of the good rather than the good itself. Its econometric basis is enshrined in the random utility theory. The attributes of alternative j in choice occasion t faced by consumer n could be labelled as vector X . The utility obtained by consumer n from alternative j in choice occasion t is specified as

$$U_{njt} = \beta_n X_{njt} + \varepsilon_{njt} \quad (1)$$

where the coefficients of β_n is unobserved and varies in the population with a density function $f(\beta_n/\theta)$ while θ are parameters to be estimated. ε_{njt} is an unobserved random term that is identically and independently distributed. The unconditional probability of the sequence of choices made by an individual is expressed as:

$$P_{njt}(\theta) = \int L_{nj}(\beta_n) f(\beta_n/\theta) \quad (2)$$

The mixed logit specified in Eq. (2) accounts for only unconditional heterogeneity but not conditional heterogeneity (explain the sources of heterogeneity). To account for conditional heterogeneity, model expansion is required to incorporate socio-economic characteristics of respondents. This process enables the model to pick up both random and conditional heterogeneity and further improves the model fit (Birol *et al.* 2006).

Maximum likelihood (ML) is often employed in accounting for preference heterogeneity. The ML works on the principle of searching for a solution by simulating n draws from distributions with given means and standard deviations (Birol *et al.*, 2006). Joint simulated distribution integration is used to obtain probabilities. The standard approach to simulation estimation is based on random draws. However, with large samples and complex models, this can be very time consuming. The Halton draw, therefore, serves as an alternative to the random draws with the advantage of speed gains and no degradation in simulation performance (Revelt and Train 1998).

Estimating willingness to pay. The consistency of choice experiment with consumer theory makes it suitable in estimating welfare effects such as the willingness to pay. Willingness to pay (WTP) is a measure of the trade-off between non-price attributes and a price attribute. In the choice experiment literature, two approaches have been proposed in estimating WTP: the indirect ratio method and the direct method (Owusu *et al.*, 2016). The indirect approach, also called preference space model, has received lots of criticisms in the literature because of the biases it introduces into the WTP values (Hole and Kolstad, 2012). Hensher *et al.* (2006) therefore advances that individual level parameters of the preference space model be used to compute the willingness to pay values. In this study, the individual level parameters were simulated in Stata using 10 000 draws, followed by the calculation of the willingness to pay values as the ratio of non-monetary attributes to monetary attribute (price).

Table 1. Uncorrelated and correlated mixlogit estimates

	Model I-MIXL uncorrelated		Model 2-MIXL correlated	
	Mean	SE	Mean	SE
Taste parameters				
Shiitake mushroom variety	-0.281	0.152	-0.316	0.253
Oyster mushroom variety	-0.103	0.143	-0.390*	0.253
Frozen mushroom	0.143	0.176	0.073	0.264
Dried mushroom	0.049	0.167	0.293	0.263
Canned mushroom	0.026	0.187	0.038	0.302
Mushroom label	0.147	0.101	0.048	0.174
Location	-0.848***	0.182	-0.947***	0.245
Price	-0.029***	0.006	-0.038***	0.114
Status quo	-4.518***	1.105	-6.097***	1.238
Heterogeneity in mean				
Shiitake mushroom variety	0.575**	0.238	1.369***	0.321
Oyster mushroom variety	0.415*	0.241	1.180***	0.263
Frozen mushroom	0.265	0.473	1.409***	0.335
Dried mushroom	0.160	0.303	0.904***	0.288
Canned mushroom	-0.160	0.288	0.350	0.329
Mushroom label	-0.207	0.222	0.766***	0.222
Location	1.174***	0.192	1.797***	0.308
Price	0.035***	0.006	0.061***	0.011
Status quo	8.001***	1.467	11.640***	2.948
LL	-678.19		-651.33	
BIC	1735		1500	
N	3000		3000	

N= LL-Log likelihood, BIC-Bayesian information criteria, N-Number of observations

Table 2 Willingness to pay estimates

	MIX uncorrelated			MIXL correlated		
	Mean	Min	Max	Mean	Min	Max
Shiitake mushroom variety	19.37	-463.07	632.42	-0.79	-686.14	280.67
Oyster mushroom variety	11.85	-101.93	620.59	-5.34*	-678.98	62.03
Frozen mushroom	-11.70	-310.16	258.27	11.50	-472.62	205.95
Dried mushroom	-3.82	-48.32	8.29	-23.99	-307.44	134.89
Canned mushroom	-1.64	-33.67	47.06	-4.46	-101.46	50.51
Mushroom label	-10.52***	-282.27	251.07	3.81***	-138.12	135.24
Location	63.30	-241.74	646.13	77.26***	-330.94	843.09

Results

The estimated results show that the location attribute has negative and significant coefficient indicating that consumers prefer mushrooms that have been cultivated locally. This finding is very important for the local mushroom industry and shows that there is ready and available market for the mushroom

industry in Ghana. Also, the results show that sampled respondents prefer cheap mushrooms as is revealed by the negative and significant price coefficient. In addition to these factors, the oyster mushroom variety is negative but significant in Model 2, suggesting that consumers prefer straw mushrooms to oyster mushrooms. This could be arising from the fact that most consumers have ever tasted the straw mushrooms, and therefore find it more palatable.

The significance of most of the standard deviations (heterogeneity in the mean) show that unobserved heterogeneity exist in the preferences of consumers for mushrooms. Further analysis revealed that educated consumers preferred imported mushrooms to locally produced mushrooms. Also, the aged had more preference for the locally produced mushrooms as opposed to the younger consumers. The selection of mushroom for wider adoption needs to consider these differing preferences.

The willingness to pay values are represented in Table 2. The consumers value cultivated mushrooms more than wild mushrooms. Also, consumers hold high utility for the location attribute, indicating that they were willing to pay 63.30 Cedis for a locally cultivated mushroom per kg as opposed to imported mushrooms. Hence, we observe both positive and negative utility attached to the attribute.

Conclusion

This study investigated consumers preferences and willingness to pay for mushrooms in Ghana. Using the mixed logit modelling technique, we found that consumers preferred locally produced mushrooms that were cheap compared to locally produced mushrooms that were expensive. This finding suggests that there is ready market for locally cultivated mushrooms in Ghana. It is therefore recommended that the Government of Ghana invests in cost effective cultivation techniques for the mushroom industry in Ghana. It is also recommended that the value chain for the mushroom industry be developed to ensure that mushrooms are readily available to consumers. Also, there should be awareness creation on the various types of mushrooms available on the Ghanaian market and their nutritional value.

Acknowledgement

This paper is a contribution to the Fifteenth RUFORUM Annual General Meeting held 2-6 December 2019 in Cape Coast, Ghana.

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