

**FACTORS UNDERLYING CONSUMERS' CHOICES OF DRY COMMON
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ABSTRACT

Beans are widely grown, consumed and are major source of protein especially among low income households in Africa. The overall consumption is low but underlying reasons are not well established, leading to limited ability of chain actors to respond to consumers' requirements. This study was conducted in Dar es Salaam City, Tanzania to assess factors influencing consumers' choices of beans using data collected under Legume Innovation Lab Project SO2.2 in 2015 from a random sample of 600 households in a choice experiment setting. The experiment involved four beans attributes (grain colour, grain size, cooking time and gravy quality). Colour had four levels that were identified as *soya supa*, *soya kawaida*, mottled red and yellow while size had three levels (small, medium and large). Cooking time had two levels, slow cooking beans that require more than 120 minutes to cook and fast cooking beans, which require less than 90 minutes to cook. Gravy quality had two levels, poor (watery) and good (thick). Factorial design was used in the experiment where attributes were treated as factors to generate 48 choice tasks. The tasks were then blocked into six choice sets, each comprising eight hypothetical choice alternatives. Respondents were presented with each of the choice alternatives and asked to state whether they would choose it or not independent of the others, resulting into a binary dependent choice variable. Finally, the respondents were presented with all the choices made and given a fixed amount of money to spend over those choices. Cragg's double hurdle model was used to measure consumers' choices of beans and expenditure on the selected bean varieties. Results revealed that choices of beans were significantly influenced by gravy quality, cooking time, grain size as well as household size, income status of consumers, age and education of the main decision maker. Expenditure on the selected bean varieties were significantly influenced by gravy quality, cooking time, grain size, income status of consumers, education and sex of the main decision maker. Efforts to promote production and consumption of beans should focus on improving gravy quality, reducing cooking time and increasing grain size. Future research endeavours should attempt to explore further the overall effect of the three attributes and other identified factors on selection of wide range of beans varieties and expenditure on the same. This could be achieved by conducting more choice experiments using other popular beans.

Key words: Common beans, Tanzania, consumers' choices, expenditure, Cragg's double hurdle model



INTRODUCTION

Beans are widely consumed and cultivated in Tanzania [1] because more than 50% of farmers grow legumes [2]. Bean production is mainly undertaken by smallholder farmers especially women who consume part of what they produce and sell the surplus [3]. It is an important cash crop because it generates income earlier than major staples owing to its short production cycle. Beans can generate more income if consumers' preferences are well known and met. Poor knowledge of these factors undermines the potential of beans to boost farmers' earnings. Moreover, leguminous crops can improve soil fertility through nitrogen fixation, which makes it cheaper to produce among resource-poor farmers. Studies reveal that consumption of dry beans is associated with several nutritional and health benefits [4, 5]. The significant and varied roles of bean make it a strategic crop for addressing development goals of reducing poverty, improving health and nutrition, and promoting soil fertility in Tanzania.

However, the consumption is reported to have remained stagnant between 1980 and 2009 despite the increase in population, reasons for which are not well-established. Per capita consumption of pulses was 6.8 gm/day in 2007 which is far below the minimum recommended rate of 30 gm/day [6, 7]. It has been established that 10% of women in Tanzania have low body mass indices (BMIs) and 50% of infants are stunted [8]. Beans would be the best food for these groups because they are a cheaper source of vital nutrients. There is limited information on factors influencing beans consumption and preferences because most of the studies done so far were focused on addressing specific production and marketing problems [9, 10, 11]. This study was conducted to assess factors influencing consumers' choices of beans so as to provide chain actors and other stakeholders with facts for devising policies and strategies to promote beans production, consumption and utilization in Tanzania.

In general, beans are an important component of diet among Tanzanians. The diet is based mainly on cereals (maize and sorghum), starchy roots (cassava) and pulses (mainly beans). Beans and other pulses account for 12% of calorie intake [12]. Over 75% of rural households depend on beans for daily subsistence. Beans that are produced are highly diversified in terms of genetic and nutritional value [13] and are particularly important for poor people who cannot afford animal-based source of protein. There are many forms in which beans are consumed: dry beans can be boiled alone or mixed with cereal grains, especially maize, rice, banana and cassava; similarly green beans can also be shelled, cooked and consumed alone or mixed with cereals; tender leaves and immature pods are other forms in which beans are consumed.

LITERATURE REVIEW

Consumer Behaviour Theory

Researchers have developed keen interest in knowing how consumers make their consumption decisions since the last three centuries, but their approach has been purely based on economic perspective and focused on the consumer act of purchase. These early scholars came up with what is commonly known as 'utility theory' which suggests that consumers are rational and make choices based on the expected outcomes [14].



According to the theory, consumers make choices that will maximize utility subject to resource constraints. Other researchers developed further this theory as they established that consumers derive satisfaction from not only the goods but also attributes of such goods [15].

Theory reveals that consumer behaviour is influenced by diverse and interactive factors including intrinsic and extrinsic product characteristics as well as cultural, socio-economic, personal, psychological, biological and situational factors [16]. Consumer behaviour is largely influenced by socio-economic and demographic characteristics including sex, age, education level and nutritional knowledge of the main decision maker [17]. Other factors like household size and income, price of the commodity and its attributes have also been identified to influence consumption decisions [18, 19]. Furthermore, food availability, culture, religious beliefs and spatial differences in lifestyles are also reported to influence consumer behaviour [20].

Different studies have been conducted to study behaviour of beans' consumers. A study in Canada [21] reported age, education level, marital status and race of the decision maker as significant factors. A study conducted in Kenya [22] identified grain colour, cooking time, taste, grain size and availability of beans as significant factors underlying consumers' preferences. Similarly, a study in Zambia [23] reveals grain size and colour to influence consumers' preferences.

Although many factors have been identified to influence beans consumption and preferences elsewhere, it is uncertain whether the same factors influence preferences for beans in Tanzania in the same way. The few studies conducted in Tanzania have focused mainly on grain attributes and effects of these attributes on consumers' willingness to pay. In these studies, household and individual demographic characteristics reported to influence choices elsewhere were not assessed. This study hinges on a consumers' perspective and household-level data to assess the relative importance of various factors identified to influence consumers' choices of beans. The findings of the study are useful to inform stakeholders' decisions especially among breeders, farmers, traders, nutritionists, policy makers and agencies supporting bean development.

Modelling food choices

Previous studies used different approaches to estimate individuals' preferences for food attributes. Some used methods that measure consumers' acceptance and willingness to pay for products such as the hedonic pricing, which is based on revealed preference [24]. These models assume that the price of a good is a function of its attributes and attempt to estimate the contribution of each attribute to the final price of that product. However, the approach is criticised because it regards consumers as price setters while in reality they are price takers.

Other researchers adopted choice modelling to study consumer choices [25], which is rooted in random utility theory that attempts to understand consumers' preferences over the product attributes rather than the product itself. The approach corresponds well with the actual behaviour of consumers. Such a choice could be modelled using a probit or logit model. The standard logit model relies on strong assumptions of homogeneity of

consumers' tastes and independence from irrelevant alternatives [26]. Alternatively, mixed logit model that allows for taste variation, substitution between attributes and accommodates repeated choices may be specified because it is not restricted to normal distributions [27]. However, the use of mixed logit is appropriate when consumers' choices are informed by all alternative choices and choice attributes. However, the present study adopted the Cragg's double hurdle model that was more appropriate because decision makers were not exposed to alternatives and there were many zero observations in the dependent variable. Ignoring these values would lead to biased results [28].

METHODOLOGY

Source of Data

Secondary data were analysed to meet the study objectives. Primary data were collected by Legume Innovation Lab project SO2.2 at Sokoine University of Agriculture in 2015 from 600 households in 100 enumeration areas (EAs) in Dar es Salaam, Tanzania that were randomly selected in consultation with the National Bureau of Statistics (NBS). According to the source, Dar es Salaam City was selected to represent Tanzania nation due to its heterogeneity of consumers in terms of social, ethnic and economic backgrounds. Another reason to justify the choice of this region is that it is the largest consumer market that accounts for about 26% of beans consumed in the country.

The EAs were stratified into high, middle and low income residences while 100 EAs were randomly selected from the three strata. Finally, six households were randomly selected from each EA resulting in a sample of 600 households.

Design of the Choice Experiment

The choice experiment involved four beans attributes (grain colour, grain size, cooking time and gravy quality). Colour had four levels that were identified as *soya supa*, *soya kawaida*, mottled red and yellow, while size had three levels (small, medium and large). Cooking time had two levels, slow cooking beans that require more than 120 minutes to cook and fast cooking beans, which require less than 90 minutes to cook. Gravy quality had two levels, poor (watery) and good (thick). *Soya supa*, *soya kawaida*, mottled red and yellow were the most widely sold and consumed beans not only in Dar es Salaam City but also in other regions of Tanzania. It was crucial to identify attributes that can make the beans more appealing to consumers so as to promote marketability, consumption and boost farmers' earnings.

Factorial design was used in the experiment where attributes were treated as factors to generate 48 choice tasks. The tasks were then blocked into six choice sets, each comprising eight hypothetical choice alternatives. Respondents were presented with each of the choice alternatives and asked to state whether they would choose it or not, independent of the others, resulting in a binary dependent choice variable. Finally, the respondents were presented with all the choices made and given a fixed amount of money to spend over those choices.



Modelling factors influencing consumers’ choices of beans

Cragg’s double hurdle model was used to identify factors influencing consumers’ choices of- and expenditure on selected varieties of beans. Each of the two decisions are represented by a different latent variable [29]. Four separate models were estimated, one for each variety. Since price of beans and income of respondents were controlled during the experiment, respondents’ expenditures on the alternatives completely reflected their preferences.

The first hurdle (equation 1) represents households’ decision to select the variety, while the second hurdle (equation 3) represents households’ expenditure on the variety given that it was selected.

$$D_i^* = Z_i'\alpha + \varepsilon_i \text{ Selection equation (1)}$$

$$D_i = \begin{cases} 1 & \text{if } D^* > 0 \\ 0 & \text{Otherwise} \end{cases} \dots \dots \dots (2)$$

$$Y_i^* = X_i'\beta + U_i \text{ Expenditure equation (3)}$$

$$Y_i = \begin{cases} 1 & \text{if } Y^* > 0 \text{ and } D_i > 0 \\ 0 & \text{Otherwise} \end{cases} \dots \dots \dots (4)$$

Where D^* is a latent variable describing the household’s choice of beans, D_i is the observable discrete variable, Y_i^* is a latent variable describing optimal household expenditure on beans, Y_i is the observed household expenditure, Z_i is a vector of variables underlying the selection process, X_i is a vector of variables underlying the expenditure decision, ε_i and U_i are the respective error terms assumed to be independent and normally distributed, which is mathematically written as $\varepsilon_i \sim N(0,1)$ and $U_i \sim N(0, \sigma^2)$. The model is based on the assumption of normality of the error term, but upon estimation it was transformed to accommodate non-normal error term and the likelihood function of the transformed double hurdle model is given as;

$$L = \prod_{Y_i=0} [1 - \Phi(Z_i'\alpha)] \prod_{Y_i>0} \Phi(Z_i'\alpha) \left[\Phi\left(\frac{X_i'\beta}{\sigma_i}\right) \right]^{-1} \frac{1}{\sigma_i} \phi\left[\frac{T(Y_i)-X_i'\beta}{\sigma_i}\right] \dots \dots \dots (5)$$

Estimation was done through maximum likelihood method in STATA software. For the generalized double hurdle model, the probability of observing positive expenditure is;

$$P(Y_i>0) = \Phi(Z_i'\alpha) \dots \dots \dots (6)$$

The condition mean of Y_i which measures the average expenditure given that the probability of selection is greater than zero is;

$$E(Y_i/Y_i>0) = \left[\Phi\left(\frac{X_i'\beta}{\sigma_i}\right) \right] \int_0^\infty Y_i \frac{1}{\sigma_i} \phi\left[\frac{T(Y_i)-X_i'\beta}{\sigma_i}\right] dY_i \dots \dots \dots (7)$$



The unconditional mean of Y_i which measures the overall average expenditure in the population is given as;

$$E(Y_i) = E(Y_i/Y_i > 0)P(Y_i > 0) \dots \dots \dots (8)$$

The probability of selecting each of the four varieties stated in equation 6 along with the conditional mean expenditure and unconditional (overall) mean expenditure stated in equations 7 and 8, respectively were automatically computed by STATA software through specific post estimation commands.

Marginal effects were obtained by partial differentiation of equations (6) to (8) with respect to each of the significant explanatory variables. Variables included in the model are described in Table 1.

RESULTS AND DISCUSSION

The results showed that about 40% of respondents were below 30 years, 46% were 30-50 years and 14% were above 50 years. Many respondents had primary education (58%) and about 40% came from low, 46% came from medium and 14% came from high income residence areas.

Selection of- and expenditure on mottled red beans

In general, the overall fit was good. Mottled red beans had the highest predicted probability of being selected than other bean varieties (Table 3). Predicted mean expenditures indicated that these were the most preferred beans followed by *soya supa* and *soya kawaida*, while yellow beans were the least preferred. Respondents were more willing to spend on mottled red beans than other varieties (Table 3). Grain size and gravy quality had significant influence on both the probability of the mottled red variety being selected and corresponding expenditure. Cooking time influenced significantly the probability of selection but had insignificant influence on expenditure, while education and income status of consumers had significant influence on expenditure only (Table 4). Marginal effects revealed that gravy quality had the highest effect on the probability of mottled red beans being selected whereby mottled red beans with good quality were more likely to be selected relative to those with poor gravy quality. Also, fast cooking beans had a higher probability of being selected relative to slow cooking ones. However, consumers preferred grains with large size relative to those with small size. Grain size was found to have strongest influence on expenditure on mottled red beans among those who selected it followed by income status of consumers (Table 4). Consumers who selected this variety had lower mean expenditure on beans with large grain size relative to beans with small size. Good gravy quality and secondary education of the main decision maker affected positively both the mean expenditure among those who selected mottled red beans and overall mean expenditure. Similarly, respondents from medium and high income residences spent more on mottled red beans relative to those from low income residence areas. The analysis has established that the conditional and overall mean expenditure on mottled red beans were the highest. The actual market price was also observed to be highest, implying difficulties for consumers from low income households to afford buying these beans.



Selection of- and expenditure on *soya kawaida*

Findings from the estimated model revealed that the probability of *soya kawaida* being selected was significantly influenced by grain size, cooking time and gravy quality while expenditure on this variety was significantly influenced by gravy quality, education and sex of the main decision maker (Table 5). Marginal effects showed that gravy quality had the highest effect on the probability of *soya kawaida* being selected. The probability of selecting *soya kawaida* with good gravy quality was predicted to be higher than the probability of selecting beans with poor gravy. Fast cooking increased the probability of being selected relative to slow cooking. Consumers showed higher preference for large grain size beans than small sized ones. Furthermore, education of the main decision maker strongly affected expenditure among those who selected *soya kawaida* although the outcome was also affected by gravy quality and sex of the main decision maker. It was estimated that respondents with technical/vocational training spent less on this type of beans compared to those with at most primary education. Conversely, good gravy quality was predicted to increase mean expenditure by 2079.44 Tsh and male respondents spent 1148.68 Tsh higher on this variety than female. Moreover, gravy quality had the strongest positive effect on overall mean expenditure while education maintained a negative effect.

Selection of- and expenditure on *soya supa*

Results indicated that the probability of *soya supa* being chosen was significantly influenced by cooking time, gravy quality and income status of the consumers (Table 6). Its choice was less sensitive to the size of grains though it influenced its expenditure. Results indicated that expenditure on these beans was significantly influenced by grain size, cooking time and income status of the residence area. The marginal effects revealed that the probability of *soya supa* being selected was highly affected by quality of gravy. It was estimated that beans with good gravy quality had higher probability of being chosen than those with poor gravy. Likewise, fast cooking beans had higher chances of being chosen than slow cooking ones. However, medium income residence status reduced the probability of the variety being chosen. Conditional mean expenditure on *soya supa* variety was strongly affected by size of the grains followed by income status of the residence area, while the overall expenditure was mainly influenced by cooking time. Respondents who selected the variety spent more on beans with large than small grains. The overall expenditure on fast cooking beans was higher than that on slow cooking beans. High income residence status increased mean expenditure among those who selected the variety while it reduced the overall mean expenditure.

Selection of- and expenditure on yellow beans

Grain size, gravy quality and education level of the main decision maker influenced significantly both the probability of selection and expenditure when yellow beans were selected (Table 7). Household size and age of the main decision maker had significant influence on the probability of selection only. Marginal effects showed that gravy quality had the highest effect on selection probability followed by grain size. Yellow beans with good gravy had higher probability of being selected than those with poor gravy. Likewise, beans with medium grain size had higher probability of being selected than those with small grains while household size and middle age had positive but relatively



smaller effect (< 0.1) on the probability. On the contrary, respondents with secondary and college/university education had low probability of selecting yellow beans relative to those with lower education. Mean expenditure among those selecting the beans was affected mainly by education level of the main decision maker, while overall expenditure was mostly affected by gravy quality. Respondents with technical/vocational training had lower conditional mean expenditure relative to those with lower education. Good gravy increased both conditional and overall mean expenditure on yellow beans. Although conditional mean expenditure on medium grains was slightly higher than that on small grains, the overall expenditure was lower implying that many respondents did not choose yellow beans. Moreover, the mean expenditure of respondents with technical/vocational training was less than that of respondents with lower education.

CONCLUSION

Findings revealed that cooking time, gravy quality and medium to large size were the attributes that significantly influenced consumers' choices of beans. Good gravy strongly influenced the selection in all varieties; fast cooking attribute influenced the selection of mottled red, *soya kawaida* and *soya supa* bean varieties. Income status of consumers influenced the selection of mottled red and *soya supa* bean varieties; age influenced the selection of yellow beans; sex influenced the selection of *soya kawaida* and yellow beans, while education level of the main decision maker was also observed to significantly influence selection of yellow beans.

It was observed that mottled red beans were the most preferred varieties followed by *soya supa*, *soya kawaida* and lastly yellow beans. There is no empirical evidence revealing reasons for higher preference for red beans but it can be associated with consumers' real experience from purchase and consumption of beans. It is worth noting that consumers' expectations of products' invisible attributes are normally developed from history, experience, culture, advertisement and other available information. Colour of beans normally serves as an indicator of invisible attributes. It was established during the survey that mottled red were the most widely traded and purchased beans in Dar es Salaam City. Results also reveal that households with more members and medium age showed higher preference on yellow beans while households from high income residence status and those with high education level preferred mottled red beans.

In general, there is notable variation with respect to relative importance of the factors hypothesized to influence the selection of- and expenditure on the four varieties of beans. However, results are consistent with respect to influences of grain size, cooking time and gravy quality. Fast cooking, good gravy quality and large to medium size are the attributes that increased both the probability of selection and actual expenditure on beans. Intuitively, consumers are likely to incur less fuel cost and spend less cooking-time when they purchase fast-cooking beans. Equally, consumers would be more satisfied when they consume beans with good gravity quality. The higher preference for medium to large size beans could be attributed to the finding that there is positive correlation between bean size and hydration and swelling capacity. Larger beans are more likely to swell/expand upon cooking than small sized beans. This means one may require fewer kilograms of large sized beans to make a meal for a family than small sized beans.



Therefore, efforts to promote production and consumption of beans should consider beans' attributes that are likely to command higher consumers' appeal and market prices. In the context of this study such interventions should focus on improving gravy quality, reducing cooking time and increasing grain size. Future studies should attempt to explore further the overall effect of these three attributes and other factors found to have inconsistent effect on selection of- beans and expenditure on the same. This could be achieved by conducting more choice experiments using other popular beans.

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Table 1: Variables included in the model and their expected signs

Variable	Description	Sign
Size_medium	Dummy 1 if grain size is medium, 0 otherwise	+ve
Size_large	Dummy 1 if grain size is large, 0 otherwise	+ve
Cooking_fast	Dummy 1 if beans are fast cooking, 0 otherwise	+ve
Gravy_good	Dummy 1 if gravy quality is good, 0 otherwise	+ve
Age_middle	Dummy 1 if age is medium, 0 otherwise	+ve/-ve
Age_old	Dummy 1 if age old, 0 otherwise	+ve/-ve
Education_secondary	Dummy 1 if education is secondary, 0 otherwise	+ve/-ve
Education_college/university	Dummy 1 if education is college/higher, 0 otherwise	+ve/-ve
Education_tech/vocational	Dummy 1 if education is tech/vocational, 0 otherwise	+ve/-ve
Sex_male	Dummy 1 if sex is male, 0 otherwise	+ve/-ve
Household size	Continuous variable, number of household members	+ve/-ve
Residence_medium	Dummy 1 if residence is medium income, 0 otherwise	+ve/-ve
Residence_high	Dummy 1 if residence area is high income, 0 otherwise	+ve/-ve

Table 2: Respondents characteristics

Variable name	Percent
Sex	
Male	13
Female	87
Age	
Less than 30 years	40
30 to 50 years	46
51 years and above	14
Education	
None	09
Primary	58
Secondary	22
College/university	08
Technical/vocational	03
Consumers from:	
Low income residence	40
Medium income residence	46
High income residence	14

Table 3: Expected probabilities and mean expenditures on four bean varieties

Variety	Selection probability	Conditional mean expenditure	Overall mean expenditure
Mottled red	0.35	7891.85	2832.69
<i>Soya kawaida</i>	0.20	5635.80	1263.97
<i>Soya supa</i>	0.26	6872.11	1934.87
Yellow	0.19	4607.14	908.36

Table 4: Factors influencing selection and expenditure on mottled red beans

Variable	Coefficient	Robust s.e.	z	P>z
Selection				
Size_medium	0.13	0.88	1.44	0.15
Size_large	-0.65	0.98	-6.56	0.00
Cooking_fast	0.83	0.83	9.98	0.00
Gravy_good	1.31	0.76	17.12	0.00
Age_middle	-0.22	0.85	-0.26	0.79
Age_old	0.12	0.12	1.00	0.32
Education_secondary	-0.07	0.10	-0.78	0.43
Education_college/university	0.17	0.14	1.16	0.24
Education_tech/vocational	-0.01	0.25	-0.05	0.96
Sex_male	-0.19	0.13	-1.48	0.14
Household size	-0.01	0.02	-0.38	0.70
Residence_medium	0.02	0.08	0.25	0.80
Residence_high	0.06	0.12	0.51	0.60
Expenditure				
Size_medium	-958.55	497.95	-1.93	0.05
Size_large	-1531.79	607.67	-2.52	0.01
Cooking_fast	788.72	564.50	1.40	0.16
Gravy_good	893.78	515.42	1.73	0.08
Age_middle	-729.84	504.51	-1.45	0.15
Age_old	849.39	660.53	1.29	0.20
Education_secondary	950.92	517.34	1.84	0.07
Education_college/university	592.08	867.58	0.68	0.50
Education_tech/vocational	404.59	1548.62	0.26	0.79
Sex_male	119.69	688.98	0.17	0.86
Household size	60.38	81.98	0.74	0.46
Residence_medium	1066.88	463.25	2.30	0.02
Residence_high	1375.54	701.42	1.96	0.05
Sigma				
Constant	4474.37	140.88	31.76	0.00
Marginal effects of significant variables				
Variable	Mean	Standard deviation		
Selection probability				
Size_large	-0.18	0.07		
Cooking_fast	0.23	0.09		
Gravy_good	0.37	0.14		
Conditional mean expenditure				
Size_medium	-789.05	65.04		
Size_large	-1251.57	103.17		
Gravy_good	732.94	60.41		
Education_secondary	763.34	62.92		
Residence_medium	856.05	70.56		
Residence_high	1106.17	91.18		
Overall mean expenditure				
Size_medium	-79.00	57.45		
Size_large	-2276.63	1586.73		
Gravy_good	3443.38	2400.64		
Education_seconary	63.93	46.71		
Residence_medium	369.51	257.80		
Residence_high	580.22	404.62		



Table 5: Factors influencing selection and expenditure on soya kawaida beans

Variable	Coefficient	Robust s.e.	z	P>z
Selection				
Size_medium	-0.15	0.11	-1.37	0.17
Size_large	0.36	0.10	3.60	0.00
Cooking_fast	0.58	0.08	6.77	0.00
Gravy_good	1.32	0.09	13.94	0.00
Age_middle	0.01	0.09	0.11	0.91
Age_old	0.06	0.14	0.42	0.67
Education_secondary	-0.10	0.10	-0.97	0.33
Education_college/university	-0.05	0.17	-0.27	0.77
Education_tech/vocational	-0.16	0.28	-0.57	0.57
Sex_male	0.00	0.13	-0.03	0.98
Household size	-0.01	0.02	-0.57	0.57
Residence_medium	0.03	0.09	0.28	0.78
Residence_high	-0.16	0.14	-1.11	0.27
Expenditure				
Size_medium	-1029.67	972.59	-1.09	0.29
Size_large	610.46	762.91	0.80	0.42
Cooking_fast	231.35	730.95	0.32	0.75
Gravy_good	3539.80	1233.20	2.87	0.00
Age_middle	-114.56	722.63	-0.16	0.87
Age_old	-634.26	1187.91	-0.53	0.59
Education_secondary	388.04	865.09	0.45	0.65
Education_college/university	1886.30	1386.85	1.36	0.17
Education_tech/vocational	-4726.83	1644.81	-2.87	0.00
Sex_male	1810.21	1035.22	1.75	0.08
Household size	-132.06	128.14	-1.03	0.30
Residence_medium	885.13	736.31	1.20	0.23
Residence_high	1080.06	1102.59	0.98	0.33
Sigma				
Constant	4474.37	240.42	18.92	0.00
Marginal effects of significant variables				
Variable	Mean	Standard deviation		
Selection probability				
Size_large	0.08	0.05		
Cooking_fast	0.12	0.08		
Gravy_good	0.29	0.18		
Conditional mean expenditure				
Gravy_good	2079.44	486.44		
Education_tech/vocational	-2946.71	689.32		
Sex_male	1148.68	268.71		
Overall mean expenditure				
Gravy_good	2136.03	2096.32		
Education_tech/vocational	-875.07	854.69		
Sex_male	260.09	253.55		

Table 6: Factors influencing selection and expenditure on soya supa beans

Variable	Coefficient	Robust s.e.	z	P>z
Selection				
Size_medium	-0.14	0.09	-1.56	0.12
Size_large	0.02	0.09	0.20	0.84
Cooking_fast	0.30	0.07	4.08	0.00
Gravy_good	1.15	0.08	14.44	0.00
Age_middle	-0.08	0.08	-0.94	0.34
Age_old	-0.20	0.13	-1.56	0.12
Education_secondary	0.00	0.09	-0.04	0.97
Education_college/university	-0.01	0.16	-0.09	0.93
Education_tech/vocational	0.14	0.23	0.60	0.55
Sex_male	0.00	0.12	0.01	0.99
Household size	0.01	0.01	0.71	0.48
Residence_medium	-0.18	0.08	-2.22	0.03
Residence_high	-0.19	0.12	-1.53	0.13
Expenditure				
Size_medium	-882.27	708.73	-1.24	0.21
Size_large	1629.99	671.70	2.43	0.02
Cooking_fast	1262.50	587.82	2.15	0.03
Gravy_good	759.32	798.33	0.95	0.34
Age_middle	-44.09	611.51	-0.07	0.94
Age_old	-143.63	1034.28	-0.14	0.89
Education_secondary	-496.60	746.72	-0.67	0.51
Education_college/university	-1738.33	1154.91	-1.51	0.13
Education_tech/vocational	1151.32	1639.89	0.70	0.48
Sex_male	1191.24	1004.812	1.19	0.24
Household size	-84.87	141.82	-0.60	0.55
Residence_medium	144.57	607.50	0.24	0.81
Residence_high	1604.80	882.12	1.82	0.07
Sigma				
Constant	4737.07	178.88	26.48	0.00
Marginal effects of significant variables				
Variable	Mean	Standard deviation		
Selection probability				
Cooking_fast	0.08	0.03		
Gravy_oodg	0.33	0.14		
Residence_medium	-0.05	0.02		
Conditional mean expenditure				
Size_large	1202.08	156.66		
Cooking_fast	829.39	108.09		
Residence_high	1177.58	153.47		
Overall mean expenditure				
Size_large	378.29	279.09		
Cooking_fast	815.45	610.83		
Residence_high	-4.98	18.31		

Table 7: Factors influencing selection and expenditure on yellow beans

Variable	Coefficient	Robust s.e.	z	P>z
Selection				
Size_medium	0.53	0.10	5.34	0.00
Size_large	0.01	0.10	0.07	0.94
Cooking_fast	0.02	0.08	0.21	0.84
Gravy_good	0.92	0.09	10.57	0.00
Age_middle	0.03	0.02	2.09	0.04
Age_old	0.22	0.09	2.43	0.02
Education_secondary	0.03	0.13	0.26	0.80
Education_college/university	-0.17	0.10	-1.75	0.08
Education_tech/vocational	-0.43	0.17	-2.47	0.01
Sex_male	-0.45	0.30	-1.50	0.13
Household size	0.14	0.12	1.15	0.25
Residence_medium	-0.07	0.08	-0.85	0.40
Residence_high	-0.32	0.24	-1.33	0.35
Expenditure				
Size_medium	-1483.27	868.48	-1.71	0.09
Size_large	77.71	898.03	0.09	0.93
Cooking_fast	590.27	715.74	0.82	0.41
Gravy_good	1676.50	900.73	1.86	0.06
Age_middle	239.74	161.23	1.49	0.14
Age_old	-505.32	775.01	-0.65	0.51
Education_secondary	-2012.04	1218.20	-1.66	0.10
Education_college/university	251.04	867.86	0.29	0.77
Education_tech/vocational	1055.47	1720.21	0.61	0.54
Sex_male	-3686.98	1670.92	-2.21	0.03
Household size	51.50	1136.31	-0.05	0.96
Residence_medium	-397.85	732.01	-0.54	0.59
Residence_high	-1163.27	1415.30	-0.82	0.41
Sigma				
Constant	4212.97	374.97	11.24	0.00
Marginal effects of significant variables				
Variable	Variable	Variable	Variable	
Selection probability				
Size_medium	0.13		0.05	
Gravy_good	0.22		0.09	
Household size	0.01		0.00	
Age_middle	0.05		0.02	
Education_secondary	-0.04		0.02	
Education_college/university	-0.08		0.04	
Conditional mean expenditure				
Size_medium	40.82		7.92	
Gravy_good	880.71		170.94	
Education_tech/vocational	-1936.87		375.94	
Overall mean expenditure				
Size_medium	-510.82		350.62	
Gravy_good	1010.92		759.71	
Education_tech/vocational	-793.75		598.63	

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