

**CONSUMER INTENTIONS TO BUY NUTRIENT-RICH PRECOOKED BEAN
SNACKS: DOES SENSORY EVALUATION MATTER?**

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ABSTRACT

Precooked bean products have the potential of bridging the common bean demand and consumption gap in Kenya. However, sensory evaluation of novel precooked processed products has been inadequate in determining acceptability. This study assessed the sensory evaluation of precooked bean snacks by 269 rural consumers in Machakos County of Kenya. Descriptive results indicated that less than one-quarter (22%) of the consumers were aware of the precooked bean products. The low awareness is a disconnect from the expectations that farming households were probably going to be aware of processed bean products because of their participation in bean value chain. Sensory evaluation showed that 75% of the consumers evaluated the freshness of the bean snacks positively, with about 90% and 63% of them positively assessing the taste of the precooked bean snacks branded Keroma Delicious and Keroma Fruity, respectively. The taste evaluation of Keroma Fruity brand significantly differed depending on age and level of education of the consumer. Similarly, the taste of Keroma Delicious brand also significantly differed by age and educational attainment of consumers. Furthermore, while consumers liked the taste parameters of the products, less than half of them liked the beany flavour of the two products. Results from the binary logit regression model indicated that freshness, sourness, and flavour positively and significantly predicted the probability of future purchases of Keroma Fruity bean snack brands. Consumer intentions to buy Keroma Delicious brand were positively predicted by flavour and marginally by sweetness. To accelerate the consumption of precooked bean products, product development and marketing strategies should recognise the role of sensory attributes in driving acceptability of the bean snacks, deploy processing technologies that retain and enhance sensory attributes, create awareness of the products, and segment the market from a gender lens in order to satisfy the diverse consumer needs and preferences.

Key words: Sensory evaluation, precooked bean products, common bean, buying intentions, bean snack



INTRODUCTION

Beans are an important crop and an excellent source of iron, zinc, dietary fiber, protein, B vitamins, and other micronutrients needed by the body. Beans are typically consumed without much processing. Value-added processing presents great potential to improve food and nutritional security, reduce energy consumption, preserve the environment and create jobs. Product development and improvement strategies must be guided by drivers of consumers' food choices for a sustainable processed food chain [1]. For instance, consumer awareness about healthy food is rapidly shifting demand towards nutritious and safe food products [2]. Therefore, processors are increasingly focusing on producing quality and safe food products. Nonetheless, quality information may be insufficient in provoking consumer perception of food products as high-quality because consumers' quality perceptions are often subjective due to underlying personal judgments or motivations [3, 4]. As a result, consumers' food choices may, besides quality, be determined by uniqueness of product attributes. Price and convenience are relevant drivers of purchase. As a result, marketers should focus on exploiting differences in reasons that motivate purchase decisions by identifying and targeting diverse customer preferences.

Sensory evaluation is one of the approaches used by food manufacturers to capture consumers' product quality perceptions [5]. The process involves inducing, measuring, evaluating, and construing the sensory responses for the taste, smell, or touch of food products [6]. The responses are then manipulated to generate useful information used to predict consumer acceptability of new or modified food products. Additionally, sensory evaluation is crucial in reducing uncertainty surrounding the consumers' acceptance and success of novel products [5]. Sensory assessments exploit the variability in consumer decision-making process and quality perceptions, to establish the degree of like or dislike of specific food attributes [7].

In an attempt to bridge the gap between bean product demand and supply gap, food processors in Kenya are leveraging the public-private partnerships to have access to adequate supply of mineral-rich, flatulence-free bean grains, with excellent processing characteristics [8]. The partnerships have led to the emergence of new bean products, popularly known as precooked bean products among the bean value chain actors in Kenya and Uganda. Besides closing the food and nutritional demand and supply gaps [9], the precooked common bean products, including bean flours, snacks, and noodles, are expected to address consumer demand for convenient, affordable, easy to prepare, and ready-to-eat food [10]. However, consumers may reluctantly accept new products based on their evaluation of product attributes [11]. Thus, food companies' perceived value of their products may not automatically be reflected in consumer product preferences. Instead, consumer preferences may be influenced by sensory evaluation and perceptions [12]. Hence, understanding consumer sensory evaluation of processed bean products is critical in shaping marketing efforts by food processing companies seeking to commercialise the bean products.

However, there is lack of clear understanding of consumer quality perceptions of bean snacks. Limited information is available on the consumers' sensory evaluation of bean



snacks and their willingness to buy. Consequently, investigating consumer sensory evaluation of precooked bean snacks is particularly relevant in creating awareness of the products and promoting consumer acceptance in order to reduce the prevalence of these deficiencies in Kenya. Additionally, sensory evaluation is critical in providing product development information, determining consumer profiles in terms of their needs and preferences, and guiding promotional efforts and positioning strategies. The current paper investigated how sensory attributes influence consumer intention to purchase precooked beans snacks. In this study, buying intention is defined as behaviour that indicates product acceptability.

MATERIALS AND METHODS

Study area

Data for this study came from 269 consumers randomly interviewed during an agricultural trade fair organised by Smart Logistics company, and KALRO in Machakos town, Machakos County, Kenya. This County was purposively selected because it hosts one of the precooked bean product processors and has high chances of being an important market for precooked bean products. Besides, the County is one of the project areas of the Cultivate Africa's Future (CultiAF) project that promoted processed bean products.

Product description

Two types of relatively new precooked processed bean snacks were tested: Keroma Fruity and Keroma Delicious brands. These are ready-to-eat bean snacks that are prepared from 60% bean flour with pearl millet and other ingredients. Banana, honey and dry berries are other ingredients of Keroma Fruity, while lemon and lime juices are used as preservatives.

Survey instrument

The consumer survey questionnaire consisted of two parts, namely demographic information and consumer awareness and sensory evaluation perceptions. It also captured consumer willingness to buy the products. The study focused on the taste and freshness attributes. Consumers were asked to rate their sensory evaluation on the freshness and taste of the products using a 5-point scale, ranging from "not very good" (1) to "indifferent" (4) and "very good" (6). Other parameters that were evaluated were consumer different taste preferences or parameters: saltiness, sourness, sweetness, mouthfeel and bean flavour of the products. A 5-point just-about-right (JAR) scale was used to assess the five taste parameters. The scales range from "none or much too little" (1), "just about right" (4) and to "much too much" (6).

Data Analysis

Data were analysed using Stata 16 software [13]. Frequencies and percentages, cross-tabulation and test statistic were performed using Pearson Chi-square and independent samples *Student's t-test* to establish the differences in proportions and means of the responses to the sensory evaluation questions by demographic characteristics of consumers. Logit regression was used to estimate the influence of sensory evaluation and demographic characteristics on consumer purchase intentions.



RESULTS AND DISCUSSION

Demographic characteristics and product awareness

Table 1 presents descriptive results of demographic characteristics of consumers and their knowledge of processed bean products. The proportion of women (54%) who participated in the survey was higher than men (46%). The mean age of the consumers was 42 years, but there was no statistical difference between men and women. From the results, men were more educated (12 years) than their women counterparts (11 years) ($t = -2.93$). The consumer survey was conducted in Machakos town and consumers were diverse. We had consumers from Machakos town and the periphery areas as well as consumers from Nairobi and Makueni counties. Furthermore, most staple foods, including legumes such as common bean, are consumed on-farm due to the subsistence nature of food production in most Sub-Saharan African countries [14, 15]. A majority (88%) of consumers were bean farmers, implying that they were net bean consumers because they retained most of their bean produce. With average bean farming experience of 12 years, net bean consumers are expected to be aware of either local or industrially processed bean products. In contrast to this assertion, only 21% of them were aware of the available processed bean products. The low awareness is expected because the products are new, less promotion has been carried out to sensitize consumers, and the products have not yet reached rural markets [8].

The low awareness of processed bean products is expected given that common bean though a widely grown and consumed legume in Kenya and Eastern Africa [16, 17] is mostly consumed in its unprocessed state. Second, low awareness is in sharp contrast to the level of agro-processing in the country. Kenya has a comparative advantage in agricultural processing compared to other countries in the region, suggesting availability of agro-processed products [11]. Nonetheless, consumer unawareness of available bean products signifies gaps in the bean value chain. Among many other factors, the awareness of food products influences consumer food choices. Therefore, low awareness suggests that processed bean products form an insignificant part of household diet. The lack of farm-level bean value addition appears to translate into limited knowledge about specialised processed bean products. The finding is not peculiar to the current study because it corroborates results reported in studies conducted in other developing countries [18, 19]. This situation needs to be confronted by focusing on bean value chain activities, especially value capture activities such as processing and distribution of common bean products.

Sensory Evaluation Results

Functional Attributes

A majority (>80%) of the consumers ranked all the attributes (apart from the taste of Keroma Fruity), as good and very good (Table 2). Nearly 81% of consumers perceived the freshness of Keroma Fruity as good and very good. On the other hand, 90% of the consumers positively evaluated the freshness of Keroma Delicious (Table 2). The positive and negative evaluation of freshness were significantly different for Keroma Fruity ($\chi^2 = 186.53$; $p = 0.001$) and Keroma Delicious ($\chi^2 = 281.33$; $p = 0.001$). Freshness



is a critical attribute that determines consumer judgment of food quality [20, 21]. Consequently, a positive evaluation of freshness could imply a positive perception of other properties such as texture, odour, colour, and flavour [22]. Freshness also plays a crucial role in influencing the anticipated taste of food, with consumers being more likely to evaluate fresh food as tastier. In other words, freshness results show that consumers would positively evaluate and like other bean attributes. Therefore, product development and marketing strategies should recognise freshness as one of the potential drivers of acceptability of precooked bean products.

Furthermore, results in Table 2 show more consumers evaluated the taste of Keroma Delicious (90%) more positively than Keroma Fruity (63%). The difference reveals that the tastes of the two products differ depending on the ingredients. The results also suggest that taste could be the essential quality attribute of processed bean products that could differentiate the level of consumer acceptability of the bean snacks. Furthermore, the difference in consumer taste evaluations of the two bean snacks could be attributed to their ability to discriminate the basic parameters of taste, including saltiness, sweetness, and sourness [23]. This provides direct information on intrinsic food attributes to target in developing bean snacks and other bean products. As discussed later in this section, the taste is a compound attribute that is affected by addition or reduction of ingredients, which may influence quality perceptions of bean snacks and intentions to buy.

Table 3 presents sensory evaluation of Keroma Fruity's freshness and taste disaggregated by the consumers' demographic characteristics. The sensory evaluation of freshness of Fruity bean snacks did not differ significantly by sex, age, and education levels of the consumers. Similarly, taste of Keroma Fruity did not vary significantly by sex of the consumers. However, consumer evaluation of the taste of Keroma Fruity significantly depended on age ($\chi^2=11.280$; $p=0.024$) and level of education ($\chi^2=26.911$; $p=0.001$) of the consumers. More (82%) older adults than the youth (52%) and middle-aged (65%) consumers positively evaluated the taste of Keroma Fruity. This might be because elderly are more concerned with nutritional benefits of food products. Significantly more consumers with primary (77%) and secondary (68%) education positively evaluated the taste of Keroma Fruity than consumers with college (55.88%) and university education (43.86%). Furthermore, results in Table 4 indicate that consumer sensory evaluation of freshness of Keroma Delicious differed depending on the education level of the consumers ($\chi^2=14.465$; $p=0.025$). In addition, consumer sensory evaluation of the taste of Keroma Delicious significantly differed by age ($\chi^2=16.707$; $p=0.002$) and educational attainment ($\chi^2=11.357$; $p=0.078$) of consumers.

Age possibly increases consumer knowledge about specific food product attributes to look for when evaluating food healthiness and quality. Older consumers possibly understood sensory attributes and characteristics of processed bean products and attached greater importance to products with a great taste and freshness as reflection of



their possible health impact. This finding is consistent with results reported by Marina *et al.* [24] who revealed that age greatly influenced consumers' detection of differences between taste of farmed and wild fish. However, it was surprising that lower educational attainment was associated with positive evaluation of the taste of bean snacks. Nonetheless, it is possible that consumers with post-secondary education could have required more information (repeated tasting) to validate the product taste.

Results in Tables 2, 3 and 4 shows that consumers either infer or perceive product quality depending on multiple product characteristics, including sensory attributes like freshness and taste, and their characteristics. As illustrated in consumer and sensory research, marketers and food manufacturers need to focus on establishing relationships between processed food products' sensory properties and their overall liking and acceptability [25, 26, 27]. It is crucial to identify and cluster consumers into unique groups that are differentiated by sensory preferences (preference mapping). Preference mapping would be necessary for establishing hedonic preferences, which are valid indicators of consumer liking of food products. This information would support sensory-based advertising in addition to the environmental and nutritional functions of precooked bean products. Besides, there is a need for product changes and improvements in terms of ingredients that capture identifiable sensory preferences.

Intrinsic Food attributes

Table 5 presents the sensory evaluation results of five basic taste parameters, flavour, saltiness, sourness, sweetness, and mouthfeel of bean snacks. The *none*, *very little*, and *just about right* responses are considered positive evaluations of saltiness, sourness, and sweetness, whereas a *little too much* and *too much* are negative evaluations. On the other hand, *none*, *very little*, *a little too much*, and *too much* are considered as negative evaluations of bean flavour. At the same time, *just about right* is regarded as a positive evaluation of bean flavour. The results show that majority of the consumers positively evaluated saltiness of Keroma Fruity (93%) and Keroma Delicious (92%). The proportions of consumers who positively evaluated sourness and sweetness of Keroma Fruity were 84% and 77%, respectively. In comparison, 95% and 60% of them positively evaluated the sourness and sweetness of Keroma Delicious. In general, less than half of the consumers positively perceived bean flavour as *right*, with about 48% and 49% of them affirming that Fruity and Delicious had original bean flavour. These results reveal that bean processing may have damaged or failed to preserve the appropriate or natural bean flavour.

Factory-level high-pressure cooking and processing appear to retain the taste of bean snacks in terms of saltiness, sourness, and sweetness but fail to retain much of bean flavour. Nonetheless, since high-pressure cooking preserves food flavour [28, 29, 30], negative evaluation of bean flavour indicates that preservatives and other industrial additives impacted on the natural bean flavour. For instance, lemon and lime juices are added as preservative ingredients when preparing bean snacks, which would have possibly interfered with the natural bean flavour. Additionally, fruit berries and banana fruit were used as functional food ingredients for Keroma Fruity. The berries contain ascorbic acid and bioactive compounds with sharp and delicious flavour [31], which could have masked bean flavour. Food manufacturers should have the right balance of



food preservatives to not only exploit the great nutritional importance of fruit berries but also ensure that bean products are correctly flavoured to meet consumer expectations.

The characterisation of sensory evaluation results shows that 84% and 93% of the consumers favourably rated the mouthfeel of Fruity and Delicious, respectively. The results indicate that bean snacks had the usually smooth-textured mouthfeel of typical snacks. That is, bean snacks probably have low viscosity and smooth texture that makes chewing easier, just like the customarily cooked bean grain. Furthermore, the results show that bean snacks are not extremely gritty. Thus, since the mouthfeel is a vital descriptor attribute of the quality of food product that may guide consumer acceptance, it is expected that food processors have to work to further maintain and improve the products in terms of texture and ease of chewing.

Consumer Buying Intentions

Consumers were also asked to state their future buying intentions (Figure 1). Whereas less than one-quarter (21%) of the consumers indicated they would consider purchasing Keroma Fruity, more than half (57%) reported that they would buy Keroma Delicious. The possible reason for the difference in proportions of consumer buying intentions between the two products could be explained by sensory evaluation of taste and freshness, as shown in Tables 3 and 4. Nevertheless, this is an intuitive argument and may not reveal variations in consumer idiosyncrasies. Therefore, inferential analysis is crucial in partitioning the influence of the sensory functions and other peculiarities within and between-subject differences in intentions to buy bean snacks.

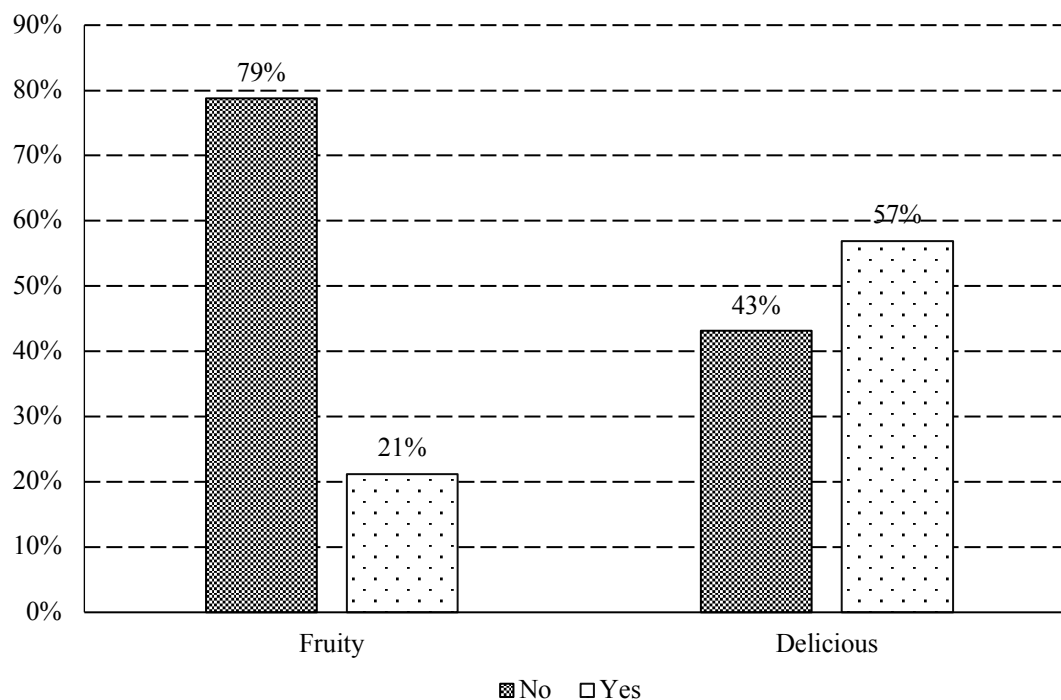


Figure 1: Consumer intentions to buy precooked beans snacks

The results in Table 6 suggest that taste (53%) and healthier and nutritious (22%) diets are critical considerations by consumers of any age for the purchase of beans snacks. As people age, they become more vulnerable to diet-related and degenerative diseases [32], thus making healthier food choices. The proportion (27%) of older consumers who reported that they would buy bean snacks was higher than the percentages for middle-aged (22%) and youthful consumers (20%). Precooked bean products are promoted as functional foods because of their potential contribution to nutritional and health wellbeing, thus more likely to appeal to elderly consumers. The findings corroborate the results of other studies that identified age as a vital influencer of consumer buying intentions [33, 34, 35, 36]. Therefore, food processing companies in collaboration with nutrition experts need to conduct rigorous sensitization campaigns to reach consumers of all ages, including children.

Besides, consumers also cited prices (15%) and convenience (9%) as important factors that would influence their decision to buy bean snacks. Higher proportions (17%) of youthful consumers than middle-aged (15%) and older adults (12%) indicated that the prices of the two products would influence their purchase intentions. Price is a relevant driver of purchase intention among youth, possibly because they are yet to have stable sources of income and thus sensitive to their expenditures compared to adults. Convenience was also highly rated by the youth than middle-aged and older adults, possibly because youth prefer ready-to-eat meals and have higher mobility than adults. As a result, marketers should focus on exploiting differences in reasons that motivate purchase decisions by identifying and targeting diverse customer preferences.

The nutritional potential of bean snacks promises to curb zinc and iron deficiencies in local diets. According to the last national micronutrient survey conducted in Kenya, iron deficiency and anaemia were observed more among pregnant women and children than men. Pre-school children had a higher prevalence of anaemia and iron deficiency than school-age children. The survey also established that preschool children had the highest prevalence of zinc deficiency. Considering that beans are rich in both iron and zinc, nutrition education on the value of these products should be conducted to increase awareness and their consumption in order to reduce the prevalence of these deficiencies in Kenya.

Regression Results

Table 7 presents logistic model estimates of consumer intentions to buy bean snacks.

The goodness of fit for Keroma Fruity ($\chi^2=51.23$; $p=0.001$) and Keroma Delicious ($\chi^2=26.63$; $p=0.005$) regression are significant, indicating that variables in the models fit the data well. The average predicted probabilities of purchasing Keroma Fruity and Keroma Delicious were 22% and 60%, respectively. The logit model correctly predicted 64% and 84% of the intentions to buy Keroma Delicious and Keroma fruit, respectively, with the rest being misclassified. Additionally, results in Table 7 indicate that sex and bean farming experience and the interaction term of age and bean farming experience were significantly associated with consumer purchase intentions. Freshness, sourness, sweetness, and flavour were important taste parameters that significantly influence consumer buying intentions.



The intentions to buy Keroma Fruity were positively and significantly related to sex of the consumers. Male consumers were 30% more likely to purchase Keroma Fruity than female consumers. This result suggests gender differences regarding convenience and food preparation. Male consumers possibly preferred ready-to-eat, ease-to-prepare food because of their “limited role in the kitchen.” The result could also imply there are gender differences in quality perceptions of food products. On the other hand, consumer bean farming experience and its interaction term with the consumer's age significantly influenced Keroma Delicious' buying intentions. Bean farming experienced increased the likelihood of purchase decision of Keroma Delicious by 2.6%, holding other factors fixed. More experienced bean farming consumers possibly consumed beans more frequently than the less-experienced consumer. This finding is in line with results reported by Combest and Warren [37] who indicated that regular eating positively influenced perceptions and purchase intentions of whole-grain foods. The age and experience interaction term was marginally significant in influencing consumer intentions to buy Keroma Delicious. This indicates that the influence of farming experience on the probability of buying Keroma Delicious reduces by 0.1% with every one-year increase in the consumer's age. The implication is that manufacturers should focus on the acceptability of the product by both younger and older consumers.

Furthermore, freshness, sourness, and flavour were significant sensory predictors of the probability of buy Keroma Fruity. In contrast, sweetness and flavour were the only sensory parameters that significantly predicted likelihood of consumers to buy Keroma Delicious. Holding other factors constant, positive evaluation of freshness improved the possibility of purchase of Keroma Fruity by 14%. Positive evaluation of sourness increased consumers' likelihood of buying Keroma Fruity by 24.5%, holding other factors fixed. Besides, a positive assessment of the bean flavour improved the probability of purchasing Keroma Fruity and Keroma Delicious by 22.3% and 18.6% respectively. On the other hand, consumers who positively evaluated the sweetness of Keroma Delicious were 11.2% more likely to buy. The findings corroborate results reported by studies that highlighted sensory characteristics as essential predictors of consumer willingness to buy food products [38, 39, 40].

These results highlight the critical role played by sensory evaluation in influencing consumer choices of processed food products. Food manufacturing companies should, therefore, adopt food processing technologies that are effective in maintaining and enhancing taste, freshness, and flavour of bean snacks in order to deliver products that match consumer preferences and criteria for assessing product quality. This approach would encourage product acceptability across different consumer profiles. Sensory assessments of intrinsic attributes with expert panels that represent typical consumers are needed during product development to improve sensory quality of precooked bean products.



CONCLUSION

The study found low awareness of processed precooked products, suggesting the need for promotional marketing campaigns by both public and private bean value chain actors. Furthermore, the sensory evaluation showed that consumers liked the functional attributes (freshness and taste) of the bean snacks, although more consumers liked the taste of Keroma Delicious than Keroma Fruity. Sensory evaluation of the taste of bean snacks significantly differed depending on age and education of the consumers, signalling how essential taste is in determining food quality perceptions and acceptability. Additionally, consumers favourably evaluated taste parameters (saltiness, sourness, flavour and sweetness). These results suggest that manufacturers should deploy formulation technology that retains taste attributes without masking bean flavour. Moreover, results showed that freshness, sourness, sweetness, and flavour positively predicted consumer buying intentions. Nevertheless, more consumers were willing to purchase Keroma Delicious than Keroma Fruity, possibly because of the differences in sensory evaluation of the two bean snacks.

The findings have several implications for the achievement of the anticipated role of processed bean products in bridging the protein and mineral gaps enhancing food and nutritional security. They are important to food processing companies and actors in the bean distribution chain because they provide valuable information about product attributes of processed precooked bean products that are likely to influence consumers buying intentions. First, marketing campaign messages should emphasise the positive attributes of precooked processed bean snacks to influence consumer behaviour. Marketers have to tailor product messages and communicate clearly and effectively to different consumer segments. In other words, marketers should profile consumers by identifying customer preferences and needs, which should be used to determine the marketing strategy. Second, promotional messages should emphasise the nutritional potential of precooked bean snacks through consumer knowledge creation. The communication should emphasise the numerous non-sensory attributes like nutrient density, additive-free, affordability, ease of preparation, and convenience.

Nevertheless, the potential of precooked bean products in addressing micronutrient deficiencies in Kenya is not adequately exploited and documented. Therefore, the current study encourages further research in understanding constraints to bean consumption. For example, researchers need to focus on the antecedents of consumer purchase intentions, with particular attention to the comparison of precooked bean products to other existing processed bean products. Lastly, future research should identify critical marketing and communication pathways with the highest potential of increasing consumer awareness and consumption of precooked bean products.

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Table 1: Consumer demographic characteristics and awareness of precooked bean products

	Pooled		Women		Men		p-value
	N	Mean	N	Mean	N	Mean	
Sex	267		144	53.93	123	46.07	
Education	246	11.59 (3.09)	133	11.06 (3.03)	111	12.21 (3.06)	0.004
Age	268	42.04 (13.40)	144	41.70 (11.96)	123	42.46 (15.01)	0.645
Bean farmer (1=Yes, 0 otherwise)	237	88.10	126	87.50	109	88.62	0.875
Farming experience	269	12.12 10.04	144	12.53 9.86	123	11.73 10.30	0.516
Awareness	55	21.74	33	25.00	22	18.49	0.213

Standard deviations is provided in parenthesis

Table 2: Proportional of consumer evaluation of functional attributes of bean snacks

		Not very good	Not good	Indifferent	Good	Very good
Fruity	Freshness	3.41	4.92	10.98	39.39	41.29
	Taste	4.21	9.96	22.99	36.4	26.44
Delicious	Freshness	1.98	1.98	5.95	36.9	53.17
	Taste	1.99	2.79	5.18	34.66	55.38

χ^2 goodness of fit test: Fruity freshness=186.53***; Fruity taste= 87.33***

χ^2 goodness of fit test: Delicious freshness=281.33***; Fruity taste= 289.50***

Note: *** denote significance at 1% level

Table 3: Sensory evaluation results of the freshness of Keroma Fruity disaggregated by demographic characteristics of consumers

	Freshness							Taste						
	-ve		Neutral		+ve		χ^2	-ve		Neutral		+ve		χ^2
	N	%	N	%	N	%		N	%	N	%	N	%	
Sex														
Female	10	6.99	14	9.79	119	83.22	1.49	24	17.14	29	20.71	87	62.14	2.34
Male	12	10.08	15	12.61	92	77.31		13	10.92	30	25.21	76	63.87	
Age														
Youth	9	11.11	10	12.35	62	76.54	1.67	17	21.52	21	26.58	41	51.9	11.28**
Middle	11	7.38	15	10.07	123	82.55		19	12.93	33	22.45	95	64.63	
Elderly	2	5.88	4	11.76	28	82.35		1	2.94	5	14.71	28	82.35	
Education														
Primary	2	3.77	5	9.43	46	86.79	2.98	7	13.21	5	9.43	41	77.36	26.91***
Secondary	12	10.08	14	11.76	93	78.15		16	13.79	21	18.1	79	68.10	
College	3	8.57	5	14.29	27	77.14		8	23.53	7	20.59	19	55.88	
University	5	8.77	5	8.77	47	82.46		6	10.53	26	45.61	25	43.86	

*Note: * *p<0.05; ***p<0.01*



Table 4: Sensory evaluation results of the freshness of Keroma Delicious disaggregated by demographic characteristics of consumers

	Freshness							Taste						
	-ve		Neutral		+ve		χ^2	-ve		Neutral		+ve		χ^2
	N	%	N	%	N	%		N	%	N	%	N	%	
Sex														
Female	6	4.41	7	5.15	123	90.44	0.24	8	5.88	8	5.88	120	88.24	1.86
Male	4	3.51	7	6.14	103	90.35		3	2.65	5	4.42	105	92.92	
Age														
Youth	7	9.46	9	12.16	58	78.38	4.92	7	9.46	9	12.16	58	78.38	16.71***
Middle	4	2.8	4	2.8	135	94.41		4	2.8	4	2.8	135	94.41	
Elderly	1	2.94			33	97.06		1	2.94			33	97.06	
Education														
Primary	1	2			49	98	14.46**	2	4	1	2	47	94	11.36*
Secondary	7	6.03	13	11.21	96	82.76		4	3.45	6	5.17	106	91.38	
College	1	2.94			33	97.06		4	11.76			30	88.24	
University	1	1.92	2	3.85	49	94.23		2	3.92	6	11.76	43	84.31	

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$



Table 5: Proportional of consumer sensory evaluation of intrinsic attributes of bean snacks

		None	Very little	Just about right	Little too much	Too much
Fruity	Saltiness	17.76	33.59	41.31	5.02	2.32
	Sourness	35.48	22.18	26.21	12.10	4.03
	Sweetness	9.20	24.14	44.06	16.48	6.13
	Flavour	12.02	21.32	47.67	13.18	5.81
	Mouthfeel	46.95	18.70	17.94	8.02	8.4
Delicious	Saltiness	31.87	23.51	36.25	6.77	1.59
	Sourness	53.82	20.48	20.48	4.02	1.20
	Sweetness	2.79	7.97	49.00	16.73	23.51
	Flavour	9.49	20.55	47.43	13.83	8.70
	Mouthfeel	57.83	15.66	19.28	5.62	1.61

Table 6: Reason for consumer buy bean snacks

	Pooled		Youth		Middle-aged		Older adults	
	N	%	N	%	N	%	N	%
Taste	195	53.28	62	52.99	108	54	25	51.02
Healthfulness/nutritious	79	21.58	23	19.66	43	21.5	13	26.53
Price	56	15.3	20	17.09	30	15.0	6	12.24
Convenience	34	9.29	12	10.26	18	9.0	4	8.16

Table 7: Logistic regression estimates of the influence of sensory attributes and demographic characteristics on consumer intentions to buy bean snacks

Variable	Fruity			Delicious		
	Coef.	Std. Err	dy/dx	Coef.	Std. Err	dy/dx
<i>Demographic characteristics</i>						
Age	0.044	0.029	0.006	0.021	0.022	0.004
Sex (1=Male, 0 otherwise)	2.275*	1.277	0.308*	0.408	0.947	0.087
Age-sex interaction	-0.038	0.028	-0.005	-0.006	0.022	-0.001
Farming experience	-0.021	0.077	-0.003	0.124**	0.057	0.026**
Age-exp. Interaction	0.001	0.001	0.000	-0.002*	0.001	0.001*
<i>Sensory attributes</i>						
Freshness	1.031**	0.426	0.140**	0.411	0.322	0.088
Sourness	1.808**	0.902	0.245**	-1.008	0.741	-0.215
Saltiness	-1.138	0.963	-0.154	-0.125	0.622	-0.027
Sweetness	0.410	0.579	0.055	0.525*	0.298	0.112*
Flavour	1.649***	0.437	0.223***	0.870***	0.297	0.186***
Mouthfeel	0.034	0.617	0.005	0.787	0.646	0.168
Constant	-8.41***	1.976		-2.458*	1.445	
LR χ^2	51.23***			26.63***		
Predicted probability	22.03%			59.56%		
Predicted classification	83.05%			63.91%		

Note: *p<0.1; **p<0.05; ***p<0.01

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