

Article

What Is the Possibility of Commercializing African Indigenous Crops?—The Case of Ethiopia

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Abstract: Africa has a rich diversity of indigenous crops whose commercial and economic value have been underutilized. *Eragrostis tef* is a crop with great potential for production and commercialization in Ethiopia. The nutritional and curative values of *tef* are recognized not only in Ethiopia but also in the global market. Economically, *tef* and its value chain are a source of livelihood for more than six million small-scale Ethiopian farmers. Its large-scale commercialization has the potential to transform the livelihoods of many impoverished people. However, little research has been conducted to assess Ethiopian consumers' attitudes toward *tef* products. The objective of this study is to understand product attributes that would affect consumer purchasing decisions. The study is based on pasta and baby food, the two most important products that could be made out of *tef*. The attributes analyzed are the inclusion of *tef* in the products, price, organic certification, and brand origin. The study relies on survey data that were randomly collected from 318 respondents and secondary data from the central statistical agency. The attributes were subjected to conjoint analysis, a method that is commonly used in consumer market research with hypothetical products consisting of multiple attributes to understand customers' preference for different components of the product. The results of the analysis show that the inclusion of *tef* flour in the products is the most important factor consumers would consider when buying pasta or baby food. Further, consumers are interested in brand origin as they have a strong inclination to buy domestic brands and prefer products with organic certification. In the case of baby food, Ethiopians are likely to buy products containing more *tef* flour, packaged in sealed can rather than a paper bag, and concentrated in iron or protein. However, they are less willing to pay a premium even for products they perceive to be of greater utility. The preference for domestic brands and processed food with *tef* implies that there is opportunity for local brands to grow if they can understand and satisfy consumer expectations. It also means that consumers are interested in business practices that promote sustainable livelihoods. Overall, these findings suggest the potential for commercialization of *tef* products in Ethiopia and that the development of its value chain could combat nutritional deficiencies in the country.

Keywords: *Eragrostis tef*; Ethiopia; commercialization; poverty reduction; pasta; baby food



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1. Introduction

Africa is home to a rich diversity of indigenous crops that have been cultivated and consumed for centuries, but many of them remain underutilized and have limited commercial value. Investigating the potential for commercialization of these crops is important for several reasons. Firstly, it can contribute to food security and nutrition by promoting the cultivation and consumption of locally adapted crops, which often possess unique nutritional qualities and are well-suited to local environmental conditions. Additionally, commercializing African indigenous crops can enhance economic development and provide income opportunities for small-scale farmers, particularly in rural areas. Ethiopia, with its diverse agroecological zones and rich agricultural heritage, provides an interesting case. The country is known for its indigenous crops such as *tef*, finger millet, enset, and various

indigenous vegetables. Examining the potential for commercialization in Ethiopia can shed light on the challenges and opportunities associated with scaling up the production, processing, marketing, and distribution of African indigenous crops.

According to [1], African nations should strategically invest in the development of agriculture- and food-related industries, particularly in downstream sectors, to bring about a transformation in food demand, combat malnutrition, and address food insecurity. Africa is currently experiencing a promising growth market for pasta and instant noodles, driven by factors such as a growing population, cost considerations, and convenience. Additionally, there is an opportunity to incorporate local grains, including sorghum, cassava, tef, and amaranth, into pasta and noodles produced in Africa, which can improve the nutritional quality of these products and utilize local crops [2]. Ethiopia, for instance, with its population of 112 million people [3] and an annual population growth rate of 2.5 percent stands out as a significant market in Africa. The country's expanding middle class, urbanization, and an increasing number of women in the workforce contribute to the potential and profitability of the food industry [4]. From 2014 to 2019, the food industry in Ethiopia experienced an annual growth rate of 15 percent, and it is projected to continue growing at a rate of 2.2 percent from 2019 to 2024. However, Ethiopia has faced challenges in terms of dietary diversity and poor nutritional outcomes among its population [5].

In recent years, Ethiopia's food market and system have been undergoing gradual transformation due to contextual changes. Three key drivers have been identified as the catalysts for these changes [6]. Firstly, there have been shifts in dietary consumption habits including increased calorie consumption, a decrease in the consumption of starchy staple foods, and an increased preference for high-value products. This shift is supported by the emergence of processed convenience foods like pasta and a growing trend of out-of-home food consumption. Secondly, there is an intensification and modernization of agriculture aimed at promoting commercial farming and adding value to agricultural products. This shift towards commercialization may also impact household purchasing behaviors [7]. The third driver is the growth in agricultural supply chains, resulting in rapid growth in agricultural commercial surpluses. Tef, an important crop in Ethiopia, constitutes 23 percent of these surpluses [6]. The food processing sector, which accounts for 39 percent of the gross production, is the largest manufacturing industry in Ethiopia and provides significant employment opportunities [6,8]. The growth of the agrifood processing industry in Ethiopia, centered around indigenous crops like tef, reflects a similar pattern seen in other African countries [9]. However, despite their potential to address malnutrition, enhance productivity, and improve profitability, the value chain of African indigenous crops, including tef, is understudied, leading to their classification as "orphan, neglected, or underutilized crops" [10,11].

As both producers and consumers increasingly rely on the market, the Ethiopian food industry is experiencing a rise in competition. Modern marketing techniques, the presence of retail stores, and various food distribution systems contribute to this competitive landscape. Ref. [12] documented a 75 percent increase in the number of trucks in urban wholesale markets over a decade, while refs. [10,13] suggests an increase in differentiation within urban food retail markets in Ethiopia in recent years. Understanding consumer preferences and purchasing habits become crucial for companies aiming to maintain a competitive advantage in the growing processed food market. However, there is a lack of information regarding Ethiopian consumers' preferences for processed food, with limited studies examining food attributes and consumer preferences in Ethiopia. Additionally, there is a lack of empirical research on processed food made from tef, despite its economic and nutritional significance.

This study aims to address this knowledge gap by focusing on consumer preferences for pasta and baby food made from tef, one of Ethiopia's key local cereals. Pasta and baby food are selected for this study as they represent important food products that can be produced from tef or alternative competing crops. Factors such as nutritional content, calories, sensory quality, and taste, along with changing dietary diversity and lifestyle

habits among consumers, make these products ideal for investigation [6,11,14]. Tef is specifically chosen for this study because it is one of the most important indigenous cereals grown in Ethiopia. The study utilizes hypothetical product attributes and data collected through a random survey conducted in Ethiopia. Conjoint analysis, a technique that deconstructs a product into its attributes and tests different attribute combinations to identify consumer preferences, was employed to analyze the data. The findings reveal a strong preference among Ethiopian consumers for pasta and baby food, particularly those containing tef. They also prefer organically certified products and local brands to foreign brands, indicating an interest in business practices that promote sustainable livelihoods. However, consumers are less willing to pay a premium for these products, indicating a preference for average market prices. Notably, this study is the first of its kind to analyze consumers' preferences for pasta and baby food made from tef in Ethiopia. It makes valuable contributions both theoretically and practically to research, market practitioners, and policymakers from a least developed country perspective.

The rest of this paper will progress as follows: Section 2 presents the economic and nutritional importance of tef relative to other crops in Ethiopia. Section 3 introduces literature on conjoint analysis and its application in consumer market research. The section then presents previous literature on studies on product attributes that influence consumers' purchasing intentions. Further, it examines studies on factors that influence consumers' decisions to buy pasta and baby food. In Section 4, the paper discusses the methodology of the research including the research design and how the survey was implemented. The section concludes by presenting sample characteristics and their consumption habits. Section 5 presents the econometric results of pasta and baby-based analysis of their attributes. Section 6 discusses the findings, highlighting their implication for market players and policymakers and concludes with the limitations of the study.

2. The Relative Importance of Tef

The development of an indigenous crop value chain is essential for combating malnutrition, hunger, and generating income to support livelihoods [10,11]. Indigenous crops are adaptable to marginal conditions, which is essential for resilient agriculture and sustainable food systems [15]. As climate change continues to heighten food insecurity, attention should be paid to agricultural products that are important to food and nutrition security. In Africa, food security reduces by 15 to 20 percent with each drought or flood [16]. In 2021, 20% of Africa's population was undernourished which is double the size of any region [17]. Moreover, many African countries are currently over-reliant on a few crops for nutrients and calories, making it necessary to find alternative, viable, and nutrient-rich crops to diversify eating habits [1]. Thus, African consumers spend a large share of their income on food but continue to remain malnourished, deficient in the required protein-calorie levels needed for the development of the body.

While African countries rely on fragile food chains that are vulnerable to changing weather patterns [18], Ethiopia has the potential to develop a resilient food chain. Eragrostis tef, commonly known simply as tef, is the most important cereal in Ethiopia in terms of volume of production, nutrition, as well as cash crop value. It is Ethiopia's staple food and the leading cash crop. Each year, Ethiopia uses nearly three million hectares of land with the capacity to produce approximately five million tons of tef. This accounts for about 30% of cultivated land and one-fifth of all cereal production in Ethiopia [19] (Table 1). Over the last 10 years, it has recorded a relatively steady growth in quantities produced, which implies its increasing importance to the population (Table 2). Tef is well adoptable to the Ethiopian climate and ecological conditions; it is adoptable to both drought and waterlogged conditions in Ethiopia and less vulnerable to pests and diseases in major growing areas. Tef is also believed to be one of the main sources of protein in the Western parts of Ethiopia, where it accounts for two-thirds of proteins and more than 10% of calories. This makes it the biggest contributor of calories [14]. It is, moreover, observed that since tef seed is high in fiber and free from disease-causing gluten and could be the world's

next ‘superfood’. Due to the fact that tef grains are gluten free, it is useful as food for people suffering from a gluten protein allergy called celiac disease [20]. In addition, tef is most famous for its best quality and most preferred authentic injera, an Ethiopian flat pancake-like bread. While injera can also be made from wheat, tef is most preferred because it gives the bread a spongy texture and the ability to remain fresh for longer. Another advantage is that both the grain and straw fetch a relatively higher price in the market compared to other cereals [21]. The nutritional value of tef is increasingly recognized in global markets, such as Europe and the United States, where restaurants are already selling injera. Ref. [14] estimated that if the production of tef was enhanced sustainably, it could increase the income of six million farmers. Thus, the value of tef cannot be overlooked in a country that suffers periodic famine and acute malnutrition. Additionally, while Ethiopia is struggling with poverty, *Eragrostis tef* has the potential to become a source of sustainable livelihood for a large number of small-scale farmers.

Table 1. The relative importance of crops in Ethiopia: Area, Production, and Yield of Crops for Private Peasant Holdings for Meher Season 2018/19.

Crop	Area Cultivated		Production	
	Level (in Hectares)	Share in Total Area Cultivated	Level in Tones	Share in Total
Grain	12,727,191.21	88.1	31,560,205.85	81.70
Cereals	10,358,890.13	71.7	27,763,838.10	71.90
Tef	3,076,595.02	21.3	5,403,479.05	14.00
Barley	811,782.02	5.6	1,767,518.45	4.60
Wheat	1,747,939.31	12.1	4,838,074.09	12.50
Maize	2,367,797.39	16.4	9,492,770.83	24.60
Sorghum	1,829,662.39	12.7	5,024,368.07	13.00
Finger millet	446,909.00	3.1	1,035,629.57	2.90
Oats	14,843.08	0.1	30,143.94	0.08
Rice	63,361.86	0.4	171,854.10	0.44
Pulses	1,620,497.30	11.2	301,1348.06	7.80
Oilseeds	747,803.78	5.2	785,019.69	2.03
Vegetables	241,191.40	1.7	889,316.91	2.30
Root Crops	231,551.95	1.6	4,535,754.94	11.70
Fruit Crops	119,908.57	0.8	834,356.22	2.20
Chat	323,643.90	2.2	274,777.10	0.71
Coffee	764,863.16	5.3	494,574.36	1.30
Hops	38,112.41	0.3	49,052.13	0.12
Total	14, 446,462.60	100.00	38,638,037.50	100.00

Source: Author’s calculations based on (Central statistical Agency) CSA data. Grains include cereals, pulses, and oilseeds.

Table 2. Annual growth in area cultivated production and yield for *Eragrostis tef*, 2011/2012–2020/2021.

Year	Cultivated Area in ha	Annual Growth Rate (%)	Production (tons/ha)	Annual Growth Rate (%)	Yield qt/ha	Annual Growth Rate (%)
2011/2012	2,731,111.67	−1.1	3,497,689.46	0.41	12.81	1.51
2012/2013	2,730,272.95	−0.03	3,765,241.17	7.65	13.79	7.65
2013/2014	3,016,521.9	10.5	4,418,642.20	17.35	14.65	6.24
2014/2015	3,016,062.55	−0.02	4,750,657.28	7.5	15.75	7.51
2015/2016	2,866,052.99	4.97	4,471,378.69	−5.83	15.6	−0.95
2016/2017	3,017,914.36	5.3	5,020,440.05	12.3	16.64	6.67
2017/2018	3,023,283.5	0.18	5,283,401.16	5.24	17.48	5
2018/2019	3,076,595.02	1.8	5,403,479.05	2.27	17.56	0.45
2019/2020	3,101,177.38	0.8	5,735,710.19	6.15	18.5	5.35
2020/2021	2,928,206.26	−5.58	5,509,961.51	−3.94	18.82	1.73

Source: Author's calculations based on CSA data.

3. Literature

The development and commercialization of new products involve a significant investment in the study of consumer preferences and market trends analysis. These studies are carried out to ensure success in the large-scale commercialization of new products. This is primarily because to develop a new product and succeed in the market, capturing consumers' perception and preference for the product from its early stage of development is vital for survival [22,23]. Knowledge or awareness of consumers' preferences in advance is economically advantageous because it increases the possibility to stave off the product from failure in a competitive market. That is, the producer can avoid the possibility of incurring high costs in the new product development process without any profit. Conjoint analysis and other methods of consumer research have been used in research related to the food industry. For instance, studies have been conducted to find out the buyers' intention on processed foods using ingredients such as rice [22,24], soybean [25], ginseng [26], potato [27], and sorghum grain [28]. Ref. [25] used conjoint analysis to test Japanese housewives' intention to purchase indigenous fermented soy products and found that country of origin, seasonings, and price accounted for 81.0%, while the sensory taste of the product accounted for 19.0% of purchase intents. In a survey of US consumers of ginseng food products, ref. [26] found a low level of initial interest in ginseng food products. "Sweetness" and "ginseng chocolate" were found to have the highest utility values to the consumers. The study suggested that the original ginseng flavors, including bitterness and earthiness, be minimized in order to establish the potential for success in the U.S. market. Ref. [27] investigated consumer preference for industrial potatoes with Swiss consumers and found that size, color, and producer price determine 46% of the buying decision. Ref. [28] conducted a study based on focus group discussions and conjoint analysis to determine consumer perception of human food made from sorghum grains. Focus group discussions showed that the health aspects of grain products are the most appealing for consumers, whereas conjoint analysis found that sensory attributes of the grain were the main drivers for consumer intent to purchase. Ref. [29] showed that the taste and sustainability of products positively influenced consumers' preference for processed cowpeas in Ghana. Ref. [30] found that nutrition and health claim labeling are the most important attributes for consumers when making the decision to buy enriched snack products in Ethiopia. While ref. [31] also confirmed that health is the most important concern for consumers in making purchase decisions in Ethiopia, they nonetheless find that nutrition

is not an important consideration. However, these studies are not focused on pasta or baby food.

There are limited studies that have examined the factors that influence consumers' decision to purchase pasta, despite its popularity. Previous studies have mainly focused on Italian consumers who are considered the originators, and the leading producers, consumers, and exporters of pasta in the world [2]. For instance, ref. [32] used conjoint analysis to assess consumers' considerations when buying pasta made from durum wheat. The attributes examined in the study were the origin of the wheat, color, packaging, cooking time, brand, and price. The result showed that for Italian consumers, native wheat, also known as traditional wheat, was the most important factor for making buying decisions. Ref. [33] collected information from real pasta buyers in a grocery retail and concluded that brand affects consumers' choice mostly, while protein content was the least influential attribute.

Apart from the limited research on consumers' perception of pasta, several studies have been conducted in an effort to enhance the nutritional status of pasta. Furthermore, a sensory test has been carried out to assess the acceptability of a newly developed pasta with the addition of different substances. Spaghetti was developed by including unripe banana flour, and when a sensory test was carried out among the consumers, the results showed no difference compared to commercial pasta [34]. Similarly, ref. [35] included barley in pasta, and when the product was subjected to evaluation by trained judges, they found a stronger preference for it. Several additives such as rocket salad [36], beetroot [37], and cassava [38] have been developed and taken through sensory analysis to check their acceptability and uptake in the consumer market. However, a sensory test has been conducted among a small number of customers or trained evaluators, and the goal has been to establish its competitiveness in the market. Market research with actual consumers to find what customers would consider when buying the product is still lacking on this subject.

In the case of commercial baby food, previous studies found nutritional content as a vital consideration [39–41]. However, cultural factors also influence the priority among consumers from countries of origin [42]. For instance, ref. [39] found that among five European countries, health issue was the most vital consideration for consumers when making purchasing decision on baby food. In Germany, Scotland, and Sweden, taste and organic ingredients followed health issues, while in Italy, the method of production and brand were the important considerations. Among consumers in Spain, taste and brand were ranked after health. Meanwhile, ref. [41] concluded that in South Korea, hygiene, safety, freshness, variety of ingredients, and nutritional value of baby food were highly ranked on importance and performance perception among mothers, while economic factor was not an important consideration. Further studies have been conducted to assess consumers' perceptions and preferences for organic or functional baby food [43–46]. Ref. [45] used choice experiments with price, organic level, processing process, origin of ingredients, and brand as attributes. Their study found that baby food customers were willing to pay a premium for organic food, even though it was not the most important attribute. Further, brands with higher reputations and domestic ingredients were preferred. Other studies also demonstrated the importance of organic ingredients among parents, especially due to the concern for the health of babies. However, it was also found that low trust in the advertisement or health claims of the products obstructs consumers from buying functional baby food in Malaysia.

However, most of the studies examining consumer preferences are based on developed countries. Among 119 studies from 1971 to 2017, most of them that applied conjoint analysis was based on developed countries [47]. There are limited studies from least-developed countries even though the latter has growing market opportunities. The fast-growing population and high economic growth in least developed countries will provide opportunities, while less research on the consumers can be a high risk, especially in Africa where the attributes of food can vary between countries. Ref. [48] conducted a study among household consumers in Dire Dawa, one of the biggest cities in Eastern Ethiopia to find

out consumers' preference for foreign pasta. While the study confirmed that foreign pasta was more frequently consumed, it also found that the preference is because of taste and the brand impression including attractiveness, safety, and social privileges. In Tanzania, ref. [49] found that consumers are averse to novel technology when making a choice over processed baby food. Instead, they have a strong preference for natural, nutritious, tasty, and quality processed food attributes. However, they are inclined to forego preference for naturalness to try novel technology when the novelty is embedded with benefits such as nutrition. Other studies have also been conducted on new product development, in particular, developing pasta including tef as a component [50]. Further sensory tests based on texture and taste were conducted with trained personnel, and the authors concluded that some improvement is still needed in this area of research [51].

There are also several studies that have examined pasta production in African developing countries such as Nigeria, Egypt, and South Africa. In Nigeria, for instance, a study focused on consumer preferences for pasta made from yellow cassava, a locally grown crop. The findings revealed a positive reception towards the new food, with low levels of food neophobia (32%), a consumption pattern driven by health considerations and significant acceptance of the pasta among consumers. The study concludes that there is a promising opportunity to enhance nutritional well-being and address food security concerns in low- and middle-income Africa through the utilization of yellow cassava [52]. A separate study revealed that Nigerians exhibit a pronounced inclination towards sustainability indicators linked to health and safety [53]. In South Africa, there is a significant focus on health and sustainability among consumers. They show a preference for locally sourced products that are rich in minerals and vitamins. Additionally, consumers are willing to pay a premium for products aligned with their values, indicating a propensity to support companies that prioritize sustainable practices and provide healthy choices [54]. The preferences of numerous Egyptian consumers when selecting pasta are predominantly driven by the attributes of price, color (specifically yellow), and quality [55]. In the case of baby food, there are several studies in Ethiopia focused on child malnutrition and the inappropriate weaning practice [56]. For instance, inadequate weaning practices have been identified as a concern in Northwest [57,58] and Southern Ethiopia [59,60]. Nevertheless, there are no published studies focusing on purchasing behavior or parental preference in relation to baby food in Ethiopia.

4. Methodology

4.1. Research Design

This study uses conjoint analysis to investigate customers' preference for a hypothetical newly developed pasta and baby food. Conjoint analysis is widely applied for developing new products and services to predict how customers would respond [61]. Rather than estimating customers' inclination on each attribute one by one, this analytical technique is based on questions regarding hypothetical products, comprising multiple attributes in different scales to evaluate customers' preference for different components of the product. This overall judgment is decomposed into separate judgments, which gives information on customers' preferences for each attribute [62]. Conjoint analysis can, therefore, help firms to make informed decisions about how to package their market offerings, marketing strategy, as well as consumer segmentation. In addition to its general use to solve marketing problems, its application is increasingly common in several sectors including financial services, electronic goods, education, automobile, and food products, among others [47].

4.2. Survey Implementation

Before implementing large-scale survey, a pre-survey was carried out among 17 tef professionals to arrive at appropriate attributes for each product. The professional surveyees were asked to rate the importance of each listed attribute on a scale of one to five, where a score of five is very important in making purchasing decisions, while one is not important at all. For both pasta and baby food attributes, questions were asked about

the price, quality certificate, and origin of the product brand. Price was selected as an attribute because it is the most commonly used attribute to explain consumers' selection of each attribute and its level [50]. Previous studies have also elaborated on the influences of organic products [43–45,63], and the origin of the product brand [33,46,51]. In the case of baby food, additional product features including packaging material [39,47], quantity of the product [38], and nutritional value [40] were incorporated into the list. The percentage of tef included in the product, and the type of tef used for the product were also included in the study.

The pilot survey to select appropriate attributes showed that price was the most important attribute to consider when choosing pasta. The origin of the product brand, that is, whether it is a domestic brand or foreign/imported brand, and product quality certificate was ranked as the next critical considerations. In the case of baby food, nutritional value was the most critical attribute. This was followed by a quality certificate, price, brand, package, and quantity of the product. As a result of the pilot survey, a total of four (4) attributes were chosen for pasta, while six (6) attributes were chosen for the baby food (Tables 3 and 4). After the selection of the attributes, SPSS conjoint analysis package was employed to create hypothetical product profiles. Using this program, eight (8) profiles were generated each for the pasta and baby food. These profiles were used to create the questionnaire for the final survey.

Table 3. Attributes and Attribute Levels/Classification of Pasta.

Attributes	Levels
Price	ETB 40; ETB 60 (In US Dollar, ETB 40 = USD 0.72 and ETB 60 = USD1.08. Exchange rate is ETB 1 = USD 0.018.)
Origin of Product Brand	Domestic Brand; Imported Brand
Type of Quality Certificate	General; Organic Certificate
Percentage of Tef Included	0%; 10%; 20%

Table 4. Attributes and Attribute Levels/Classification of Baby Food.

Attributes	Levels
Price	ETB 120; ETB 180 (In US Dollar, ETB 120 = USD 2.16 and ETB 180 = USD3.24. Exchange rate is ETB 1= USD 0.018.)
Main Nutrition Value	Balanced; Concentrated
Origin of Product Brand	Domestic Brand; Imported Brand
Type of Quality Certificate	General; Organic Certificate
Packing Material	Paper Bag; Sealed Can
Percentage of Tef Included	0%; 20%

The questionnaires had two sections. The first section collected general information such as socio-economic characteristics and consumption habits of the respondents. The second section collected information about consumer preferences for each product attribute. The respondents were asked to rank their preferences for each profile. Before the actual survey, a pilot survey was conducted with 30 tef experts. A few changes were made to the questionnaire for the final survey. These include the structure of the questionnaire and translation of the questionnaire to the Ethiopian language, Amharic. To ensure that the questionnaire was accurately translated without altering the meaning, a translator with many years of experience and who is fluent in both English and Amharic was engaged in the process. After the first translation, two experts working at the Ethiopian Institute of Agricultural Research were consulted to translate the questionnaire back into English. The experts further suggested how to improve the wording of the questionnaire in Amharic. A

screening question was included in the first section of the questionnaire to deduce more precise conclusions through conjoint analysis. Respondents who participated in the pasta survey were asked if they had the intention to buy pasta made from tef flour. In the case of those who participated in the baby food survey, every respondent was asked about their intention to buy baby food now or in the future. Respondents who answered 'Highly Disagree' or 'Disagree' in the questions were excluded from the survey.

The survey was conducted between February and March 2020. Three Ethiopian surveyors with experience in carrying out consumer surveys were engaged to conduct the survey. The survey was based on random sampling as well as purposive sampling targeting experts with knowledge of tef. In the first case, respondents were randomly selected in front of two main grocery stores in Addis Ababa. For the baby food survey, respondents were asked in advance if they had babies who are less than 24 months old and whether they were buying or using commercial baby food. In the case of purposive sampling, researchers working in Ethiopian governmental research centers—the Ethiopian Institute of Agricultural Research (EIAR) and Debre Zeit Agricultural Research Center (DZARC) were engaged in the survey for both pasta and baby food. In the particular case of the baby food survey, patients, caregivers, and visitors in Debre Zeit Hospital participated in the survey. In order to target EIAR and DZARC researchers and Addis Ababa University graduate students, an online survey was additionally conducted for a month. Consequently, the survey for pasta surveyed 218 consumers, while 200 consumers took part in the survey for baby food. Among the respondents, 182 results from the pasta survey and 135 results from the baby food survey were valid for use in the final analysis after the exclusion of respondents who answered using spree settings or lacking sincerity such as answering in a pattern for conjoint analysis. The assumption of the study is that those who were surveyed represent the consumption pattern of the diverse population of Ethiopia. However, consumption patterns might vary between urban and rural areas and even by ethnicity. This means they might have very different preferences for pasta and baby food.

4.3. Descriptive Analysis

4.3.1. Sample Characteristics and Behaviors

Table A1 in Appendix A shows the demographic characteristics of respondents surveyed for pasta and baby food. While respondents were predominantly male (57.7%) in the case of the pasta survey, there was a fair share of males (50.4%) and females (45.9%) in the case of the baby food survey. The majority of the respondents (81.9% and 76.3%) were in their 20s or 30s for both surveys. Understandably, as baby food is for babies, significantly more married people (71.1%) responded to the baby food survey questionnaire.

4.3.2. Consumption Habit: Pasta

Table 5 presents the consumption habits related to pasta. Among the respondents, the majority of individuals (96.7%) reported consuming pasta more than once a week. However, a small portion of the respondents (2.7%) stated that they did not eat pasta at all due to personal preferences. Based on the analysis, the main reasons for preferring pasta were its convenience in terms of cooking and eating (38.3%), taste (28.3%), and affordability (16.3%). Nutrition (14.7%) was also taken into consideration, and the occasional fasting period was mentioned as a minor factor influencing its preference. Among the respondents who had prior experience purchasing pasta from the market (89.0%), the majority (47.8%) bought pasta two to three times per month. Additionally, the quality of the pasta product emerged as the most crucial factor when making a purchasing decision, with 50.0% of respondents considering it significant. The price (28.5%) and the brand (15.2%) were also mentioned as important factors. Similarly, 4.6% of the respondents cited advertisements as an important factor that influence their purchasing decision.

Table 5. Consumption habit: Pasta.

Consumption Habit		No. of Respondents	Percentage
Frequency of eating pasta in one week	1–2 times	99	54.4%
	3–4 times	64	35.2%
	5–6 times	10	5.5%
	7 times or more	3	1.6%
	Do not eat pasta	5	2.7%
	Missing	1	0.5%
Reason to eat pasta (Multiple choice)	Convenient to cook and eat	115	38.3%
	Price	49	16.3%
	Taste	85	28.3%
	Nutrition	44	14.7%
	Other	7	2.3%
	Missing	10	-
Experience of buying pasta in the market	Yes	162	89.0%
	No	8	4.4%
	Missing	12	6.6%
Frequency of buying pasta in the market in one month	Once	36	19.8%
	2–3 times	87	47.8%
	4–5 times	35	19.2%
	6 times or more	9	4.9%
	Missing	15	8.2%
Most important factor in buying pasta (Multiple choice)	Price	86	28.5%
	Brand	46	15.2%
	Quality	151	50.0%
	Advertisement	14	4.6%
	Other	5	1.7%
	Missing	15	-
I will increase my consumption of pasta in near future	Highly Disagree	8	4.4%
	Disagree	24	13.2%
	Neutral	75	41.2%
	Agree	58	31.9%
	Highly Agree	16	8.8%
	Missing	1	0.5%
I have intention to buy pasta including tef flour	Highly Disagree	8	4.4%
	Disagree	16	8.8%
	Neutral	17	9.3%
	Agree	83	45.6%
	Highly Agree	57	31.3%
	Missing	1	0.5%

Since pasta is already a popular menu in Ethiopia, the majority of the respondents (41.2%) expressed neutrality towards increasing pasta consumption in the near future.

However, when asked about their intention to buy pasta with tef flour as an ingredient, 76.9% answered affirmatively. This indicates a very high interest in tef pasta.

4.4. Consumption Habit: Baby Food

Since the survey targeted people with babies, 80.7% of respondents were found to have children. Out of the respondents, 70.4% reported having one to three children, while 51.1% of them had one baby (Table 6). Further questionnaire items were directed toward those who have bought commercial baby food in the market (77.0%) in order to assess their consumption habits. The results showed that 69.2% of respondents frequently bought baby food, approximately two to five times a month. The results further revealed that commercial baby food was believed to be safer (34.5%) and has more nutritional value (30.9%). Similarly, quality of the product (45.7%) and nutrition value (34.2%) were identified as the most important factors when purchasing baby food. The price (15.1%) and brand of the product (5.0%) followed as additional important factors. However, advertisement (0.0%) did not influence people's decision to buy commercial baby food. On the other hand, respondents who reported having no experience in buying baby food in the market expressed doubts about the quality and nutritional value, with expiration date of the baby food being a major concern. Furthermore, the respondents mentioned the lack of suitable baby food factories in Ethiopia, leading people to prepare baby food at home.

Table 6. Consumption Habit: Baby Food.

Consumption Habit	No. of Respondents	Percentage
Number of children in the house	None	19.3%
	One	36.3%
	Two or Three	34.1%
	Four or Five	7.4%
	Six or more	3.0%
Number of babies (0~24 months old) in the house	None	42.2%
	One	51.1%
	Two	5.9%
	Three or more	0.7%
Experience in buying any commercial baby food in the market	Yes	77.0%
	No	21.5%
	Missing	1.5%
Frequency of buying baby food in the market in one month	Once	21.5%
	2–3 times	29.6%
	4–5 times	23.7%
	6 times or more	3.0%
	Missing	22.2%
Reason to buy and use commercial baby food (Multiple choice)	Convenient to cook and eat	18.6%
	Price	14.9%
	Safety	34.5%
	Nutrition	30.9%
	Other	1.0%
	Missing	-

Table 6. Cont.

Consumption Habit	No. of Respondents	Percentage	
Most important factor in buying baby food (Multiple choice)	Price	30	15.1%
	Brand	10	5.0%
	Quality	91	45.7%
	Nutrition	69	34.2%
	Advertisement	-	-
	Other	-	-
	Missing	29	-
In the present or future, I like commercial baby food that includes tef flour	Highly Disagree	7	5.2%
	Disagree	10	7.4%
	Neutral	7	5.2%
	Agree	58	43.0%
	Highly Agree	52	38.5%
	Missing	1	0.7%
	In the present or future, I have intention to buy commercial baby food	Highly Disagree	6
Disagree		8	5.9%
Neutral		24	17.8%
Agree		87	64.4%
Highly Agree		9	6.7%
Missing		1	0.7%

It is particularly noteworthy that Ethiopian consumers have shown a significant interest in baby food containing tef flour.; While 12.7% showed low or no interest in buying baby food containing tef flour, an overwhelming 82.1% responded positively, indicating their willingness to buy the product.

5. Econometric Analysis: Conjoint Analysis

5.1. Part-Worth Utilities and Relative Importance: Pasta

Respondents who did not have the intention to buy pasta that has tef flour were excluded in the conjoint analysis of pasta. As a result, out of 182 responses, 158 were used in this analysis. Tables 7 and 8 provide the part-worth utilities, relative importance, and validity of the conjoint analysis model, respectively. Pearson's R and Kendall's tau coefficient of correlation were used to assess the validity of the conjoint analysis model. The overall model was found to be adequate, as both Pearson's R (0.998) and Kendall's tau (1.000) were significant at a level less than 0.01.

In terms of relative importance, the analysis finds that the inclusion of tef flour in the product was the most important attribute (61.88%) for consumers when buying pasta. The types of the quality certificate (15.96%), price (13.09%), and the origin of the product brand (9.07%) followed, respectively. Overall, this result implies that consumers are more willing to buy pasta that includes tef as a component. Nonetheless, in line with the general economic sense, consumers tend to derive higher utility from lower prices. Pasta consumers in Ethiopia demonstrated a higher level of satisfaction when purchasing pasta within the average market price compared to buying it at 1.5 times the normal price. In the case of the origin of the brand, the results show that Ethiopian consumers have a strong preference for domestic brands over imported brands. This finding contradicts the results of a previous study [47], where customers in Dire Dawa showed a higher preference for foreign pasta products. This discrepancy might be attributed to concerns regarding the credibility of information regarding imported goods. However, the origin of the brand

did not significantly impact consumers' preferences, as the analyzed contrasting attributes showed only a small disparity. Regarding the type of certificate, the results indicate that pasta with an organic certificate was preferred over a general certificate. Finally, the findings suggest that consumers have a strong preference for pasta that contains a higher proportion of tef flour compared to pasta with a lower proportion of tef. Therefore, the inclusion of tef flour not only emerges as the most important attribute but also indicates that people prefer pasta with a higher tef content. In sum, based on the results, the most ideal pasta product for Ethiopian consumers is one that contains a high amount of tef, is organically certified, falls within a moderate price range, and is of a domestic brand. This implies that the inclusion of tef in pasta will provide a competitive advantage to manufacturers of these products in the Ethiopian market. Moreover, it suggests that there is an opportunity to commercialize tef pasta.

Table 7. Part-worth Utilities and Relative Importance of Pasta.

Attribute	Level	Utility	Relative Importance
Price	ETB 40	0.324	13.09%
	ETB 60	−0.324	
Origin of Product Brand	Domestic	0.225	9.07%
	Imported	−0.225	
Type of Quality Certificate	General	−0.396	15.96%
	Organic	0.396	
Percentage of Tef Included	0% of tef	−1.766	61.88%
	10% of tef	0.465	
	20% of tef	1.301	
Constant		5.886	

Table 8. Correlations between Observed and Estimated Preferences: Pasta.

	Value	Significance *
Pearson's R	0.998	0.000
Kendall's tau	1.000	0.000

* The Pearson's R and Kendall's tau coefficients of correlation were significant at less than the 99 percent confidence level.

5.2. Part-Worth Utilities and Relative Importance: Baby Food

Before analyzing the data, further data cleaning was conducted to exclude respondents who indicated no intention to buy commercial baby food in the present or future from the conjoint analysis. As a result, 121 out of 135 responses were used for the conjoint analysis. Tables 9 and 10 present the part-worth utilities, relative importance, and validity of the conjoint analysis model, respectively. Pearson's R (0.986) and Kendall's tau (0.691) both significant at a level of less than 0.01 implies that the conjoint analysis model demonstrated a good fit.

Beginning with relative importance, similar to pasta, the inclusion of tef flour was the most important attribute (56.26%). In addition, consumers would also consider other attributes including the type of quality certificate (15.62%), the origin of the product brand (12.51%), the price (7.00%), the packing material (5.17%), and the main nutritional value (3.44%). In sum, attributes such as price, origin of product brand, type of quality certificate, and the percentage of tef included showed the same results as pasta. This suggests that consumers have a preference for baby food products with a lower price, a domestic brand, organically produced, and a higher proportion of tef. With regard to utility, the analysis reveals that consumers prefer baby food products sold at a moderate price. In terms of

nutritional value, the analysis shows that baby food products whose nutritional value is concentrated in iron or protein is more preferred than a balanced one. Further results show consumers prefer baby food made by a domestic company rather than a foreign one. With respect to the type of certificate, the analysis shows that those surveyed prefer baby food with an organic certificate over a general certificate. Moreover, the study reveals that consumers also have a strong inclination for baby food products packed in sealed cans instead of paper bags. In terms of inclusion of tef, the respondents strongly prefer commercial baby food with tef flour over the one without tef flour. Nonetheless, in terms of ranking of the attributes, the main nutritional value and packing material of the baby food were the two least important attributes consumers would consider when buying baby food.

Table 9. Part-worth Utilities and Relative Importance of Baby Food.

Attribute	Level	Utility	Relative Importance
Price	ETB 300	0.205	7.00%
	ETB 400	−0.205	
Main Nutrition Value	Concentrated	0.063	3.44%
	Balanced	−0.063	
Origin of Product Brand	Domestic	0.227	12.51%
	Imported	−0.227	
Type of Quality Certificate	General	−0.283	15.62%
	Organic	0.283	
Packing Material	Paper Bag	−0.094	5.17%
	Sealed Can	0.094	
Percentage of Tef Included	0% of tef	−1.021	56.26%
	20% of tef	1.021	
Constant		6.065	

Table 10. Correlations between Observed and Estimated Preferences: Baby Food.

	Value	Significance *
Pearson's R	0.986	0.000
Kendall's tau	0.691	0.009

* The Pearson's R and Kendall's tau coefficients of correlation were significant at less than the 99 percent confidence level.

6. Discussion

The food industry is one of the most dynamic and competitive industries given the ever-emerging new products that share very similar attributes. To compete sustainably in such an industry, product developers must understand consumer preferences, trends, and the driving forces in the industry. They should also differentiate their products in ways that deliver greater value to their customers. However, product differentiation is also one of the most challenging tasks in the food industry. Previous studies have also shown that consumers in the least-developed countries are increasingly becoming as sophisticated as those in developed countries. They are looking for authenticity, quality, place of origin, and seasonality of food [64]. This implies that ingraining these attributes in new products could enable product developers to gain a competitive advantage in a crowded market.

This study was conducted to analyze the potential for commercializing tef pasta and baby food based on consumer preferences. Pasta and baby food are two of the most important products that can be made from *Eragrostis tef*. Additionally, these two products have a significant consumer market in Ethiopia due to the emerging eating culture in the

country. Following previous conventional approaches to new product development, this study incorporated several product attributes commonly used by nutritional and development experts in the analysis. The results reveal that tef is the most important attribute Ethiopian consumers would consider when buying pasta or baby food. Furthermore, Ethiopian consumers show a strong preference for pasta and baby food that contains a significant amount of tef flour. The analysis for baby food further shows that Ethiopian consumers prefer nutritionally rich baby food. Refs. [30,49] also found nutrition to be the most influential consideration for consumers of processed food in Ethiopia and Tanzania. Given that tef is rich in nutrients, the findings suggest that enhancing its value chain could be an effective approach to addressing malnutrition in the country. These findings are in line with previous research [9–11,29,65]. For example, a study by ref. [29] recommended the cultivation of cowpeas in Ghana as a means to enhance the nutritional intake of consumers, while also generating income for producers and processors. Similarly, ref. [57] proposed the development of the yellow cassava value chain as an opportunity to enhance nutrition security in the least developed and developing countries in Africa. Additionally, ref. [65] highlighted the importance of strengthening the utilization of locally adaptable, climate-resilient, and nutrient-rich African crops as a crucial step toward improving dietary diversity. The emerging food processors in Ethiopia can derive two significant implications from this outcome. Firstly, incorporating tef in pasta and baby food grants these products a competitive edge in the market. Secondly, there is a promising potential for large-scale commercialization of tef pasta and tef baby food within the country, as consumers have a strong preference for products crafted from tef. Additionally, the research reveals that Ethiopian consumers find products originating from their own country, especially those associated with domestic brands, more attractive than foreign brands. While it might not be clear why this is the case, it is likely that Ethiopian consumers have less confidence in foreign brands. It is also plausible that Ethiopian consumers associate foreign brands with a higher price relative to domestic brands. The preference for domestic brands over foreign ones provides an opportunity for local brands to grow if they can understand and satisfy consumer expectations [49]. The other attribute found to be of significance is the type of certificate. That is, whether a product is labeled as an organic or general certificate. This type of product branding highlights the ethical attributes of the product. The findings reveal that Ethiopian consumers prioritize organically certified food or those bearing organic labels, over general certification, making them green consumers. Consequently, businesses aiming to operate sustainably in this market need to invest in ecologically sound production methods and ensure safe handling processes for their products. In fact, certification branding serves as a crucial means to differentiate a slightly more expensive yet ethical product from a nearly identical alternative [66].

With regard to baby food, the study further finds that consumers prefer products packed in sealed cans rather than paper bags. This research postulates that this preference could be due to the lack of safe storage facilities in Ethiopia. Another intriguing finding is that Ethiopian consumers are also very sensitive to the product price and, therefore, are less willing to pay a premium even for products they perceive to have greater value. This contradicts the supposition by ref. [66] that consumers of branded products, as well as products perceived to be of greater value, would be readily willing to pay a premium. This result can be attributed to the fact that this study has been conducted in a least-developed country where the majority of consumers belong to the low-income class. This category of consumers has less disposable income and might not be willing to pay a higher price even for products of greater value. This means that those who intend to operate in this market must strike a balance between product quality and price. However, pasta is one of the foods commonly eaten away from home in Ethiopia. Thus, despite the current findings, it is hypothesized that as the middle-income class expands and the market becomes saturated with more consumers willing to eat away from home, consumer sensitivity to price is likely to change.

Overall, the findings of this study also have vital implications for diverse players in the industry. For African policymakers, it is crucial to recognize that the substantial commercialization of a local crop value chain has the potential to become a significant pillar of the economy. This is especially important considering that the processing industry plays a vital role in fostering the commercialization of smallholder agriculture and driving rural development. Moreover, the rapid growth in African population will trigger a sharp increase demand for food, while at the same time; the emerging middle class is shifting the composition of demand from unprocessed food to high-value processed food [9]. Paying attention to the development of African neglected crops could play a vital role in addressing malnutrition, famine, productivity, as well as profitability of the crops [10]. Opting for high-value indigenous African crops as the focus of production can be seen as a strategic investment, with the potential to optimize agricultural yield and reduce food prices. In a similar vein, increasing investments in nutrition-sensitive agrifood processing can directly alleviate poverty and combat undernourishment. It is worth noting that a significant portion of the agricultural workforce in Africa comprises women. By developing a profitable local crop value chain, there is an opportunity to narrow the gender gap by enhancing their income levels [1]. Additionally, a continual reliance on donor aid or food aid to Africa is not a sustainable approach to fostering prosperity. Donors should instead consider supporting Research and Development (R&D) efforts for neglected African indigenous crops and their corresponding value chains, as a means of promoting sustainable consumption. In Rwanda, Africa Improved Foods has partnered with donor organizations to provide a scalable and sustainable solution to malnutrition through the production of porridge targeting pregnant and lactating mothers as well as children. The porridge is made from locally grown mixed grains of millet, sorghum, soybeans, maize, and whole wheat [67].

Nonetheless, it is important to acknowledge that the viability of commercializing indigenous crops in African countries can vary, influenced by consumer perceptions of the country of origin. Whereas consumers in South Africa [54] and Ethiopia prefer local brands, a study found that Nigerian consumers have a negative perception of the label 'Made in Nigeria', rating it lower than labels from developed countries [68]. The study further indicates that the superior reliability and technological advancement of foreign brands are the most important reasons for the Nigerian consumer's likelihood to purchase foreign products. As a result, careful consideration must be given to the specific consumer attitudes towards indigenous products in each country when assessing the potential for commercialization. To promote the development of indigenous crops, it is important to prioritize value reorientation and raise awareness among people regarding the nutritional benefits of local crops [69]. Moreover, according to [1], it is proposed that donor aid could be directed towards African companies to assist them in enhancing quality standards and transitioning from the sale of raw commodities to the sale of processed food made from local crops.

Conclusions

African countries continue to face malnutrition challenges because of overdependence on a few crops while neglecting indigenous crops that are rich in nutrients and adaptable to their climate. However, the government of Ethiopia has increased investment in the production of tef, one of the most valuable food components. The development of the tef value chain is of vital importance, as the grain sector constitutes a large share of the agriculture produce. *Eragrostis tef* has great commercial value not only because of its richness in nutrition but also its curative element. Yet development institutions and researchers alike have paid little attention to its nutritional and economic value. Based on pasta and baby food products, this study has confirmed that there is a potential for large-scale commercialization of tef products in Ethiopia. In comparison with alternative food components, consumers are more inclined to buy pasta and baby food made from tef. It is also informative that consumers prefer domestic brands to foreign brands. This value cannot be overemphasized in a country that suffers periodic famine and acute malnutrition;

in the horn of Africa, Ethiopia is one of the countries that bear the disastrous effects of climate change and drought, which come with huge losses of lives. Yet studies also show that tef is much more adaptable to the Ethiopian climatic conditions. Additionally, while Ethiopia is struggling with poverty, *Eragrostis tef* has the potential to become a source of livelihood for a large number of small-scale farmers. Its large-scale commercialization could create employment opportunities for a sizeable number of people working along its value chain.

Overall, the commercialization of local crops in Africa presents a promising opportunity to promote sustainable consumption, combat malnutrition, and generate income. African indigenous crops are not only rich in nutrients but also highly adaptable to the diverse climatic conditions prevalent on the continent. However, to effectively promote the development of indigenous crop value chains, more research is needed to assess consumer attitudes toward the local crops. In situations where consumers hold a negative perception of local crops and brands, it becomes crucial to realign the values of the African population and raise awareness about the numerous advantages associated with consuming local crops. Specifically focusing on their nutritional benefits, it is important to emphasize and promote these advantages to fully capitalize on the potential of local crops. Additionally, supporting African companies through donor aid to improve quality standards of processed food from local crops can further enhance the commercial viability of local crops. Moreover, understanding the best strategies and practices for enhancing the entire value chain from production to processing and distribution, will be crucial for maximizing the economic and nutritional potential of African neglected crops. By prioritizing sustainable consumption, addressing malnutrition and leveraging the economic opportunities of local crops, Africa can achieve a transformative impact on food security, livelihoods, and overall well-being. There are two limitations of this study. Firstly, the study is based on a small sample size. It is suggested that where resources allow, the study should be replicated with a larger sample size to validate the findings of the current research. Secondly, most of those surveyed live in urban and sub-urban areas. Yet consumption patterns and eating habits could vary between rural and urban areas [7,70]. This problem could be solved in future studies when a larger sample size is reached to include those in different areas of the country for comparison.

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Appendix A

Table A1. Demographic Characteristics of Respondents.

	Pasta (<i>n</i> = 182)		Baby Food (<i>n</i> = 135)	
	No. of Respondents	Percentage	No. of Respondents	Percentage
Gender				
Male	105	57.7%	68	50.4%

Table A1. Cont.

	Pasta (<i>n</i> = 182)		Baby Food (<i>n</i> = 135)	
	No. of Respondents	Percentage	No. of Respondents	Percentage
Female	75	41.2%	62	45.9%
Missing	2	1.1%	5	3.7%
Age				
≤19	5	2.7%	3	2.2%
20–29	74	40.7%	27	20.0%
30–39	75	41.2%	76	56.3%
40–49	21	11.5%	24	17.8%
≥50	7	3.8%	5	3.7%
Marital Status				
Single	85	46.7%	34	25.2%
Married	93	51.1%	96	71.1%
Missing	4	2.2%	5	3.7%
Family Size				
1	17	9.3%	9	6.7%
2	16	8.8%	9	6.7%
3	31	17.0%	30	22.2%
4	25	13.7%	32	23.7%
5	35	19.2%	27	20.0%
6	25	13.7%	10	7.4%
7	9	4.9%	9	6.7%
8	5	2.7%	-	-
≥9	6	3.3%	2	1.5%
Missing	13	7.1%	7	5.2%
Education				
None	-	-	1	0.7%
Elementary (~8th grade)	5	2.7%	6	4.4%
Secondary (9th~12th grade, TVET)	37	20.3%	23	17.9%
Bachelor's	80	44.0%	49	43.7%
Above Bachelor's	59	32.4%	45	33.3%
Missing	1	0.5%	1	0.7%
Occupation				
Self-employed	36	19.8%	17	12.6%
Student	26	14.3%	9	6.7%
Government Employee	81	44.5%	73	54.1%
Private Sector	25	13.7%	26	19.3%
Housekeeper	9	4.9%	9	6.7%
Unemployed	4	2.2%	1	0.7%

Table A1. Cont.

	Pasta (<i>n</i> = 182)		Baby Food (<i>n</i> = 135)	
	No. of Respondents	Percentage	No. of Respondents	Percentage
Missing	1	0.5%	-	-
Household Monthly Income (ETB) (Exchange rate is ETB 1 = USD 0.018 at the time of drafting the manuscript.)				
≤5000 (≤USD 90)	64	35.2%	48	35.6%
5001–10,000 (USD 90–USD 180)	58	31.9%	33	24.4%
10,001–15,000 (USD 180–USD 270)	38	20.9%	36	26.7%
15,001–20,000 (USD 270–USD 360)	15	8.2%	13	9.6%
20,001–25,000 (USD 360–USD 450)	4	2.2%	2	1.5%
≥25,001 (≥USD 450)	2	1.1%	2	1.5%
Missing	1	0.5%	1	0.7%
Frequency of Purchasing Food Items				
Daily	20	11.0%	8	6.1%
Two or more time a week	68	37.4%	60	45.5%
Once a week	79	43.4%	53	40.2%
Once a month	3	1.6%	5	3.8%
Once in two weeks	2	1.1%	1	0.8%
Others	4	2.1%	5	3.8%
Missing	6	3.3%	-	-

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