Consumers’ frequency of purchasing behavior of organic honey and butter foods from the farmers’ food product market in Northwest, Ethiopia: a poisson regression approach

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Abstract: World economies are currently concerned about insufficient food supplies, food adulteration, and heavy reliance on manufactured foods. The study investigated the frequency of purchasing behaviors of organic honey and butter foods from the farmers’ food product market in Debre Markos District, Northwest Ethiopia, to shed light on this issue. A cross-sectional survey of 353 sample consumers was conducted in the study area. Consumers who buy honey and butter at the farmers’ market are chosen at random and interviewed using a structured questionnaire. Descriptive statistics and the Poisson regression model were used to analyze the data. The empirical results of the Poisson regression model revealed that socioeconomic characteristics of the consumer (gender, age, income, and education), product characteristics (quality, price, taste, adulteration, and risk), consumer trust, and knowledge all had a significant influence on the consumer’s frequency of purchasing honey and butter products. The implication is that improving product quality, increasing consumer trust, and reducing product adulteration from other unnecessary products are all necessary to increase the

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PUBLIC INTEREST STATEMENT

In the farmer’s market, organic products are sold directly to consumers and traders. The demand for organic food is rising in response to changes in consumer lifestyle, taste, choice, and standard of living as well as the country’s growing population. However, due to growing concerns about food adulteration and associated risks that have led to unsustainable consumption, the markets for organic food products have not yet fully matured. For example, honey is adulterated by sugar, whilst butter is adulterated by vegetable oil and mashed potatoes. Due to these problems, organic food consumers have intentionally shifted their demand towards manufactured goods, where the production process appears more trustworthy. As a result, this study investigates the factors that influence consumer purchase frequency of organic honey and butter foods from the farmer’s product market. To ensure sustainable consumption, marketing authorities should use food safety and quality control devices in the product market.
frequency with which consumers purchase products. It is suggested that organic food safety and quality be regulated accordingly.

**Subjects:** Sociology & Social Policy; Economics; Marketing

**Keywords:** honey; butter; determinant; purchase frequency; Poisson regression model; farmers market

1. **Introduction**

Organic food safety and quality are major concerns among modern food consumers. This concern coincides with their awareness of the relationship between production practices and food product quality, as well as their environmental concerns regarding food (Arnot et al., 2016). Increased awareness has contributed to an increase in demand for environmentally friendly food, as well as an increase in consumer interest in developing a closer relationship with the organic food producer (Oroian et al., 2017).

Furthermore, organic and healthy food demand appears to be increasing in line with the country's population growth, changes in consumer lifestyle, tastes, and preferences, and standard of living (Dolezalová et al., 2016; Gassler et al., 2019). As a result, healthy foods have grown in importance in the global food market and in consumption patterns. As a result, global production of healthy foods is expected to increase significantly, and the organic market is regarded as one of the most promising growth markets in the food industry (Hossain & Lim, 2016). Organic foods are being purchased by consumers as an investment in their health.

However, there is a growing problem in developing countries of information asymmetry between sellers and buyers about the quality and safety of organic food in the food market. Obviously, sellers are much more familiar with the product's quality and safety attributes than buyers are, and buyers are unlikely to assess these attributes during the transaction (Dolezalová et al., 2016 Gassler et al., 2019). Given these issues, Ethiopia has seen an increase in food adulteration on fresh products, food contamination by lower-grade foods and unnecessary substances, and unregulated additives in fresh foods (Woldemariam & Abera, 2014). Honey and butter adulteration endangers food safety, food security, and the ecological sustainability of this important and valuable product (Fakhloei et al., 2020). The problem has two effects: first, consumers’ health has been affected much more than previously where it was assumed to have accurate information (Choudhary et al., 2020); and second, markets for organic foods have underdeveloped.

Understanding the health risks of these unsafe foods, consumers are increasingly turning to manufactured foods (such as edible oil and sugar, which serve as substitutes for butter and honey, respectively; FSSAI, 2016; Qian et al., 2011). As a result, even if consumers buy many other products from the farm market, growth in sales of fresh honey and butter foods in farm markets tends to lag behind growth in sales of manufactured foods. Finally, sustainable agriculture faces three new challenges: producing more, polluting less, and distributing it more effectively (Oroian et al., 2017).

However, no research has been conducted in Ethiopia, including the study area, on the purchasing frequency of honey and butter foods, despite the fact that consumer trends are constantly changing. The study area, Debre Markos district, is one of Ethiopia’s high potential honey and butter producers. Despite the rapidly increasing demand for organic foods, research on the determinants of consumers’ purchasing frequency behaviors of organic honey and butter farm products from the farmers’ product market has been lacking in the literature. As a result, given the high potential areas for honey and butter products, as well as the high demand for these products in this area, this study seeks to investigate consumers’ purchasing frequency behaviors of organic honey and butter farm products in the farmers’ product market in Debre Markos District, northwest
Ethiopia. It aids in determining what factors influence the consumer’s decision to purchase healthy foods. It assists market actors and policymakers in identifying the factors that influence consumers’ purchasing frequency of organic foods, thereby ensuring sustainable agricultural development.

2. Literature review

2.1. Overview of honey and butter production and utilization in Ethiopia

The production and utilization of honey and butter food products are reviewed at the country level in Ethiopia. Geographically, butter and honey production and consumption have occurred in all regions of Ethiopia (CSA, 2021a). For instance, honey is made from hives of traditional, intermediate, and modern types, while butter considered in this table is produced from cow milk (see, Table 1). Both honey and butter are used as traditional foods across the world, including Ethiopia. According to USAID (2012) reports, Ethiopia has approximately 1.4–1.7 million households engaged in beekeeping and produces various types of honey that vary regionally as well as in terms of color, consistency, and purity. The country’s honey production potential, the variety of natural honey flavours associated with the country’s diverse bee forage sources, and Ethiopian honey’s desirable qualities, such as low moisture content, have all been universally acknowledged.

Traditional beehives made from old logs found in the forest are the most commonly used method of honey production in Ethiopia (CSA, 2021a; Gratzer et al., 2021; Yadeta, 2015). In 2019, Ethiopian honey production is estimated to be about 150.23 million kilograms, with traditional hives producing the majority of the honey (CSA, 2020a). The annual average honey yield from intermediate hives is estimated at 497.3 thousand kg, while that of modern hives is at about 1.9 million kilograms of honey. However, honey production fell to 129 million kilograms between 2019/20 and 2020/21. Reasons for the decline in honey supply might include the use of outdated technologies, a lack of training, and a lack of financial resources (such as loans) for beekeepers to purchase modern beehives and other tools needed to increase honey production (Miklyaev et al., 2014). Regarding butter production, butter (Kibe in Amharic) is produced solely from cow milk in Ethiopia (Abebe et al., 2020). Approximately 40.67% of the country’s milk was reported to be processed into butter and Ethiopian cottage cheese (Ayib) using traditional equipment (CSA, 2021b). In 2020, about 1.7 billion liters of cow milk were used in the production of butter in Ethiopia (CSA, 2021b). The report in the observed time period indicates there is a consistent increase in cow milk used for butter production (See, Table 1).

In terms of livestock product utilization, it is widely accepted that honey and butter products are frequently used for household consumption and/or sold to finance the purchase of basic household commodities such as coffee, salt, cooking oil, sugar, and so on (CSA, 2021b). Due to their high nutritional value and cultural value, the demand for butter and honey is increasing (Abebe et al., 2020). The revenues generated by the sale of butter and honey are primarily used to cover

| Table 1. Honey and butter production in Ethiopia |
|-----------------------------------------------|
| **Product types** | **Production from** | **Total Production** |
|                  |                   | 2019/20 | 2020/21 |
| Honey (Kg)       | All types of Beehives | 150,257,615 | 129,301,078 |
|                  | Traditional        | 145,327,500 | 124,791,328 |
|                  | Intermediate       | 1,453,942 | 920,058 |
|                  | Modern             | 3,476,172 | 3,589,692 |
| Butter (litter)  | Cow milk for butter | 1,440,900,676 | 1,783,051,968 |

Source: Source: CSA (Central Statistics Agency) Ethiopia data from (CSA, 2020a, 2021a)
(https://www.statsethiopia.gov.et/our-survey-reports/)
Table 2. Honey and butter product utilization in Ethiopia

| Percent of product utilized for: | 2019/20 | 2020/21 |
|---------------------------------|---------|---------|
|                                 | Honey   | Butter  | Honey   | Butter  |
| Household consumption           | 37.07   | 54.89   | 37.13   | 56.17   |
| Sales                           | 58.70   | 38.60   | 58.46   | 36.67   |
| Wages in kind                   | 0.69    | 0.48    | 0.49    | 0.58    |
| Others                          | 3.73    | 6.02    | 3.92    | 6.58    |
| Total %                         | 100     | 100     | 100     | 100     |

Source: CSA (Central Statistics Agency) Ethiopia data from (CSA, 2020b, 2021b) (https://www.statsethiopia.gov.et/our-survey-reports/)

household expenses, with a part of the earnings going toward savings and investment, as well as covering various expenses such as the repayment of fertilizer loans and the purchase of livestock inputs (Endalew & Ayalew, 2016; Gebremedhin et al., 2014). The products are now and then used as payments and gifts for others (CSA, 2021b).

According to CSA (2021b) statistics, 37.13 percent of total honey production was used for household consumption, 58.46 percent was sold, 0.49 percent was used for wages in kind, and the remaining 3.92 percent was used for other purposes (see, Table 2). Approximately 59 percent of total honey production was sold to consumers, collectors (near village/town markets), or beekeeper cooperatives. The honey collectors sold it to tej houses. Honey wine, also known as Tej, is a popular honey drink consumed throughout Ethiopia. Domestic honey consumption is increasing as a consequence of the high demand for tej, which has increased consumption of processed table honey in most urban areas and increased demand for honey in local industries (Gratzer et al., 2021; Sebeho, 2015). Up to 80% of the honey collected is used to make the traditional beverage; the remainder is sold as table honey (Gratzer et al., 2021; Serda et al., 2015).

Furthermore, butter is a traditional food that is widely consumed all over the world, as well as an important milk product that is being marketed. Butter is used as a cooking ingredient as well as a cosmetic for skin and hair treatment (Gebremedhin et al., 2014). Fresh butter is frequently used for cosmetic purposes, whereas mature butter is preferred for cooking due to its high nutritional value (Patange et al. 2013). According to CSA (2021b) Ethiopia, 56.17 percent of total butter production was consumed by households, 38.67 percent was sold, less than 1% was used for wages in kind, and the remaining 6.58 percent was used for other purposes (see, Table 2).

2.2. Overview of the economics of food adulteration

Economic adulteration is now a long-term issue affecting the global food industry at its most severe level (Choudhary et al., 2020). Food adulteration is a process in which the quality of food is lowered or reduced by replacing lower quality food ingredients, adding non-authenticated substances, or removing a vital component from food in order to increase sales volume and profit (Banti, 2020). It can also be defined as the act of adding, removing, or substituting valuable food ingredients with less expensive (cheaper) substances for unfair economic gain (FSSAI, 2016). This act of food fraud may result in an economic profit for the manufacturer who adulterates the food, but it results in a loss for the final consumers of the products (Banti, 2020).

Food is mostly adulterated in order to enhance quantity and profit. The nutrients in the meal are sucked out. Consumer items such as butter, honey, and milk have been widely adulterated in Ethiopia and across the world. Local butter, for example, has been found to be adulterated by vanaspati, mashed potatoes, vegetable oil, and dalda; local honey has been found to be adulterated by sugar syrup and molasses; milk is mixed with water; chili powder is adulterated by brick
powder; wheat flour is adulterated by chalk powder; chicory and roasted barley are used as an adulterant for coffee; black pepper is adulterated by papaya seeds; According to Subba and Wangchuk (2022), more than 50% of the local butter samples that were analyzed were adulterated with either vanaspati or banana, or both. The following table summarizes the adulterants of different food items in the literature.

One typical approach for producers to increase their monetary flow is to adulterate food products (Subba & Wangchuk, 2022; Johnson, 2018; Woldemariam & Abera, 2014). External food ingredients are added to raise the total weight or to make the product look more valuable (Bansal et al., 2017). Although some selfish producers, processors, and retailers started adulteration in order to increase their profit margins, the major causes of adulteration are dishonesty and a lack of accidental quality evaluation on questionable items (Anita and Neetu, 2013; Ayza & Yilma, 2014). For example, Ehsan et al. (2010) observed that the high price of fuel inspired people in Bangladesh to adulterate petrol in order to reap unfair financial gains. Food and drinks are generally adulterated for reasons such as when demand exceeds supply, to improve market competitiveness by lowering production costs; to increase profit margins; a lack of trained manpower with outdated food processing techniques; when the common man cannot afford food items with their original constituents; and a lack of awareness about disease outbreaks caused by adulterated food products (Narayan, 2014).

2.2.1. Impacts of food adulteration on consumers and producers
Food adulteration not only depletes key nutrients from your foods but also makes them toxic, which can cause paralysis and, in severe cases, death in consumers (Wolademariam & Abera, 2014). For example, butter adulterated with vanaspati will cause long-term heart problems in consumers (Navale & Gupta, 2016). Adulterated food consumption causes a variety of diseases, ranging from minor to life-threatening issues such as vision problems, liver failure, heart disease, blood disorders, kidney damage, skin diseases, and stomach disorders such as diarrhea (Bansal et al., 2017). Sugar and bananas in food can quickly cause health problems such as cancer, infertility, and brain damage (Choudhary et al., 2020; FSSAI, 2016). Other studies have discovered that the harmful effects of food adulteration are linked with diarrhea, abdominal pain, nausea, vomiting, eyesight problems, headaches, insomnia, muscular paralysis, and brain damage; stomach disorder giddiness, joint pain, liver disorder, dropsy, gastrointestinal problems, respiratory distress, cardiac arrest, glaucoma carcinogenic effects, kidney failure, brain damage, digestive system disorders, and digestive system disorders (Anita and Neetu, 2013; Faraz et al. 2013; and Lakshmi et al., 2012). This suggests that consumers’ health is extremely susceptible to food adulteration, particularly from organic foods.

Adulteration also harms farmers and producers (such as dairy and honey) by eroding consumer trust in their products. During the crisis, many farmers suffered large losses, cost rises, milk cow shortages caused by mass sales or slaughter, as in the case of the China dairy scandal, and a lack of acceptability of the products (Nie, 2008; Qian et al., 2011). Consumers are throwing doubt on a supplier’s fault, resulting in lost revenue due to a lack of customer confidence. People are losing trust in the products they buy. According to Qian et al. (2011) in China, for example, due to milk adulteration by melamine, approximately 40 to 60% of consumers either stopped or were unwilling to purchase domestic milk products, whereas those who purchased foreign milk powder increased from 34% to 47%.

2.3. Determinants of consumer behaviour for the purchasing frequency of organic honey and butter
Variables in the buyer’s black box, such as attitude, knowledge, trust, perceived risk, and values, determine the purchasing decision of food commodities in the Model of Buyer’s Behaviour (Kotler & Armstrong, 2007). So the basic point that market participants must understand is the buyer’s black box. What happens inside the consumer’s mind is referred to as the “black box.” According to Wijesinghe et al. (2021) and Hossain and Lim (2016), perceived knowledge, trust, and availability,
and government support and policy affects the purchase intention of organic foods, increased dairy product purchase intention. Furthermore, the empirical results of Wahyudi et al. (2019) indicates that socio-economic characteristics of the consumers such as gender, age, occupation, education, and income; colour, and products price significantly influenced consumers’ frequency of purchasing locally-produced rice. Daba et al. (2021) also shows that unavailability, unaffordability, income, family size were associated with the choice of animal source food (ASF). Another study also indicates that quality (Dolezalová et al., 2016) and taste (Gassler et al., 2019) determines the purchasing decisions of organic food consumers. Education, age, and perceived risk (Arslan et al., 2013; Nguyen & Gizaw, 2014; Rzem & Debabi, 2012) all have a negative impact on organic food purchases.

Furthermore, gender, product quality, lower price, and taste (Pawl and Tadeusz, 2014) influence consumer purchasing behaviour, in the food market. The level of social pressure from family and friends (Senadisai et al., 2014), trust (Arnot et al., 2016), and product availability (Kumar & Babu, 2014), and consumers’ product-related knowledge or experience all have an impact on a product’s purchase intention (Cakici & Shukla, 2017). Consumers trusted vegetable growers and the government more than vegetable processors and retailers in the food supply chain (Ariyawardana et al., 2017; Macready et al., 2020). Furthermore, consumers trust the government and third parties more, indicating an awareness and appreciation of food regulation and inspection (Li et al., 2021). Consumers are less trusting of retailers because they are more skeptical of the food’s credibility, fearing that retailers will add harmful substances to organic food. Food adulteration has a negative impact on consumer purchasing decisions (Fakhlaei et al., 2020; Fuhrman, 2018). For instance, butter is tainted by the addition of vegetable oil and banana, whereas honey is tainted by the addition of molasses and cane sugar (Ayza & Belete, 2015; Choudhary et al., 2020). For example, according to the findings of a study conducted in Bahirdar, 6.7% of butter samples were adulterated with vegetable sources, primarily mashed potatoes (Woldemariam & Abera, 2014). According to the same study, 15% of honey samples were adulterated with sugar and invert sugar.

2.4. Conceptual framework
The link between the independent and dependent variables in this study is depicted in Figure 1. The researcher desired to determine the factors that influence purchasing decisions based on a review of the literature. According to the figure, there are fourteen variables that affect a consumer’s purchasing frequency, which eventually leads to the decision to purchase organic butter and honey.

3. Methodology
3.1. Research design
A descriptive and inferential research design was used to examine consumers’ purchasing habits of organic honey and butter foods from the farmer’s food market in Debre Markos District,
northwest Ethiopia. Consumers were polled in cross-sectional surveys. These food types were chosen because they are more susceptible to adulteration than other types of food products.

3.2. Study area
This research was conducted in Debre Markos district, the administrative headquarter of the East Gojjam Zone of Amhara, Ethiopia. It is 299 kilometres northwest of Addis Ababa, the capital city. It has latitude and longitude of 10 20.43 E and an elevation of 2,446 meters. Demographically, Debre Markos has a total population of around 262,497, of whom 129,921 were men and 132,576 women (CSA Census, 2012). The choices of this study area were that it be the metropolitan city administration of the Zone by the year 2021. Given this, a high number of interactions between people from different woredas with varying household income levels, economic activity, politicians, students, businessmen, and women were found. Debre Markos area is well known in Ethiopia as the center of honey and dairy production and consumption as shown in Figure 2.

The study's objectives were explained to the participants prior to conducting face-to-face individual interviews. Food buyers were notified that their participation was completely voluntary, so any information they provided would've been kept confidential and anonymized. Participants were notified that they could refuse to take part, refuse any answer, and finish the interview at any time without fear of being wrong. There's no need for ethical clearance of the questionnaire used in this study as it was non-intrusive, didn't require any ethical dilemmas, and posed no risk of harm to the buyer.

3.3. Study population
The target populations were both male and female shoppers who visited to purchase honey and butter in the farmers' open market. The target population's data was gathered from the five major farmer food product markets in Debre Markos District, namely Wuseta, DinchTera, Bole, Dibizza, and Kidane Mihret.

3.4. Sample size and sampling technique
We used the Cochran (1967) sample size formula; it's appropriate when the population size is too large and unknown. Written as follows:

\[ n = \frac{Z^2 \cdot P(1 - P)}{d^2} \]

Where \( n \) = the desired sample size, \( P \) = sample proportion, \( Z = Z\)-score corresponding to the degree of confidence. In this case, the \( Z \) score is 1.96 at 95% of the confidence interval. \( d = \) the minimum desired precision, which is 0.05. We have taken 50% of the population proportion that is
recommended if the population proportion is not precisely estimated or not sure. A 10% non-response rate was considered.

\[ 384 = \frac{1.96^2 0.5(1 - 0.5)}{0.05^2} \]

Using this formula and the figures provided, the sample consumers for this study would have a minimum sample size of 384. However, after accounting for the non-response rate and excluding questioners that were poorly completed, the total number of consumers surveyed was 353. A multi-stage sampling technique was used to select consumers for data collection. First, a purposive sampling technique was used to select the five major honey and butter marketing sites in the farmers’ open market. Second, simple random sampling was used to identify potential buyers of such products. Organic honey and butter food products were widely consumed in the Debre Markos district.

### 3.5. Data collection instruments

Three methods were used in this study to collect relevant data and information about the purchasing frequency of food products at farmers’ markets.

1. **Structured questionnaires** were prepared and distributed at random to consumers who are potential buyers of honey and butter.

2. **The Focus Group Discussion (FGD)** was held using a prepared checklist to determine the determinants of the frequency of food purchases in the study area.

3. **Key Informant Interviews (KII)** was conducted with people who are knowledgeable about food quality and safety. Animal directors and animal product regulatory bodies in the East Gojjam Zone were interviewed as a result of this.

### 3.6. Method of analysis and model specification

Both descriptive and statistical analysis methods were used. The frequency distribution, percentage, and mean value of the study variables were used in the descriptive analysis. The Poisson regression model was used to investigate the significance of the independent variables on food product purchase frequency. Using Stata 14 version, the maximum likelihood estimation (MLE) of the Poisson regression model was used to compare the values of explanatory variables with the purchase frequency of food products, specifically honey and butter.

The Poisson regression model was used in this study to assess the factors influencing consumers’ purchases of fresh honey and butter at the farmers’ open market. The Poisson regression model was chosen because it is a good model for estimating count data (Ferrara & Ward, 2007; Greene, 2000). The Poisson distribution is a non-linear regression model application of the Poisson distribution (Mensah-Bonsu et al., 2017). The independent variables \( x_i \) are related to a scalar dependent variable \( y \) in this distribution.

In the Poisson regression model, mean = variance. Let \( Y_i \) represent counts of events occurring a given time or exposure periods with rate \( \mu_i \). The Poisson regression model is specified as follows:

\[ P(Y_i = y_i; \mu_i) = \frac{e^{-\mu_i} \mu_i^{y_i}}{y_i!}, \quad \mu_i > 0, i = 1, 2 \ldots n, \text{ and } y_i = 0, 1, 2, 3 \ldots \]

The equation can be specified as

\[ \mu = \exp(\beta_0 + \beta_1 x_{i1} + \beta_2 x_{i2} + \ldots + \beta_k x_{ik}) \]

Where, \( y_i \) denotes the value of an event count outcome variable occurring in a given time or exposure period with a mean parameter \( \mu_i \). \( \mu \) is the mean and variance of the Poisson distribution, which is assumed to be a non-linear function of the independent variables. \( \beta_0 \) is the intercept of
the model, and $\beta_1, \beta_2, \ldots, \beta_k$ is the coefficients (parameters estimated by the maximum likelihood function) of independent variables. $K$ is the number of explanatory variables.

Here, a description of the variables used in the Poisson regression model and their measurement for consumers’ frequency of purchasing honey and butter foods is shown below.

4. Results and discussions

4.1. Descriptive analysis

According to Table 3, women accounted for 79% of respondents who declared to make a purchase decision more frequently than men, and they also purchased the selected food products at a higher frequency. Women place a higher value on the various characteristics of food products (Ubrežiová et al., 2019). They buy not only for themselves but also for other members of the households with whom they live, by imposing the types of products consumed on a daily basis in accordance with current market trends (Wahyudi et al., 2019). This is because women are more concerned with the taste and quality of products than men are.

In the preceding table (Table 3), prime age groups aged 21–50 accounted for 81.59% of buyers of food products at the farmer’s market, followed by mature age groups (15.3%), and early working age buyers (3.12%). Individuals with a secondary education level were the largest buyers of honey and butter, accounting for 57.5%, while the lowest number of buyers was classified as illiterate. Furthermore, consumers with an average monthly household income of more than 8000 Birr were the most likely to purchase organic food products. This is due to the fact that honey and butter foods sold at the farmers’ open market are organic in nature, higher in quality, and more expensive. As a result, low-income people cannot afford it.

The dependent variable in the consumer choice model was formed based on the question where respondents were asked to evaluate the purchase frequency of honey and butter food products in Table 4 and 5 below. An ordinal scale was used to code the responses.

### Table 3. Socioeconomic distribution of consumers

| Variables        | Categorise                          | Total |          |
|------------------|-------------------------------------|-------|----------|
| Sex              |                                     |       |          |
|                  | Female                              | 79    | 79.04    |
|                  | Male                                | 20.96 |          |
| Age              |                                     |       |          |
|                  | Early working age (15–20) years     | 11    | 3.12     |
|                  | Prime working age (21–50) years     | 288   | 81.59    |
|                  | Mature working age (51 years and above) | 54    | 15.30    |
| Education        |                                     |       |          |
|                  | No education (Illiterate)           | 12    | 3.40     |
|                  | Primary (1–8 grade)                 | 56    | 15.86    |
|                  | Secondary (9–12 grade)              | 82    | 23.23    |
|                  | College level and above (≥13 grade) | 203   | 57.51    |
| Monthly consumer income |                     |       |          |
| < 2000           |                                     | 21.81 |          |
| 2001–5000        |                                     | 11.33 |          |
| 5001–8000        |                                     | 10.76 |          |
| > 8000           |                                     | 56.09 |          |

Source: Authors computation using survey data (2022)
Only 35.13% of respondents are non-buyers of honey, while 7.37% are non-buyers of butter. In contrast, 31.44% of consumers buy honey twice a year, and 21.81% of respondents buy butter every three or four months. Only 1.7% of respondents buy honey every two months, while 15.01% buy butter every month and around six times per year as shown in Table 6 and 7.

### 4.2. Empirical analysis of dynamic determinants of purchasing frequency of consumers behaviour in the honey and butter farmers open market

The regression included variables such as those found in the buyer’s black box, as well as economic and product characteristics.

The purchasing frequency of both food types was significantly related to household income, quality, trust, availability, adulteration, and perceived risk. Furthermore, sex, education, taste, and friends all have a significant impact on the purchase frequency of honey products, whereas age,

| Table 4. Description of variables and its measurement |
|---------------------------------|---------------------------------|------------------|
| Variable                        | Description and measurement     | Expected sign    |
| **Dependent variable:** frequency of purchases: butter, honey | Frequency of purchases (number) per year | ± |
| **Independent Variable**        |                                 | ±               |
| Age                             | Actual age in years             | ±               |
| Sex                             | Consumer’s gender, dummy: 1 = female, 0 = male | ±               |
| Household size                  | The number of individuals in a household | +               |
| Education                       | Consumers education level in year of schooling | ±               |
| Households Income               | Total Households income (in Birr) | ±               |
| Quality                         | Purchased product has quality, Dummy: 1 = quality, 0 otherwise | ±               |
| Taste                           | The taste of the product, dummy = 1, 0, not tasty | ±               |
| Price                           | Price per Kg in Birr, dummy: 1 reasonable, 0 = otherwise | ±               |
| Trust                           | Consumer’s trust sellers about safety of food, dummy: 1 = yes, 0 otherwise | ±               |
| Knowledge                       | Having knowledge about the quality and safety, Dummy, 1 = yes, 0 otherwise | ±               |
| Availability                    | Good availability of the product, Dummy: 1 = yes, 0, otherwise | ±               |
| Adulteration                    | Having the past experience of food adulteration in your purchase, Dummy, 1 = yes, 0 otherwise | ±               |
| Risk                            | Consumers perceived risk negatively affect purchase, dummy 1 = yes, 0 otherwise | ±               |
| Families and Friends            | Families and friends influences to purchase, dummy, 1 = yes, 0 otherwise | ±               |
| Purchase from farmers           | Purchase from farmers, dummy, 1 = yes, 0 otherwise | ±               |

Source: Literature review and authors compilation

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household size, knowledge, and salesperson all have an impact on the purchase frequency of butter. Consumers who are younger and have a higher income are more likely to purchase butter foods, and the latter is also a key factor in purchasing honey.

The age of the consumer had a negative influence on the frequency of butter purchases ($p < 0.005$). Older respondents are less likely than younger respondents to purchase high-quality foods (Wahyudi et al., 2019). The purchasing frequency of butter foods increases among young consumers. This is most likely due to the fact that young consumers use butter not only for cooking

### Table 5. Different food items and their adulterants

| Food and drink items | Adulterants/ extraneous substances | Purpose/reasons | Type of adulteration |
|----------------------|------------------------------------|-----------------|----------------------|
| Ghee                 | Vanaspati, anatta, & oleomargarine | To make more yellow | Deliberate           |
| Milk                 | Water, Skim milk                   | To increase volume | Deliberate           |
| Butter               | Vanaspati, vegetable oil, banana, mashed potatoes, sweet potato, dalia | To increase volume and make yellowish | Deliberate           |
| Honey                | Malasses, cane sugar               | To increase volume | Deliberate           |
| Red wine             | Juice of bilberries                | To attract/produce deep blue precipitate with lead acetate | Deliberate           |
| Mustard oil          | Papaya berries                     | To add bulk and weight | Deliberate           |
| Black pepper         | Papaya seed                        | To add bulk     | Deliberate           |
| Chillies powder      | Brick powder                       | To increase weight | Deliberate           |
| Sugar                | Chalk powder                       | To increase amount | Deliberate           |
| Oils                 | Rancid oil                         | To increase volume | Deliberate           |
| Common salt          | White powdered stone, chalk        | To increase amount | Deliberate           |
| Coffee powder        | Chicory, roasted barley powder, tamarind Seeds powder | To add bulk and colour | Deliberate           |
| Wheat                | Ergot (poisonous fungus)           | To increase weight | Deliberate           |

Source: Choudhary et al. (2020); Ayza and Belete (2015); Woldemariam and Abera (2014)

### Table 6. Purchase frequency dynamics for honey and butter food produces

| Purchase Frequency (per year) | Honey | Butter | Dependent variable (Purchase) |
|-------------------------------|-------|--------|-------------------------------|
|                               | Frequency | Percentage | Frequency | Percentage |          |
| Once a month                  | 13     | 3.68   | 63      | 17.85      | 12       |
| Every two months              | 6      | 1.70   | 53      | 15.01      | 6        |
| Every three to four months    | 40     | 11.33  | 77      | 21.81      | 3        |
| Twice a year                  | 111    | 31.44  | 66      | 18.70      | 2        |
| Once a year                   | 59     | 16.71  | 68      | 19.26      | 1        |
| Never                         | 124    | 35.13  | 26      | 7.37       | 0        |

Total number of observation ($N$) = 353

Source: Author's computation using survey data (2022)
Table 7. Results of the poisson regression of consumers purchase frequency of agricultural food products

| Purchasing frequency (dependent variable) | Honey | Food Products | Butter |
|------------------------------------------|-------|---------------|--------|
| **Coefficients** | Std. error | **P value** | Coefficient | SE | **P value** |
| Age | .0024269 | .004529 | 0.592 | −.0065721* | .0030184 | 0.029 |
| Sex | −.3191356* | .0967362 | 0.001 | −.0151798 | .0667165 | 0.820 |
| Household size | .0199839 | .031647 | 0.528 | .086265* | .021678 | 0.000 |
| Education | −.0273485* | .0088429 | 0.002 | .0064664 | .0057406 | 0.260 |
| Household Income | .0000226* | 4.25e-06 | 0.000 | 9.56e-06* | 2.99e-06 | 0.001 |
| Quality | .295333* | .139376 | 0.034 | .4926055* | .1570932 | 0.002 |
| Taste | .4146624* | .1690444 | 0.014 | .1641044 | .1342216 | 0.221 |
| Price | .1570001 | .1156421 | 0.175 | .0730186 | .0632153 | 0.248 |
| Trust | .3032896* | .1364169 | 0.026 | .1847301** | .0908915 | 0.042 |
| Knowledge | .1200883 | .1162185 | 0.301 | .2982737* | .0837852 | 0.000 |
| Availability | .2863375** | .1508692 | 0.058 | .2094674* | .089728 | 0.020 |
| Adulteration | −.2973057* | .1442404 | 0.039 | −.3989594* | .0935703 | 0.000 |
| Risk | −.3267695* | .1345065 | 0.015 | −.2556201** | .0969939 | 0.008 |
| Families and friends | .2138105* | .10303 | 0.038 | −.097957 | .0639157 | 0.125 |
| Purchase from farmer | .2014811 | .1224776 | 0.100 | .1595912** | .0878239 | 0.069 |
| Constant | −.3781668 | .2724251 | 0.165 | .4387534 | .1909616 | 0.022 |
| Log likelihood = | −479.91332 | | | −674.10548 |
| LR chi2(15) = | 559.77 | | | 824.06 |
| Prob> chi2 = | 0.0000 | | | 0.0000 |
| Pseudo R2 = | 0.3684 | | | 0.3794 |
| Number of obs = | 353 | | | |

*** denotes significant at 5% and 10% level, respectively.
but also for cosmetic and beauty purposes, whereas the latter is less important for older age groups (Gebremedhin et al., 2014). Similarly, sex had a significant negative influence on the frequency with which consumers purchased honey ($p < 0.05$). This implies that females bought more honey than males. Although women are more involved in family shopping, they have a lower preference for purchasing honey than men. This is because women's product-related knowledge experience indicates the existence of low-quality foods, which may have lower value for consumers but also pose high risks (Cakici & Shukla, 2017). Women's food purchasing frequency is reduced when they are suspicious of high risks. Additionally, household size has a positive and statistically significant effect on the purchase of butter foods ($p < 0.05$). Families with more children are more concerned about healthy eating than single people who eat junk food (Daba et al., 2021). Furthermore, consumer education had a significant negative influence on the frequency of purchasing honey products ($p < 0.05$). According to the descriptive statistics, approximately 57.51% of the respondents have completed grade 12 education levels. Higher education levels are likely to be less likely to purchase honey, as they may be more aware of the health risks of consuming adulterated honey. This is consistent with Wahyudi et al. (2019) findings.

Furthermore, household income had a significant positive influence on the frequency of purchasing both honey and butter ($p < 0.05$). Consumers’ purchases of goods and services are influenced by their personal income (Daba et al., 2021; Wahyudi et al., 2019). Higher-income consumers are more likely to purchase more products than lower-income consumers. This implies that as the household income increases, the purchasing preference and power for high quality food increases.

The quality of the product influences the purchase of both honey and butter foods ($p 0.05$). Because of the high quality, consumers purchase organic foods from farmer’s markets (Dolezalová et al., 2019; Gassler et al., 2015). Consumers consider product quality, such as potential risks and benefits. If the consumer is satisfied, he will most likely buy the same product again based on his previous experience and positive image (Kotler & Armstrong, 2007). Good taste increases honey purchase frequency significantly ($p < 0.05$), as taste is the most important criterion among consumers when purchasing organic food (Gassler et al., 2015). Taste and food safety encourage consumers to spend more money on such high-quality organic foods. Consumers buy organic foods due to their freshness, taste (more natural and rich flavour), and high quality.

Consumers’ trust in the authenticity of the goods had a significant positive influence on the frequency with which they purchased honey and butter foods ($p < 0.05$). Customers’ trust in retailers’ commitments to customer rights and the environment has a significant impact on their proclivity to purchase organic products (Nuttavuthisit & Thøgersen, 2017; Lee et al., 2020; W. Yu et al., 2021). The greater a consumer's trust in purchasing organic foods, the more likely they are to do so. Consumers want to know that the product truly comes from organic farming, with no shady certification or production practices (Arnot et al., 2016). According to one of the focus groups, consumers may have the intent to buy but fail to do so. This is due to the fact that if the appearance is unsatisfactory and the product appears adulterated to consumers, they will feel cheated and will perceive the product as being of poor quality, reducing their purchase intention. Wijesinghe et al. (2021) and Nuttavuthisit and Thøgersen (2017) both support this.

Consumer knowledge influences the frequency of purchase of butter foods ($p < 0.05$). Consumer purchasing habits are influenced by knowledge, such as where they buy, how frequently they buy, which product groups are important to them, and how well they understand the product (Hossain & Lim, 2016; Wijesinghe et al., 2021; Carlson et al., 2009). Buyers’ knowledge aids in the search for information and thus influences the level of trust in the market’s product quality (Carlson et al., 2009). It means that the greater one’s knowledge of food safety and quality, the greater one’s trust in information sources, and the greater one’s likelihood of purchasing foods. Thus, product knowledge and experience have a significant impact on food product purchase decisions (Cakici & Shukla, 2017). Similarly, availability has a positive effect on increasing the frequency with which
people buy honey (p < 0.1) and butter (p < 0.05; Daba et al., 2021; Hossain & Lim, 2016; Kumar & Babu, 2014; Wijesinghe et al., 2021). Increased availability, driven by supply-side activities in the market creates opportunities for consumers to purchase organic products.

Both honey and butter purchasing frequency were significantly influenced by the adulteration variable (P < 0.05). This derives from consumers’ fear that consuming contaminated foods puts their health at danger, which diminishes their desire to buy organic foods (Fuhrman, 2018; Woldemariam & Abera, 2014). Food adulteration not only depletes important nutrients from your foods, but also makes them hazardous, causing paralysis and, in extreme circumstances, death in customers (Woldemariam & Abera, 2014). For example, vanaspati-laced butter will induce long-term heart difficulties in consumers (Navale & Gupta, 2016). Adulterated food consumption causes a wide range of diseases, from minor to fatal, including visual problems, liver failure, heart disease, blood disorders, renal damage, skin diseases, and stomach disorders (Bansal et al., 2017). Sugar and bananas in food can cause cancer, infertility, and brain damage very quickly (Choudhary et al., 2020; FSSAI, 2016; Anita and Neetu, 2013). This shows that the health of consumers is very vulnerable to food adulteration and contamination. Aside from that, consumers lose sight of honey's nutritional worth, which undermines consumer trust in the quality and safety of food (Choudhary et al., 2020; Fakhlaei et al., 2020).

Furthermore, perceived risk had a significant negative influence on the frequency of purchase of both honey and butter products (p < 0.05). The findings are consistent with those of Nguyen and Gizaw (2014), Rzem and Debabi (2012), and Arslan et al. (2013). Private-label food products are of lower quality when purchased and consumed by consumers, leaving them dissatisfied. Consumers expose themselves to financial and health risks when purchasing and consuming products whose quality and safety are unknown (Choudhary et al., 2020). The food safety and security risks of a vulnerable food supply chain may cause consumers to become victims of disease, as unsafe food affects consumers’ health, causing abdominal pain, vision loss, cancer, muscular paralysis, brain damage, joint pain, liver disorder, and kidney failure (Anita & Neetu, 2013). In determining purchasing frequency, consumers always associate food quality with food value and risk (Arslan et al., 2013; Nguyen & Gizaw, 2014). Consumers who perceive low product quality are those who believe the product has a lower value and is more risky, leaving them dissatisfied. In this case, they are supposedly shifted towards buying and consuming manufactured substitute goods where the quality and safety of these products seem trustworthy (Li et al., 2021; Qian et al., 2011). So, the presence of food adulteration contributed to the lower consumption of animal source foods in Ethiopia (Daba et al., 2021).

Social pressures from family and friends are important factors in honey purchases (p < 0.05). A consumer’s family and friends influence his or her decision to accept or avoid purchasing food (Senadisai et al., 2014). The previous experience of family and friends encourages a buyer to purchase a product of the same quality. Furthermore, consumers trusted dairy product producers (p < 0.01) more than retailers and other traders in the food supply chain. According to Ariyawardana et al. (2017) and Macready et al. (2020), food producers are more trusted than retailers. When food scares occur, most retailers and small shoppers simply return the food for a refund by adulterating the food and applying incorrect labeling to increase profit (Narayan, 2014; Huang et al., 2015), which may affect food safety and quality as well as consumer trust. It is more difficult to obtain information about production and processing from retailers than from producers in the dairy supply chain (H. Yu et al., 2018). Although consumers place greater trust in farmers, this does not imply that farmers accept responsibility for food safety and risk (Li et al., 2021). Thus, the purchase and non-purchase behaviours of consumers are significantly influenced by the trust of salesmen (Nuttavuthisit & Thågersen, 2017; Lee et al., 2020; Vega et al., 2019; Nuttavuthisit & Thågersen, 2017; von Meyer-Höfer, 2015; W. Yu et al., 2021). The empirical literature confirmed that adulteration and expected risks reduce organic farm businesses as the consumers are constantly shifting their demand towards the substitutes.
5. Conclusion and recommendation

Organic food demand is expanding at an alarming rate all across the world. On the other hand, food adulteration and the risks linked to it are increasing. As a result, this study described the characteristics of locally produced honey and butter products in Debre Markos Town, Ethiopia, and investigated the factors that influence consumer purchases of honey and butter from the farmer’s market. A total of 353 honey and butter product purchasers from Debre Markos Town’s five largest farmers’ product markets, namely Wuseta, DinchTera, Bole, Dibizza, and Kidane Mihret, were polled. Additionally, data was collected using questionnaires and analysed using the poisson regression model. According to the descriptive statistics, about 35.13% of respondents never buy honey, and 7.37% never buy butter in a year. While the poisson regression model confirmed that household income, quality, taste, trust, availability, and peer pressure have a positive and significant impact on honey purchasing frequency while sex, education, adulteration, and risk have a negative impact. In terms of butter demand, household size, income, quality, trust, availability, and purchase from farmers have a positive influence, but age, adulteration, and risk have a negative influence.

The characteristics of the product, such as availability, quality, and taste, were the main factors in the consumer’s preference for them. On the other hand, the existence of adulteration of honey and butter as well as its associated risks such as price risk and health risk imposed on consumers makes the product market unsustainable. As indicated in the literature, consuming adulterated food leads to liver failure, kidney failure, cancer, and other deadly diseases among consumers. Due to this fact, a significant number of consumers are constantly shifting away from buying organic honey and butter food products in favour of substituting manufactured foods and other low-quality food types. The problem is paramount in Ethiopia. First, consumers are shocked by the growing inflationary pressures as most manufactured consumer goods are mostly imported. Second, producers and local markets lose their potential benefits. As a result, improving quality and safety by reducing food contamination plays an important role in long-term consumption and production, as well as societal welfare.

Thus, the following recommendations are made.

1. Consumers must ensure that the food they purchase is not tainted. Organic food items, according to consumers, are not adulterated with low-quality and unsafe foodstuffs. The government should monitor the rise in food prices. Buyers should be aware of food adulteration and its many health consequences in order to stay healthy and hearty. Keeping an eye on the food you buy and consume means keeping an eye on your health and well-being.

2. To strengthen trust and market performance in the food supply chain, consumers, marketing agents, health service agents, agricultural and rural development agents, and legal agents should work jointly.

3. There is a need to encourage farmers to produce more and boost the market availability of food products by supplying agricultural input packages.

4. The Ethiopian Food and Drug Administration (EFDA) should begin food inspection and testing efforts at the district level. Until now, EFDA’s food inspection was limited to imported and exported commodities, but local markets weren’t able to operate efficiently. Food safety and standards authorities should be formed to govern the production, distribution, and ensure the availability and sale of safe food for all consumer goods.

5. Health authorities should keep an eye out for any illegal activity involving food adulteration. As a result, the admixture of various tests should be checked on a regular basis by market surveys and sampling by public health inspectors. Regular retail food sampling and testing may ensure safe foods and eliminate unsafe foods that are inappropriate for consumption. In practice, demand forecasting is almost non-existent, and farmers strive to push what they produce into the market. Food safety measures are critical for food producers, traders, public authorities, and health inspectors in the food supply business to ensure proper
financial flow, supply-demand matching, collaborative forecasting, information sharing, and food movement synchronization.

(6) Competent authorities should enforce current regulations for livestock products with additives (sugarcane, banana, oil, potatoes, and so on). This implies that customer detection by eye and touch is difficult. Consumer goods traders should be required to label their products. Marketing agents should make it a habit to follow up on labeling directions in each district market. As a result, food inspectors and public food analysts should be empowered to initiate prosecution.

(7) The Ministry of Health (MoH) should establish the National Food Science and Risk Assessment Centre (NFSRAC) to analyze food surveillance data collected from laboratories in order to generate data on food hazards and outbreaks of food-borne diseases, as well as to put into practice the codex-adopted general principles of food hygiene and recent hazard analysis guidelines.

6. Limitation of the study and implication for further research
To the best of our knowledge, this is the first study to look at the factors that influence consumers’ purchase of honey and butter foods in Ethiopia. One of the major challenges encountered when conducting this study was a lack of structured data from public authorities about the frequency of purchasing honey and butter, as well as the factors influencing consumers’ purchasing decisions. There are no government institutions that can provide statistical data on the nature of demand for locally produced honey and butter. Furthermore, there is no statistical data in Ethiopia on disease caused by food adulteration to forecast the health impact of food adulteration. The study is also limited to only two food types and is being undertaken in a single city using cross-sectional data. As a result, future studies should investigate consumer demand for all locally produced organic foods in major cities to overcome all of these limitations. Furthermore, the impacts of adulteration on nutrition and public health and appropriate policy issues should be thoroughly investigated, as should the associated concerns.

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