

Purchasing Behavior of Fruits and Vegetables among International Students at University of Tlemcen, Algeria: Preferences, Income Effects, and Budget Constraints

Opoku-Agyemang Williams¹, Asamoah Oppong Zadok^{1,2,*}, Kofi Afari², Aidoo Anokye Joel¹

¹Department of Agricultural Economics & Extension, University of Cape Coast, Cape Coast, Ghana

²Department of Agriculture and Environmental Sciences, Lincoln University, Jefferson City, USA

*Corresponding author: asamoahzadok@gmail.com, ZadokA@lincolnu.edu

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Abstract This study investigates the purchasing behavior, preferences, and financial challenges of international students at the University of Tlemcen, Algeria. Understanding consumer behavior is essential for educational institutions, marketers, and policymakers aiming to support student wellbeing and financial planning. A descriptive cross-sectional quantitative survey design was employed to collect data from a randomly selected sample of 100 international students. Data were gathered using a structured online questionnaire that included both open- and closed-ended questions, as well as Likert scale items. The study analyzed income levels, frequency and amount of spending, and product purchasing preferences. Descriptive and inferential statistics were applied using SPSS and STATA to analyze the responses. Results revealed that a majority of the students were single and highly educated, with most earning moderate annual incomes. Weekly and biweekly purchases were common, and most respondents reported spending between 500 and 1000 Algerian Dinar per purchase. Higher income levels were associated with greater spending capacity and more frequent purchases, while students with lower incomes exhibited more conservative spending patterns. The findings suggest that income level is a key determinant of consumer behavior in this population. This research contributes valuable insights into the economic behavior of international students, highlighting the need for targeted financial education and support services. It also offers useful data for local businesses and service providers aiming to better cater to this demographic.

Keywords: International students, Consumer behaviour' purchasing patterns, student income, spending habits, and University of Tlemcen

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1. Introduction

Fruits and vegetables, the edible parts of plants consumed as food, are essential to human nutrition and overall health. They provide vital vitamins, minerals, dietary fibre, hydration, and satiety, all while being low in calories aside mushroom [1], making them indispensable components of a balanced diet. To address micronutrient deficiencies and reduce the risk of chronic diseases, the FAO and WHO recommend a daily intake of at least 400 grams of fruits and vegetables [2]. This underscores the growing global awareness of the importance of integrating fruits and vegetables into everyday diets to combat malnutrition, lifestyle-related illnesses, and non-communicable diseases. On the production side, however, smallholder farmers often face significant challenges, such as limited access to labour, land, and markets, especially during crises like the COVID-19 pandemic [3].

Meanwhile, on the consumer end, purchasing behavior for fruits and vegetables is shaped by various factors, including cultural preferences, income levels, and budget constraints.

Food market consumer behaviour is impacted by psychological, cultural, and personal aspects. Personal variables have the greatest influence on decision-making, with closeness, friendliness, quality, family atmosphere, pricing, and consumer perception being important determinants [4]. Income is frequently cited by consumers in food markets as a key factor in their decision to buy. Certain foods, such as fresh fruits and vegetables, maybe more expensive or harder to obtain than processed or fast food due to financial limitations. Additionally, cultural preferences may influence the selection of fruits and vegetables.

[5] asserted that the perceived appeal of a destination, particularly its competitive advantage and ease, affects the purchasing decisions of international students. Additionally, their desire to buy is greatly influenced by

the quality of tourism items and the perception of the place. International students' purchasing behaviour is influenced by personal reasons, country and institution image. International students constitute a distinctive category of consumers whose expenditure patterns are influenced by their varied cultural heritages, constrained financial means, and the necessity to acclimate to an unfamiliar milieu.

Malnutrition is closely associated with poor academic performance since pupils who are well-nourished have improved physical and mental health. The significance of nutrition is highlighted by the fact that students must eat a healthy, well-balanced diet to realize their full potential and achieve academic success [6]. For international students' academic success and general well-being, eating a healthy, balanced diet is essential. Although fruits and vegetables are essential parts of this diet, cultural preferences, economic constraints, and accessibility are some of the variables that frequently affect how much of them this group consumes.

International students may run into obstacles like tight budgets, unfamiliarity with local food, and culturally-based dietary choices, even if fruits and vegetables are readily available at local markets. These limitations may lead to less-than-ideal food choices, which could have an impact on their academic performance and general health. Academic performance was found to be significantly positively correlated with diet quality. Students who were food secure had higher grade point averages than those who were food insecure, demonstrating the value of good eating practices in boosting academic achievement [7]. In Tlemcen, Algeria, where international students come from diverse cultural backgrounds, understanding their purchasing behaviour for fruits and vegetables is essential for addressing potential barriers to healthy eating. This study seeks to address this gap by examining the preferences, income influences, and budget constraints that shape the fruit and vegetable purchasing behaviour of international students in Tlemcen. By identifying these factors, the research aims to contribute to strategies that promote healthier eating habits and support the dietary needs of international students in the region.

2. Literature Review

Empirical Review

Fruits and vegetables are widely recognized as essential components of a healthy diet due to their low caloric density and high concentrations of nutrients, water content, and dietary fibre. [2] argue that regular consumption of fruits and vegetables can reduce reliance on unhealthy food choices, thereby lowering the risk of chronic illnesses and micronutrient deficiencies. This view aligns with global public health recommendations and supports the present study's premise that students' access to and preference for fruits and vegetables are crucial for maintaining nutritional balance. However, the authors do not address the accessibility or affordability of these foods in specific populations, such as international students, which limits the practical relevance of their findings in resource-constrained contexts.

Similarly, [8] emphasizes the role of fruits and

vegetables in supporting bodily functions, growth, and overall health. The study also links their consumption to reduced risks of malnutrition, obesity, and non-communicable diseases. While this reinforces the value of fruits and vegetables, Almansory's work assumes a general availability and affordability of such foods, overlooking socio-economic constraints such as limited student budgets. This omission is particularly relevant to international students in Tlemcen, many of whom, despite being on scholarships, face budget constraints that may influence their purchasing behavior.

In contrast, [9] present a more behaviorally nuanced perspective, highlighting that purchasing decisions are influenced by consumer attitudes, cultural familiarity, and perceived control. Although their focus on premium produce may not fully align with the realities of scholarship-supported students, their perceptions of cultural food preferences are particularly applicable to this study.

[10] argue that international students often face multiple challenges in meeting their nutritional needs due to food insecurity, dietary acculturation pressures, and the limited availability of culturally appropriate foods. They contend that these difficulties frequently lead to suboptimal eating habits, as students struggle to adapt to unfamiliar food environments while managing financial constraints related to living expenses and tuition. The current study agrees with the authors' position, as these factors are widely documented and align with the lived experiences of many international students. The emphasis on trade-offs between cost and nutrition is particularly relevant. However, while the study outlines these challenges in general terms, it does not explore how such constraints may influence specific purchasing behaviors, such as preferences for fruits and vegetables, which is the focus of the present study. Nonetheless, their findings provide important context for understanding how environmental and financial stressors shape dietary patterns among international students, making the source highly applicable.

[11] provide a more context-specific perspective by identifying barriers unique to international students, such as limited availability of culturally familiar foods, financial constraints, and legal or logistical challenges tied to residency status. These factors are highly relevant to studies investigating food choices among internationally mobile student populations. [12] contribute a behavioral economics viewpoint by suggesting that although consumers may show limited sensitivity to minor price changes, broader budget constraints significantly influence purchasing behavior. This insight highlights the need to examine financial decision-making beyond mere price points. Additionally, [13] report that a substantial proportion of university students globally fail to meet the recommended daily intake of fruits and vegetables, with variations observed across different regions. This underscores the importance of developing targeted nutritional interventions that consider sociodemographic, behavioral, and environmental determinants.

Theoretical framework

The study is guided by Consumer Behaviour Theory. Consumer Behaviour Theory encompasses historical and current perspectives on consumption, decision-making

processes, learning, memory, attitudes, personality, and motivation, as well as macro aspects like social processes, culture, and future trends influencing buyer behaviour [14]. This theory examines how people choose, pay for, and use goods and services while taking into account the internal and external variables that affect these choices. The theory offers a thorough lens through which to view how international students choose fruits and vegetables by combining concepts from economics, sociology, and psychology.

Budgetary and income restrictions are important factors that influence consumer behaviour. According to the notion, consumers want to maximize usefulness while staying within their means. International students' purchasing habits are greatly impacted by their restricted disposable cash since they are forced to put necessities before wants.

Social norms and cultural background have a significant impact on eating preferences and attitudes. International students' readiness to adjust to locally available fruits and vegetables may be influenced by their home countries' dietary customs and preferences. Their purchasing behaviours may also be influenced by their social connections with neighbours and peers.

The theory places a strong emphasis on psychological components like attitudes, motivation, and perception. International students' purchase decisions may be influenced or discouraged by their opinions about the local

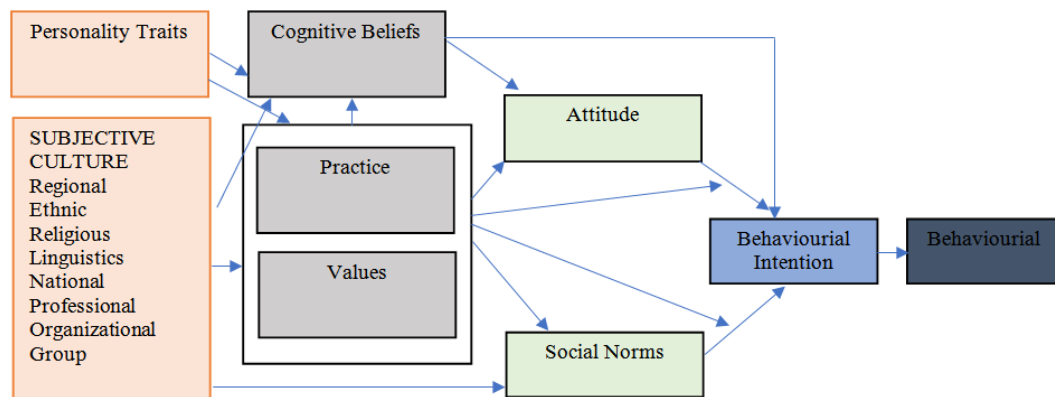
fruits and vegetables' quality, freshness, and price. The decisions of international students may also be influenced by their desire to control their finances or keep up a healthy diet.

External factors such as accessibility, availability, and the structure of local markets impact purchasing behaviour. For example, international students in Tlemcen may encounter challenges in navigating market systems, understanding pricing mechanisms, or finding produce that meets their preferences.

The Consumer Behavior Theory aligns closely with the objectives of this study, as it provides a framework to analyze the interplay of preferences, income, and budget constraints in shaping the fruit and vegetable purchasing behaviour of international students. This theory allows for a comprehensive understanding of the difficulties and driving forces behind students' dietary choices by taking into account economic, cultural, psychological, and environmental issues.

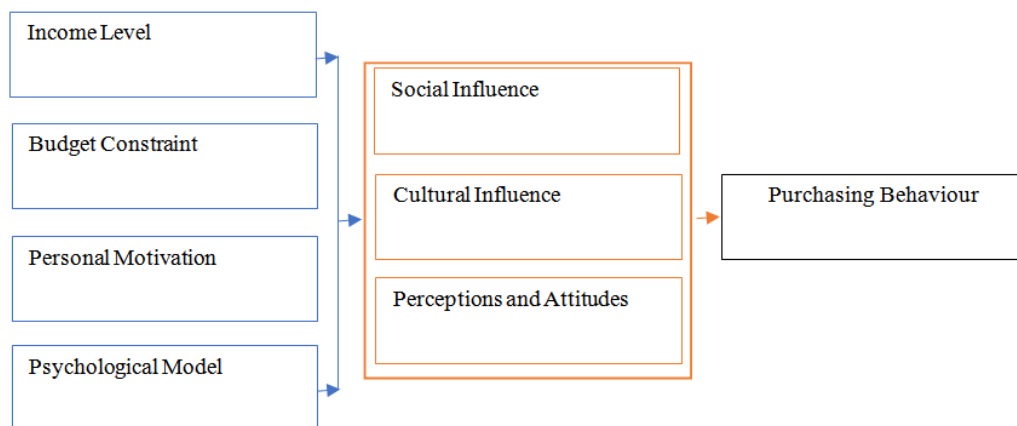
Conceptual Framework

The diagram represents the conceptual framework for the study. It highlights the relationships between independent, mediating, moderating, and dependent variables. It is designed to capture the relationships between preferences, income, budget constraints, and external factors, providing a comprehensive view of how these variables interact.



Source: Adapted from [15]

Figure 1. Consumer Behaviour Theory Framework



Source: Author's construct (2022)

Figure 2. Conceptual Framework

Cultural preferences, income level, budget constraints and market-related factors are the independent variables. Perceptions and attitudes serve as the mediating variables, purchasing behaviour is the dependent variable, while social influences and knowledge of local markets form the moderating variables. Cultural Preferences affect the types of fruits and vegetables purchased, as students may prioritize options familiar to their home countries. Income Level and Budget Constraints determine the extent to which international students can afford fresh produce, impacting both the quantity and quality of items purchased. Market-related factors like pricing, availability, and perceived quality directly influence purchasing decisions, especially in a new and unfamiliar environment. Perceptions and Attitudes act as a mediating variable, shaping how students view the affordability, quality, and importance of fruits and vegetables. Social Influences and Knowledge of Local Markets moderate purchasing behaviour by either facilitating or hindering access to fruits and vegetables.

3. Materials and Methods

Research Design

The study employed a descriptive cross-sectional quantitative survey design to examine the purchasing behavior of fruits and vegetables among international students at the University of Tlemcen. This design was chosen because it allows for the collection of data at a single point in time, providing a snapshot of students' consumption patterns, preferences, and influencing factors such as income and budget constraints. The descriptive approach was appropriate for identifying and summarizing trends and relationships among variables without manipulating the study environment. A quantitative method was used to facilitate the collection of standardized data through a structured questionnaire, enabling statistical analysis and objective interpretation. This design was particularly suited to the study's objectives, as it allowed for efficient data collection from a relatively large sample, enhanced comparability across responses, and supported generalizability of the findings to the broader population of international students at the university.

Population

The target population included all international students enrolled at the University of Tlemcen, Algeria, during the academic year in which the study was conducted. These students represent various nationalities, educational backgrounds, and socio-economic statuses, offering a heterogeneous group ideal for examining differences in purchasing behavior across demographic lines.

Sample Size and Sampling Technique

A total of 100 respondents participated in the study. This sample size aligns with the recommendation by [16], who assert that for a descriptive survey to allow for meaningful generalizations, a minimum of 100 participants should be considered. The sample was selected using a simple random sampling technique, which ensured that every international student at the university had an equal chance of being selected, thereby reducing

sampling bias and enhancing the representativeness of the findings. Unlike convenience or purposive sampling, random sampling increases the external validity of the study by minimizing researcher-induced selection effects. While stratified sampling could also have been used, it would have required pre-grouping the population based on income or gender, which was not feasible due to the relatively uniform financial support structures.

However, the sample size of 100 international students was selected to strike a balance between data manageability and statistical representation. Given the total number of international students enrolled at the University of Tlemcen during the study period, this figure was sufficient to capture diverse experiences while maintaining feasibility in data collection and analysis. Moreover, the size was appropriate for conducting simple descriptive analyses without overextending the research scope.

Data Collection Instruments

Data were gathered through a structured questionnaire designed to capture a range of variables. The questionnaire included both open-ended and closed-ended questions, as well as items formatted on a Likert scale ranging from 1 = strongly disagree to 5 = strongly agree, allowing respondents to express degrees of agreement or frequency.

A researcher-made questionnaire was used as it allowed for customization of items based on the specific objectives of the study and the contextual realities of international students in Tlemcen. Unlike standardized instruments, which may not capture local nuances or culturally-specific factors, the tailored questionnaire provided more targeted and relevant data. However, the use of a structured questionnaire allowed for anonymity, comparability, and efficient analysis of both quantitative data. Interviews would have been time-intensive and difficult to generalize.

Although all respondents were on international scholarships, income levels were categorized to identify variations in expenditure behavior. The categories <10,000 DZD, 11,000-50,000 DZD, 51,000-100,000 DZD, and 110,000+ DZD were adapted based on reported monthly stipends, remittances, and possible part-time earnings. This demarcation enabled the researcher to assess whether even minor income differences affected fruit and vegetable consumption.

Instrument Validation

Although a formal pretest or pilot study was not conducted due to time constraints and logistical limitations, the content validity of the questionnaire was ensured through expert review. The instrument was critically examined by the research supervisors and other academic scholars with expertise in consumer behavior and survey design. Their feedback focused on the clarity, relevance, and alignment of each item with the study's research objectives. As a result, necessary adjustments were made to improve wording, remove ambiguity, and ensure the appropriateness of each question for the target population of international students. This expert evaluation process established both content validity, by ensuring that the questionnaire comprehensively covered the constructs under investigation, and face validity, by confirming that the questions appeared meaningful and relevant to respondents.

Data Collection Procedure

The finalized questionnaire was converted into a digital format using Google Forms, a widely accessible online platform. A link to the form was distributed electronically via university email lists and WhatsApp groups dedicated to international students. Participation was voluntary, and informed consent was obtained at the beginning of the form. The online mode of data collection facilitated ease of access, ensured anonymity, and allowed real-time data monitoring. The data collection period lasted two weeks.

Data Processing and Analysis

Upon collection, the data were cleaned and verified for completeness and consistency to ensure quality and accuracy. The cleaned data were then subjected to statistical analysis using SPSS version 26.0 and STATA version 14. Analytical methods included descriptive statistics such as frequencies, percentages, means, and standard deviations to summarize the data. In addition, inferential statistical tests such as the one-sample t-test and Kendall's Coefficient of Concordance were employed to examine levels of agreement and assess statistical significance. These methods allowed for a robust analysis of the purchasing behavior and economic constraints faced by international students.

Kendall's Coefficient of Concordance

Kendall's coefficient of concordance (W) was used to rank the respondents' preferential fruit and vegetable consumption. According to [17], Kendall's W is an estimate of the variance of the row sum of rank R_i divided by the maximum possible value the variance can take. However, this occurs when all variables under consideration are in total agreement. Hence, $0 \leq W \leq 1$, where 1 represents perfect concordance.

The Kendall's W statistic, S is computed first from the row-marginal sums of ranks R_i values received by the objectives.

$$S = \sum_{i=1}^n (R_i - r)^2 \quad (1)$$

Given S is a sum of squares statistics over the row sums of ranks R_i , and r is the mean of the R_i value. Following that, Kendall's W statistics can be obtained from the following formula:

$$W = \frac{12S}{m^2(n^2 - n) - mT} \quad (2)$$

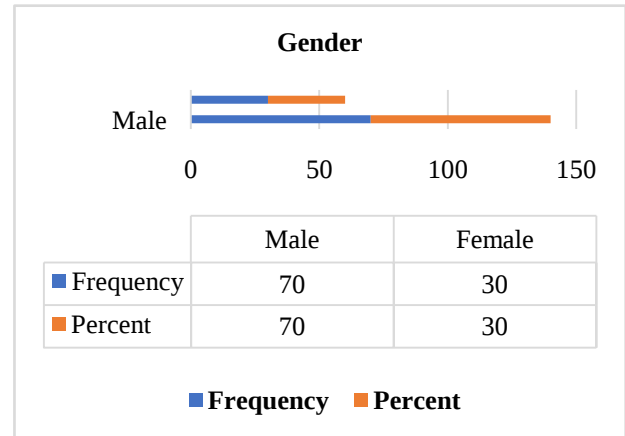
4. Results and Discussions

Response Rate

The study recorded a 100.0% response rate. Consistent and prompt follow-up with participants enabled the study to attain a 100.0% response rate. In order to guarantee that all chosen persons filled out and returned the questionnaires within the allotted period, frequent reminders were sent to responders both in person and electronically. This proactive involvement improved the completeness and reliability of the data gathered while reducing non-response bias.

Demographic Characteristics

Gender distribution of the respondents



Source: Field survey, 2022

Figure 3. Gender distribution of the respondents

The results in Figure 3 reveal that a significant majority of the respondents (70%) were male, while only 30% were female. This indicates a male-dominated sample in the study population of international students in Tlemcen. The gender composition could reflect broader trends in international student enrollment at the institution, which may be skewed toward male students. However, research has consistently highlighted gender-based differences in eating habits and attitudes toward healthy diets. Compared to men, women are generally more likely to eat fruits and vegetables, avoid foods high in fat, and place greater importance on maintaining a healthy diet [18,19,20,21]. These patterns are often attributed to women's higher tendency to engage in dieting and stronger convictions about the benefits of healthy eating [21]. Additionally, women tend to express more positive attitudes and a greater sense of control when it comes to consuming fruits and vegetables [19].

Age distribution of the respondents

Table 1. Age distribution of the respondents

Mean Age	26.82
Std. Deviation	4.34
Minimum	20.00
Maximum	36.00

Source: Field survey, 2022

The analysis of respondents' age shows that the average age of international students who participated in the study was 26.82 years, with a standard deviation of 4.34, indicating a moderate variation in age. The youngest respondent was 20 years, and the oldest was 36 years, reflecting a broad age range typical of university-level students, especially at the postgraduate level. Studies show that age, along with other variables, plays an important role in shaping the dietary habits of university students. Generally, older students are more inclined to adopt health-focused eating behaviors, whereas younger students are more likely to prefer convenience foods and frequent snacking [18].

Marital status, annual income, frequency of purchase, amount spent

Table 2. Marital status, annual income, frequency of purchase, and amount spent

Variables	Frequency	Percent
Marital status	70	70.0
Single	85	85.0
Married	15	15.0
Annual income in Algerian Dinar		
<10000	3	3.0
11000-50000	26	26.0
51000-100000	35	35.0
110000+	36	36.0
Frequency of purchase		
Daily	1	1.0
Weekly	43	43.0
Every 2 weeks	41	41.0
Monthly	15	15.0
Amount spent in Dinar		
<100	8	8.0
100-500	38	38.0
500-1000	43	43.0
1000+	11	11.0

Source: Field survey, 2022

The demographic profile of respondents reveals that a substantial majority are single (85%), compared to only 15% who are married. This distribution suggests that the sample primarily consists of younger, possibly more independent individuals.

The distribution of annual income among respondents presents a relatively balanced but upper-leaning economic profile. Only 3% earn less than 10,000 DZD, while the majority earn between 51,000 and 110,000+ DZD annually, with 36% in the highest bracket. This indicates a predominantly middle- to upper-income consumer base. Numerous studies have demonstrated that income level plays a crucial role in shaping consumer purchasing behavior and consumption trends. Individuals with higher incomes tend to allocate more of their resources to luxury and high-end products [22,23]. Their greater disposable income also makes them more receptive to product promotions and offerings across a range of categories [23]. The financial stability of the sample suggests capacity for consistent consumption, particularly in lifestyle and personal care categories.

With regard to purchasing frequency, the majority of respondents make purchases either weekly (43%) or every two weeks (41%), with only 15% purchasing monthly and a minimal 1% purchasing daily. These findings imply a planned and routine-oriented buying behavior. Consistent with research by Solomon et al. (2012), consumers tend to align their purchasing habits with income schedules, especially in cultures where wages are received on a weekly or biweekly basis. Such patterns may also reflect consumption routines for household goods and groceries, where regular replenishment is necessary but not daily.

The data on spending amounts reveals that 43% of respondents spend between 500 and 1000 DZD per purchase, and 38% spend between 100 and 500 DZD. Only 11% spend more than 1000 DZD, and 8% spend less than 100 DZD. This suggests that while purchases are frequent, the average transaction value remains moderate, reflecting prudent spending. Studies in consumer economics [24] suggest that consumers within the middle-

income bracket tend to exhibit value-conscious behavior, balancing quality and cost in their purchasing decisions. The concentration in mid-range spending brackets also aligns with the earlier income findings, reinforcing the reliability of the data.

Factors that determine the consumption of fruit/vegetables

The findings from the one-sample t-test reveal statistically significant factors influencing the purchasing behaviour of international students in Tlemcen, Algeria, regarding fruits and vegetables. All variables measured yielded p-values less than 0.001 (Sig. 2-tailed = .000), indicating that the observed mean importance ratings differ significantly from the test value of 0. This strongly supports the hypothesis that these factors play a meaningful role in the purchasing decisions of this demographic group. The results of this study offer critical insights into the fruit and vegetable purchasing behaviour of international students in Tlemcen, Algeria. Anchored in the Consumer Behaviour Theory, the findings highlight the complex interplay between economic, psychological, and socio-cultural factors in shaping consumer decisions.

Table 3. Factors that determine the consumption of fruit/vegetables

Variables	One-Sample Test				
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference
					Lower Upper
Visual attractiveness (freshness)	25.3399	.000	3.20	2.95	3.45
Certification	25.3399	.000	3.20	2.95	3.45
Price of the produce	63.9299	.000	4.29	4.16	4.42
Price of substitute produce	37.6099	.000	3.36	3.18	3.54
Safety and quality issues	27.0299	.000	3.75	3.47	4.03
Household size	26.3499	.000	3.64	3.37	3.91
Income/salary level	36.3999	.000	3.88	3.67	4.09
Household general dietary pattern	34.8399	.000	3.65	3.44	3.86
Relative/friends influence	27.4299	.000	3.03	2.81	3.25

Where {1.00, Not at all important}, {2.00, Not important}, {3.00, Neutral}, {4.00, Important}, {5.00, Very important}

Source: Field survey, 2022

From an economic standpoint, the price of produce emerged as the most significant factor ($M = 4.29$, $t = 63.92$, $p < .001$), reflecting the high price sensitivity among international students. According to the economic model of Consumer Behaviour Theory [15], consumers aim to maximize utility within budget constraints. The significant result corroborates prior studies [25,26,27], which also found price to be a dominant consideration among students and budget-conscious populations.

Closely related is the income/salary level ($M = 3.88$, $t = 36.388$, $p < .001$), further reinforcing the idea that affordability heavily shapes food choices. Given that international students often face financial constraints, this finding confirms that they prioritize economic value when selecting fruits and vegetables. Financial limitations play a major role in shaping food choices, with cost being the most important factor [11,28]. Students experiencing economic hardship tend to focus on affordability, whereas those less impacted by financial challenges are more likely

to take into account factors such as locally sourced products and health considerations [28]. The importance of household size ($M = 3.64$, $t = 26.342$, $p < .001$) also reflects structural economic considerations, as larger household sizes may prompt bulk purchasing or price-sensitive buying behaviours [29].

Psychological factors are equally relevant. Safety and quality issues ($M = 3.75$, $t = 27.016$, $p < .001$) and household dietary patterns ($M = 3.65$, $t = 34.825$, $p < .001$) were rated as important, suggesting that concerns about health and consistency with habitual eating habits influence decision-making. These align with the psychological model of consumer behaviour [24], which stresses perception, motivation, and attitude as key variables. This is consistent with findings by [30], who noted increasing global consumer attention to food safety, particularly among mobile populations such as students.

While visual attractiveness (freshness) and certification shared the same mean ($M = 3.20$, $t = 25.330$, $p < .001$), they were rated only moderately important. This suggests that although appearance and official endorsements matter, they are secondary to core economic and health-related considerations. It may also reflect a lack of trust or awareness of certification standards among students in the host country, a theme echoed in the [31] study on food labelling trust in developing markets.

The price of substitute produce ($M = 3.36$, $t = 37.604$, $p < .001$) had moderate significance, indicating that students may consider alternatives but do not heavily rely on price comparisons between categories. Finally, relatives' and friends' influence had the lowest mean ($M = 3.03$, $t = 27.418$, $p < .001$), highlighting the limited effect of social influence on their food choices. This contrasts with traditional social models of consumer behaviour, possibly due to the independent lifestyles and diverse cultural backgrounds of international students, which reduce reliance on peer or familial cues in decision-making [32,33].

In conclusion, the statistically significant results ($p < .001$ across all variables) validate the critical role that economic, psychological, and situational factors play in shaping international students' fruit and vegetable purchasing behaviour. These findings deepen the understanding of how Consumer Behaviour Theory applies in the context of student populations in host countries and provide a foundation for targeted interventions by health educators, market vendors, and policy stakeholders.

Preferential fruit consumption

To examine the degree of agreement among respondents on their fruit preferences, Kendall's Coefficient of Concordance (W) was computed. The result showed $W = 0.162$, indicating a low but statistically significant level of agreement among the students' rankings. The associated Chi-square value was 81.214 with $df = 5$ and a significance level of $p = .000$, confirming that the observed preferences did not occur by chance and were significantly consistent.

The analysis of fruit preference among international students in Tlemcen is summarized in the table above. Using a ranking scale where 1 = Most Preferred and 6 = Least Preferred, the results indicate that Apple was the most

preferred fruit, with the lowest mean rank of 2.59 ($SD = 1.06$), followed closely by Watermelon with a mean rank of 2.68 ($SD = 1.94$). Banana was ranked third ($M = 3.37$, $SD = 1.27$), while Grapes and Date Fruit were moderately preferred with mean ranks of 3.94 ($SD = 1.56$) and 3.90 ($SD = 1.78$), respectively. Mango was the least preferred fruit, with the highest mean rank of 4.50 ($SD = 1.65$).

Table 4. Preferential fruit consumption

Variables	N	Mean Rank	Std. Deviation	Min	Max
Watermelon	100	2.68	1.94	1.00	6.00
Apple	100	2.59	1.06	1.00	6.00
Grapes	100	3.94	1.56	1.00	6.00
Banana	100	3.37	1.27	1.00	6.00
Mango	100	4.50	1.65	1.00	6.00
Date fruit	100	3.90	1.78	1.00	6.00
N	100				
Kendall's Wa	0.162				
Chi-Square	81.214				
df	5				
Asymp. Sig.	.000				
a. Kendall's Coefficient of Concordance					

Source: Field survey, 2022

The findings show that apples and watermelons are the most preferred fruits among international students in Tlemcen, likely due to their refreshing taste, availability, and cultural familiarity. Apples, in particular, are globally popular and often considered healthy, portable, and convenient, which may explain their top ranking. In contrast, mangoes, although widely loved in many regions, ranked as the least preferred fruit. This could be due to seasonal availability, storage issues, or a lack of familiarity among students from certain regions.

The weak yet statistically significant Kendall's W (0.162) suggests only a modest level of consensus in preference, indicating some variability in students' tastes. This aligns with Consumer Behavior Theory, which posits that individual choices are shaped by factors such as culture, personal experience, and perceived utility ([34]; [35]). The psychological model further supports these findings by highlighting the role of personal motivation and perception in driving consumer choice [24].

Moreover, the statistically significant Chi-square value ($p < 0.001$) confirms that the differences in rankings are not random, reflecting genuine consumption preferences. These insights can help campus food services, health programs, and local vendors tailor their offerings to better meet the dietary preferences of international students. For instance, prioritizing high-demand fruits like apples and watermelons while finding ways to make mangoes more appealing (e.g., through processing or culinary integration) could improve satisfaction and nutritional outcomes.

Preferential vegetable consumption

The preference ranking of vegetables among international students in Tlemcen was assessed using a scale where 1 = Most Preferred and 6 = Least Preferred. Kendall's Coefficient of Concordance ($W = 0.372$) indicates a moderate level of agreement among respondents on their vegetable preferences. The associated Chi-square

value of 185.977 with 5 degrees of freedom is statistically significant (Asymp. Sig. = .000), implying that the preferences are consistent and not due to random variation.

Table 5. Preferential vegetable consumption

Variables	N	Mean Rank	Std. Deviation	Min	Max
Green pepper	100	4.22	1.48	1.00	6.00
Onion	100	2.37	1.38	1.00	6.00
Hot pepper	100	4.45	1.25	1.00	6.00
Tomatoes	100	1.91	1.09	1.00	6.00
Cucumber	100	4.63	1.53	1.00	6.00
Carrot	100	3.42	1.39	1.00	6.00
N	100				
Kendall's W	.372				
Chi-Square	185.977				
df	5				
Asymp. Sig.	.000				
a. Kendall's Coefficient of Concordance					

Source: Field survey, 2022

The results show that Tomatoes were the most preferred vegetable with the lowest mean rank of 1.91 (SD = 1.09), followed by Onion with a mean rank of 2.37 (SD = 1.38). Carrot came third (M = 3.42, SD = 1.39), while Green pepper (M = 4.22, SD = 1.48), Hot pepper (M = 4.45, SD = 1.25), and Cucumber (M = 4.63, SD = 1.53) were among the least preferred vegetables.

The findings highlight a clear preference for tomatoes and onions, which are staple ingredients in many cuisines and commonly used in everyday cooking. Their versatility and affordability likely contribute to their popularity. In contrast, vegetables like cucumber, green pepper, and hot pepper were ranked lower, possibly due to personal taste differences, limited cooking methods, or unfamiliarity among students from different cultural backgrounds.

The moderate Kendall's W (0.372) suggests a reasonable level of consensus, reflecting a shared cultural understanding or common dietary exposure among the international student population. This supports Consumer Behaviour Theory, which asserts that consumer preferences are influenced by personal, psychological, and socio-cultural factors [34,36,37]. For instance, students may prioritize vegetables they are accustomed to from their home countries, which explains the strong preference for tomatoes and onions.

Furthermore, the significant Chi-square test ($p < .001$) reinforces that the pattern of preferences is meaningful and not random. This has practical implications for student cafeterias and food vendors, who may consider stocking more of the preferred vegetables to meet student demand and improve satisfaction. It also aligns with the Utility Theory of Consumer Choice, where individuals aim to maximize satisfaction by selecting food items that best meet their taste, nutritional needs, and cultural expectations [38].

5. Conclusion

This study provides empirical insights into the purchasing behaviors and preferences for fruits and

vegetables among international students in Tlemcen, Algeria, with a specific focus on the roles of individual preferences, income levels, and budget constraints. The findings reveal that students' purchasing decisions are significantly influenced by factors such as price, income level, freshness (visual attractiveness), safety and quality concerns, and certification. The application of the Consumer Behaviour Theory helped frame these preferences within the context of rational decision-making, personal values, and external influences such as peer recommendations and dietary norms.

Notably, fruits like apples and watermelons, and vegetables such as tomatoes and onions, emerged as the most preferred due to their accessibility, familiarity, and nutritional value. Meanwhile, more expensive or less familiar items like mangoes and cucumbers received lower preference rankings. The results also indicated a statistically significant agreement among respondents in both fruit and vegetable preference rankings, as shown by Kendall's Coefficient of Concordance and Chi-square significance values.

The research closes a critical gap in the literature by focusing on an underrepresented group international students in North Africa, whose dietary behaviors are often shaped by cross-cultural experiences, financial limitations, and local market conditions. However, the study also highlights important limitations and areas for further inquiry. Future research could explore the seasonal availability of produce, cultural dietary influences, and the role of institutional support (e.g., university cafeterias or food subsidy programs) in shaping students' food choices. A qualitative follow-up could further enrich understanding by capturing nuanced motivations and emotional responses related to food consumption.

In sum, this study not only advances theoretical discussions around consumer behavior and student welfare but also offers practical implications for policymakers, university administrators, and local market actors aiming to improve food accessibility, affordability, and dietary well-being among international students in Algeria.

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Authors Contribution:

Opoku-Agyemang Williams: Methodology, Formal analysis, writing-original draft

Asamoah Oppong Zadok: Methodology, Reading and Editing

Afari Kofi: Conceptualization, Validation, Reading and Editing

Anokye Aidoo Joel: Reading and Editing, Validation

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APPENDIX

QUESTIONNAIRE

Topic: PURCHASING BEHAVIOR OF FRUITS AND VEGETABLES AMONG INTERNATIONAL STUDENTS AT UNIVERSITY OF TLEMCEN, ALGERIA: PREFERENCES, INCOME EFFECTS, AND BUDGET CONSTRAINTS

Dear respondent,

This questionnaire is to seek information on Fruits and Vegetables Purchasing Behaviour among International Students in Tlemcen, Algeria. We assure you that the responses will be clearly used for academic purposes and, therefore, any information given shall be treated as confidential. Your participation in the exercise is very important.

SECTION A: DEMOGRAPHIC DATA

Please **tick** [✓] the appropriate box

1. Gender: Male [] Female []
2. Age..... (years)
3. Marital status? a. single [] b. married []
4. Annual income in Algerian Dinar a. <10000 [] b. 11000-50000 [] c. 51000-100000 [] d. 110000+ []
5. Amount spent on fruits and vegetables in Dinar. a. <100 [] b. 100-500 [] c. 500-1000 [] d. 1000+ []
6. Frequency of purchase. a. Daily [] b. Weekly [] c. Every 2 weeks [] d. Monthly []

SECTION B: PREFERENTIAL CONSUMPTION

Please indicate the level of preference in order of rank from 1 to 6, where 1 is most preferred and 6 is least preferred, for the following fruits (Please respond is limited to one response per column).

Statements	1	2	3	4	5	6
Watermelon						
Apple						
Grapes						
Banana						
Mango						
Date fruit						

Please indicate the level of preference in order of rank from 1 to 6, where 1 is most preferred and 6 is least preferred, for the following vegetables (Please respond is limited to one response per column).

Statements	1	2	3	4	5	6
Green						
pepper						
Onion						
Hot						
pepper						
Tomatoes						

SECTION C: FACTORS THAT DETERMINE THE CONSUMPTION OF FRUITS/VEGETABLES

Kindly tick (✓) the appropriate answer where applicable to indicate the extent of agreement with the statements in the table below concerning **factors that determine the consumption of fruit/vegetables**. Please respond by choosing 1 to 5, where 5=very important, 4=important, 3=neutral, 2 = not important, and 1 = not at all important.

Statement	1	2	3	4	5
Visual attractiveness (freshness)					
Certification					
Price of the produce					
Price of substitute produce					
Safety and quality issues					
Household size					
Income/salary level					
Household general dietary pattern					
Relative/friends influence					

THANK YOU

Rationale Behind Questionnaire Structure and Questions

The questionnaire is designed to explore the purchasing behavior of fruits and vegetables among international students at the University of Tlemcen, focusing on preferences, income effects, and budget constraints. It is structured into three key sections: Demographic Data, Preferential Consumption, and Factors Influencing Consumption, each serving a specific research objective.

Section A: Demographic Data

This section uses **closed-ended questions** to collect standardized background information such as gender, age, marital status, income levels, expenditure on fruits and vegetables, and frequency of purchase. The use of closed-ended formats in this section allows for:

- Ease of statistical analysis through categorical and numerical data.
- Demographic segmentation to explore patterns in consumption behavior across different groups (e.g., by gender or income).
- Comparability across responses to detect correlations between socioeconomic characteristics and purchasing behavior.

Though the age question is technically open-ended (a blank for numeric entry), it is quantitative and was coded for analysis.

Section B: Preferential Consumption

This section requires respondents to rank their preferences for specific fruits and vegetables from 1 (most preferred) to 6 (least preferred). The ranking format is a structured ordinal response, enabling:

- Identification of consumption priorities among fruit and vegetable types.
- Quantitative comparisons across product preferences using descriptive statistics (e.g., mean ranks).
- Preference mapping for potential nutritional or market recommendations.

The questions are closed-ended in structure but allow subjective expression through prioritization, thus offering a blend of behavioral insight and analytical clarity.

Section C: Factors Influencing Consumption

This section employs a Likert scale (1 to 5) to assess the importance of various factors (e.g., freshness, price, household size, etc.) influencing fruit and vegetable consumption. These are closed-ended questions, designed to:

- Measure attitudinal intensity regarding influencing factors.
- Enable comparative statistical tests (e.g., one-sample t-test) to examine which variables most strongly influence purchasing decisions.

Provide insights into the relative weight students place on economic, social, and quality-related factors in their decision-making.