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AN ANALYTICAL STUDY OF THE FOOD CONSUMPTION BEHAVIOR OF BEDOUIN WOMEN IN NORTH SINAI GOVERNORATE

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ABSTRACT

This study aims to analyze the food consumption behavior of Bedouin women in the selected villages of the Bir al-Abd district, the North Sinai Governorate, against the economic and social issues faced by the group, considering that it is the prime role of such women to take care of household food resources. The study aimed at determining the character of such a behavior, the variables that accompany this behavior as well as the degree to which the behavior is conditioned by the factors like educational attainment, income, consumer attitudes and motivation, and the level of social and cultural participation. A descriptive-analytical approach was used, based on a structured interview questionnaire, to use a sample of 400 Bedouin women in three villages chosen on the basis of the developmental variation (Sadat, Al-Kharba, and Nagila). The results indicated that, based on the study, a total of 97 % of the respondents showed rational behavior in food consumption, with only 2.8 percent showing moderate behavior. Correlation and regression test results revealed that seven independent variables explained 34% of the variance of consumption behavior, with the most significant ones being age, education, attitude towards saving, and involvement in the household decision-making. Also, the research found statistically significant differences in food behavior among the women in the villages, with the highest average in rational behavior in Al-Kharba. On the outcomes, the study came up with a suggested field-based extension program to encourage good food practices amongst Bedouin women with a focus on the influence of local media and the extension system on the implementation of the suggested programs.

KEYWORDS: Bedouin Women, North Sinai, Food Consumption Behavior, Dietary Habits, Food Security, Social Empowerment, Socio-Economic Factors, Community Development.

1. INTRODUCTION

The issue of consumption has received an ample amount of scholarly attention lately, which is due to the current socio-economic circumstances that societies face, including the increase in population, the lack of economic resources on the global scale, and the high rates of inflation of prices of various goods. What needs to be mitigated are the developments that are imperative in terms of optimizing available resources and in limiting the aberrant consumption patterns. In this paradigm, food consumption behavior stands out as one of the critical phenomena, and is predetermined by psychological, social, and cultural factors. Therefore, it has developed an increasing academic interest in other fields such as economics, sociology, and psychology. The food consumption behavior takes a special role in the Bedouin context of North Sinai due to the interaction of the local environmental, cultural, and religious factors that influence the food preferences and consumption patterns. Egyptian economy has witnessed significant changes in the recent years, which are characterized by urban growth and increasing income levels. The World Bank (2022) adds that Egypt has experienced a gradual growth in its Gross Domestic Product along with the growth of the consumer-led middle-income demographic. Such macroeconomic expansion has often triggered an amplified consumer spending, not only on the basic needs.

Egypt is one of the biggest food importers. The state spends almost nine billion Egyptian pounds of buying meat and another five billion pounds on snack and fast foods, every year. This is in a context of acute crises particularly the rising food prices and acute scarcity of agricultural products, more so, the staple food crops. The shortages in agricultural production can be explained by the loss of agricultural land to an extent, which was a consequence of urbanization that was triggered by the high birth rate and the rising housing demands. The agricultural land encroachment has become one of the most acute issues of Egypt, especially in the post-2011 revolution period; about 54,300 feddans have been taken over by the construction, which undermines agricultural production and has a pernicious effect on the national economy (Fadlallah, 2015, p. 284).

Food waste is a major burden that affects the Egyptian households unequally with women being the major economic concept that takes care of food resources and household spending. The factual evidence suggests that food waste that occurs when cleaning and preparing vegetables and rice amounts

to 1020 percent of the overall amount consumed, which is catastrophically high relative to the loss acceptable level of 1 percent. Despite the fact that the government still subsidizes bread, waste in this sector alone consumes 30% of all consumption, the fiscal implications to the state are about 4.5 billion pounds of Egyptian pounds each year (Al-Hassan *et al.*, 2024). The reason why this is often blamed on the repurposing of bread as animal feed (Al-Khawaja, 1987) hence causing severe drain on the foreign and local currency reserves (Rushdi, 1980).

Since women, especially Bedouin women, are predominantly charged with the responsibility of managing the home, they also carry out activities involving the purchase, preparation, consumption, and maintenance of all products in connection with family consumption, that is, food, clothing, appliances, utility, and drugs (Younis and Ali, 2017). Due to the nature of females managing most of the domestic earnings, women play a central role in determining the consumption behavior of their children, a behavior that often carries into adults (Rushdi, 1980). Therefore, the modification of the consumption patterns and habits of Bedouin women is considered as one of the core approaches to alleviating a set of economic issues. By fostering more efficient resource use, Bedouin women can help instill rational consumption patterns within their households, especially among children. Moreover, how much people know about sustainability influences how they use resources (Yalichani & Farhi, 2016). As a result, the Bedouin woman helps us see how important food choices are in Bedouin social and economic life. Many researchers state that social hurdles keep Bedouin women from being empowered, influencing how and what they purchase. Many related factors influence food consumption, necessitating a deeper analysis to comprehend the patterns of food choice.

It is reported that stress and anxiety play an important role in changing the food preferences of Bedouin women. Hill *et al.* (2018) proved that, as a result of emotional stress, many people eat fewer healthy types of foods. Being in a tough situation, Bedouin women may rely on comfort food that may affect their dietary health. Feelings of stress and anxiety can also cause people to choose food as a way to cope, Ergün and colleagues observe in a recent study. Bedouin women are strongly influenced by others in their family and community when deciding what to eat. Yang (2023) pointed out that others in the family can have an impact on food selections, since they create the home's food culture. Among Bedouin people, food brings families together, and rules set by

the family often show what foods women should make to match the customs and beliefs of their community. In the same way, Hill et al. (2018) report that the behavior of family members largely shapes whether there is food at home.

The things they believe strongly impact the way Bedouin women eat their food. In the North Sinai area, the economic factors increase the limited food supply in the Bedouin communities. Ragavi and Mosimann (2024) claim that low financial resources are hindered by food shortages, which hinder access to a variety of food by Bedouin women. Thus, the lack of resources is forcing most women to depend on easily prepared meals that are in line with their traditional ways of life.

In addition to these limiting factors, Bedouin women are faced with social norms, which affect their choices on consuming food. The usual practices in their society tend to limit the freedom of the young people in the selection of meals. Despite having significant negative impacts and the lack of access to educational and economic opportunities, Bedouin women continue to be involved actively in their communities (Ahmed, 2023). There is also a lack of specific nutritional interventions, which further affects women in terms of receiving the necessary information to maintain a healthy diet (Ahmed and Ali, 2024; Ahmed, 2023).

Research from around the world finds that helping women become empowered often improves their families' nutrition. Women with higher education and employment are likely to make wise choices about food (Heckert et al., 2019). By being mobile, women can easily buy food and therefore play important household roles (Asim et al., 2022). Bedouin women have to cope with social changes as globalization and the growing use of markets shift them from work producers to consumers. The move inspires changes in the way students consider what to eat (Zamir & Jaber, 2015). Since money is tight and living is expensive, Bedouin women come up with frugal food choices to help the household last (Zamir & Jaber, 2015). Enabling women to make decisions about what they eat is important, as it positively changes family health and social ties (Al-Radami & Al-Abed, 2021).

1.1. Research Problem

Modern societies are seeing a fast increase in consumption which leads to major economic problems because resources are scarce. Here in Egypt, people often consume very high levels of food, higher than those found in more developed countries (Zidane, 2020). Such increases can sometimes lead us to believe living conditions have risen, though they tend to

overburden efforts to protect the environment and prevent long-term growth in the economy. In this regard, women play a crucial role, as they make the majority of financial choices at home, organize the household and shape the preferences of the following generation.

The habits of rural and Bedouin women in consumption are very significant to study because individuals are prone to buy and spend in a particular manner, which is dictated by the particular cultural and economic factors. Females in these settings perceive risks differently as shown by the results of the empirical research. Al-Dhanibat and Al-Dhanibat (2024) make it clear that the most prevalent determinants of the diets of female students are psychological factors. Similarly, Wishahi et al. (2017) and Lafta et al. (2022) share the findings of differing nutritional knowledge, with a significant lack of knowledge in the communities with limited resources. This then brings an urgent necessity to learn more about the food consuming habits of Bedouin women and the factors, which affect them. It is expected to produce evidence-based knowledge, which can lead to rational consumption and nutritional awareness to meet the requirements of the people and promote the development of the resources among the vulnerable populations.

1.2. Significance of the Study

1.2.1. Theoretical Significance

The theoretical significance of this study lies in its contribution to the scientific literature through the development of a proposed model that explains the food consumption behavior of Bedouin women. This model serves as a theoretical foundation for identifying the variables that influence consumer dietary behavior in general. The study also provides a literature review grounded in scientific principles, concepts, research variables and hypotheses, and statistical methods. Its findings and recommendations offer a starting point for future research in the field of consumer behavior, either to expand upon this study or to address its limitations.

1.2.2. Practical Significance

The practical importance of the study is its ability to define the negative eating habits by Bedouin women which can be used to offer a practical advice to be used in development policies and programme development in the North Sinai Governorate. These policies are vital in curbing the economic predicament of the mismatch between the availability and consumption rate of natural resources and therefore, the need to maximise the utilisation of the available resources and the reduction of unnecessary consumption. Moreover, clarification of behavioural, attitudinal, value-based,

and motivational antecedents that support the purchasing and consumption behaviour of Bedouin women is also inevitable in formulating an effective marketing approach.

The results of this research can also help stakeholders who work with gender-specific issues (especially those who focus on Bedouin women) to design and implement awareness campaigns that could promote responsible consumption, as well as precondition the development of positive attitudes toward the conservation of resources.

1.3. Research Objectives

1. To identify the personal, social, and economic characteristics of Bedouin women.
2. To determine the level of food consumption behavior among the study respondents.
3. To explore the relationship between food consumption behavior and the independent variables studied in the research area.
4. To assess the relative contribution of the studied independent variables in explaining the variation in the respondents' consumption behavior.
5. To examine whether differences exist in food consumption behavior among the respondents based on the three study villages.
6. To propose an extension program aimed at improving the food consumption behavior of Bedouin women based on the study findings.

1.4. Research Hypotheses

H1: There is no relationship between the food consumption behavior of the respondents and any of the following variables: age, education level, primary occupation, marital status, household size, monthly family income, degree of informal social participation, geographic and cultural openness, level of involvement in family decision-making, leadership traits, saving orientation, innovativeness, consumption values, consumer motivations, and attitudes.

H2: The studied independent variables do not contribute significantly to explaining the variation in the food consumption behavior of the respondents.

H3: There are no statistically significant differences in the respondents' food consumption behavior based on the three study villages.

1.5. Conceptual Framework of the Study

The theoretical background of this study is premised on the fact that food consumption behavior is a multifaceted process that entails cognitive, psychological, social, cultural, and economic aspects.

All these dimensions influence the choice of people, especially women in the process of purchasing, preparation, and consumption of food. This is the result of the ongoing process of interaction of the individual with the environment based on the internal and external factors as it has been stressed in modern research (Lahcene, 2016; Bahnam and Al-Rubaie, 2023). The framework is structured around four interrelated core concepts

1. Food Consumption Behavior A combination of behaviors in the process of food-related decisions, where the first stage is the identification of need, then acquiring the information and finally buying and consumption behavior (Lahcene, 2016). The practices of rationalization, alternatives, avoidance of waste are parts of these behaviors.

2. Motivations and Attitudes Motivations can also be described as internal drives, which influence and underline the consumption behavior, be it economic, social, or psychological (Zidane, 2020; Al-Ghamdi and Dhalimi, 2024). Attitudes, conversely, are comparatively unchanging statuses developed over their experiences and socialization, which affect the reaction of women to the food products (Al-Ansi, 2020; Bahnam and Al-Rubaie, 2023).

3. Influencing Factors in Food Behavior The psychological, including anxiety and stress (which may result in the so-called emotional eating) (Ergün *et al.*, 2023); social, including the influence of family and community (Yang, 2023); and cultural factors, including food-related beliefs and traditions (Lindsey, 2024).

In addition, marketing especially digital marketing has a growing impact on the consumption patterns of different age groups (Yalichani & Farhi, 2016).

4. The Bedouin Woman as a Central Actor It is generally the Bedouin woman who decides what food will be eaten by the family. She is in charge of the family's food, despite having little influence. A woman's skills and opportunities in education and finance can decide how well she makes sensible food choices (Heckert *et al.*, 2019; Ahmed & Ali, 2024). Besides, her knowledge of nutrition and ability to read ingredient labels influence what she buys (Mauludyani *et al.*, 2021).

According to this framework, the research predicts a link between the independent variables, including education, income, attitudes, motivations and family participation and the amount of food consumed by Bedouin women. Using this model, the project develops approaches to boost food consumption efficiency among chosen communities.

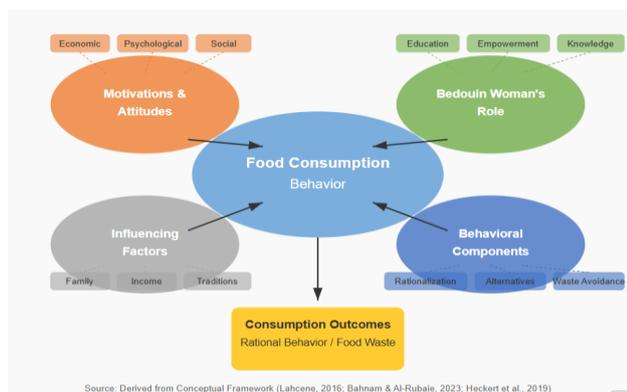


Figure 1: Conceptual Model of Food Consumption Behaviour for Bedouin Women.

2. MATERIALS AND METHODS

This section covers the study area, research sample, measurement of variables, and data analysis methods.

2.1. Study Area

The field study had been carried out in 3 villages in affiliation to the Bir al-Abd district in North Sinai Governorate. The choice of these villages relied on the different degrees of development as the North Sinai Human Development Report (2023) has stated. The village most developed was Sadat then Al-Kharba had a medium level of development and Nagila had the lowest developmental level.

2.2. Research Sample

The study population included all households permanently residing in the three selected villages. According to the respective local councils, the total number of households was as follows

- Sadat: 1,467 households
- Al-Kharba: 1,285 households
- Nagila: 1,243 households

A sample size equivalent to 10% of the total households in each village was selected using the following calculations

Sadat Village:

Sample size = $1,477 \times (10 \div 100) \approx 148$ households

Al-Kharba Village:

Sample size = $1,284 \times (10 \div 100) \approx 128$ households

Nagila Village:

Sample size = $1,243 \times (10 \div 100) \approx 124$ households

The total research sample thus comprised 400 households, with one woman (the female head of household) selected from each.

2.3. Data Collection and Analysis

Data were collected through structured interviews using a validated questionnaire designed

to meet the research objectives. The data collection process lasted approximately three months, spanning November and December 2023.

Various statistical tools and measures were employed in the data analysis process, including

Descriptive Statistics: such as arithmetic mean, standard deviation, range, frequency distributions, and percentages to describe the research variables.

Inferential Statistics: Pearson's simple correlation coefficient was used to examine the relationships between dependent and independent variables.

Stepwise multiple regression analysis was used to identify predictors of food consumption behavior.

Eta squared (η^2) was employed to estimate the effect size of nominal-scale independent variables.

t-test and F-test were used to assess the significance of differences between groups.

2.4. Operational Definitions Used in the Study

Consumer Motivations: Refers to the underlying forces or causes driving the consumer behavior of the respondent.

Consumer Attitudes: Defined as the respondent's perspective toward various consumer habits, which in turn shape her behavior in adapting to her environment.

Consumer Behavior: Encompasses the direct and indirect actions and behaviors undertaken by the respondent to meet the consumption needs of her family.

Measurement of Research Variables The variables in this study were measured as follows

Respondent's Age: The number of years from the respondent's birth to the date of data collection, measured as a numerical value.

Respondent's Education: Measured as an absolute number representing the total years of formal education completed by the respondent.

Primary Occupation: Refers to the main job the respondent engages in. This was measured on a nominal scale with values as follows: housewife = 1, government sector = 2, private sector = 3, retired = 4, self-employed = 5.

Household Size: Measured as an absolute number representing the total number of individuals living in the same household as the respondent.

Marital Status: The respondent's marital status at the time of data collection; measured on a nominal scale with the following values: married = 1, widow = 2, divorced = 3.

Monthly Household Income: The total household income per month, expressed in Egyptian pounds, at the time of data collection.

Degree of Informal Social Participation: Refers to the respondent's involvement with neighbors, relatives, and community members in social matters, which enhances social bonds. Measured through eight statements with response options: always = 4, sometimes = 3, rarely = 2, never = 1.

Degree of Geographic and Cultural Openness:

(a) Geographic Openness: Indicates spatial mobility and the extent of the respondent's exposure to urban centers beyond her village. Measured by the frequency of visits to various locations with the following values: daily = 5, weekly = 4, monthly = 3, yearly = 2, never = 1. The total score was used as an index of geographic openness.

(b) Cultural Openness: Reflects the respondent's exposure to different media sources (TV, radio, newspapers, magazines, internet, seminars), from which she obtains consumption-related information. Responses were scored as: often = 3, sometimes = 2, rarely = 1, never = 0. The combined score from both subcomponents served as an indicator of overall openness.

Leadership: Defined as the respondent's perception of the extent to which other Bedouin women seek her advice in facing life challenges. Measured using eight statements with response options: always = 4, sometimes = 3, rarely = 2, never = 1. Cronbach's alpha coefficient was 0.630, indicating acceptable reliability.

Participation in Household Decision-Making: Refers to the extent to which the respondent contributes to decisions related to family affairs and social engagements. Responses were rated: high = 3, medium = 2, low = 1, none = 0. The total score was used as an indicator of decision-making involvement.

Saving Orientation: Reflects the respondent's tendency to save part of her income and preserve valuable household assets. Measured using eight statements with responses rated as: agree = 3, neutral = 2, disagree = 1 for positive items, and reverse-scored for negative items. Cronbach's alpha was 0.673.

Innovativeness: Denotes the respondent's inclination to acquire new knowledge and skills relevant to her family's needs and apply them. Measured using six statements, scored as: agree = 3, neutral = 2, disagree = 1 for positive items, and reverse-scored for negative items. Cronbach's alpha was 0.657.

Consumer Values: Refers to the principles and beliefs held by the respondent that influence her consumption behavior. Measured through seven statements with responses scored as: agree = 3,

somewhat agree = 2, disagree = 1 for positive items (items 2 and 5), and reversed for negative items (1, 3, 4, 6, 7). Cronbach's alpha was 0.6, with a mean score of 15.93 and a standard deviation of 3.37.

Consumer Motivations: The latent forces behind the respondent's consumption behavior. Measured through eight statements, with positive items (1, 6, 8) scored: 3, 2, 1, and negative items (2, 3, 4, 5, 7) reverse-scored. Cronbach's alpha was 0.5, with a mean score of 18.2 and a standard deviation of 3.37.

Consumer Attitudes: The respondent's perspective on consumption habits, aimed at adapting to her surrounding environment. Measured using statements with response options: agree = 1, somewhat agree = 2, and disagree = 3 (all statements were negative). Cronbach's alpha was 0.675.

Dependent Variable Food Consumption Behavior of Respondents: Refers to all actions taken by the respondent regarding food across its different stages. Measured using ten statements, with responses rated as: often = 4, sometimes = 3, rarely = 2, never = 1 for positive items, and reverse-scored for negative items. The total score reflects the respondent's overall food consumption behavior. The reliability of this scale, measured using Cronbach's alpha, was 0.773.

3. RESULTS AND DISCUSSION

3.1. First: Personal, Social, and Economic Characteristics of the Respondents in the Study Area

The information contained in Table 1 demonstrates various social, economic and personal attributes of Bedouin women in the research villages, which can be viewed as the major determinants in explaining their food consumption behavior. The findings show that the highest percentage of the respondents are in the first age bracket (16-35 years) with 45 percent of the sample size. This is a representation of a relatively young population that can be more sensitive to social and economic changes. Moreover, the percentage of respondents with medium education level is 60.75 % with low percentage of higher education. It supports what is emphasized in Ahmed and Ali (2024), which clarified that low education restricts the opportunities of Bedouin women to eat healthier food.

78.8% of the surveyed women did not engage in paid jobs away from the home. It shows that Bedouin women, as the main caregivers, manage most resources for food at home. The reported result confirms that Younis and Ali (2017) were correct in focusing on the key role of women in organizing household resources and making choices about food.

Of the people surveyed, 45.75% earned little income at home. It once again supports their observation that poverty in Bedouin communities means that they must rely on simple meals. Thirty-five percent of the participants had a low level of cultural and geographical openness, meaning they are unlikely to learn nutritional information from outside sources.

This fact supports the claim made by Ahmed (2023) that Bedouin women often face challenges with receiving adequate information to educate their food choices. Regarding the values, motivations, and attitudes of the consumers, the results reveals that most women show high to moderate scores in these areas. The observation is in line with the opinions of

Yalichani and Farhi (2016), who argue that better knowledge enhances the financial decision-making of consumers. In a Bedouin setting, the findings presuppose that people will be ready to change their shopping behaviors to better ones provided that they receive the right support and access to information resources. In its turn, the findings, therefore, support the argument expressed in the introduction that social, economic, and cultural factors have a significant impact on the dietary habits and food preferences of Bedouin women. They also highlight the need of extension interventions that are based on a realistic assessment of the determinants of such behavior.

Table 1: Frequency and Percentage Distribution of the Personal, Social, and Economic Characteristics of the Respondents in the Study Area.

Variables	n = 400		Variables	n = 400	
	F	%		F	%
1. Age			8. Geographic and Cultural Openness		
16-35 years	180	45	Low (0-8 points)	142	35.5
36-55 years	172	43	Medium (9-18 points)	233	58.25
(56-75 years)	48	12	High (19-28 points)	25	6.25
2. Education Level			9. Leadership		
Low (0-6 years)	106	26.5	Low (0-6 points)	141	35.25
Medium (7-13 years)	243	60.75	Medium (7-12 points)	168	42
High (14-20 years)	51	12.75	High (13-19 points)	91	22.75
3. Main Occupation			10. Participation in Family Decisions		
Housewife	315	78.8	Low (0-7 points)	80	20
Government Sector	35	8.8	Medium (8-14 points)	279	69.75
Private Sector	8	2	High (15-21 points)	41	10.25
Retired	21	5.2			
Self-employed	21	5.2			
4. Marital Status			11. Saving Orientation		
Married	361	90.2	Negative (14-16 points)	15	3.75
Widow	43	8.5	Neutral (17-20 points)	109	27.25
Divorced	5	1.2	Positive (21-24 points)	276	69
5. Household Size			12. Innovativeness		
Small (0-2 members)	90	22.5	Negative (6-9 points)	57	14.25
Medium (3-5 members)	295	73.75	Neutral (10-13 points)	283	70.75
Large (6-8 members)	15	3.75	Positive (14-17 points)	60	15
6. Monthly Household Income			13. Consumer Values		
Low (< EGP 2,000)	183	45.75	Low (7-<11 points)	19	4.8
Medium (EGP 2,001-4,000)	126	31.5	Medium (12-<16 points)	140	35
High (EGP 4,001-6,000)	19	4.75	High (17-21 points)	241	60.2
7. Informal Social Participation			14. Consumer Motivations		
Low (8-<16 points)	107	26.8	Low (8-<13 points)	97	24.2
Medium (17-<25 points)	163	40.8	Medium (14-<19 points)	214	53.5
High (26-32 points)	130	32.5	High (20-24 points)	89	22.3
			15. Consumer Attitudes		
			Low (3-<4 points)	33	8.3
			Medium (5-<6 points)	75	18.7
			High (7-9 points)	292	73

Source: Compiled and calculated from field research data.

3.2 Second: Results Related to the Levels of Consumer Behavior from the Respondents' Perspective.

3.2.1. Respondents' Scores on Items Measuring Food Consumption Behavior

Data on Table 2 shows that respondents vary in their scores on items that evaluate food consumption behaviors. The analysis of these responses has been conducted by the calculation of arithmetic means, weighted averages, and relative rankings to help develop a more subtle perspective of the daily activities of Bedouin women in this sector. The highest-ranking item was the item I divide the loaf of bread before eating with a weighted average of 78.5. This finding highlights a strong focus on ensuring that the available food products, especially bread, are maximized use as an element of the overall Egyptian and Bedouin food features. In addition, the behavior is consistent with the fact that Ahmed (2023) has noted that Bedouin women often use pragmatic approaches to reducing food waste to address economic difficulties that happen regularly.

The item "I pay attention to the scale and check that the seller weighs items correctly" came in second, with a weighted average of 78.42%. This finding means that there is a moderate consumer awareness of consumer rights and implies a significant consumer vigilance even in rural or Bedouin areas. This behaviour can be viewed as an informal type of empowerment, which is in line with Heckert *et al.* (2019), who claim that the role of women as proactive consumers starts with the control of purchasing behaviour. On the other hand, item "I prepare huge amounts of food in case we have some uninvited guests in the house in the event of their appearance was the lowest in ranking with the

weighted average of 57.8. This finding indicates a relative decline of this traditional practice that is linked to Bedouin hospitality. It might also be related to economic strains and changing lifestyle trends, which is also supported by Yalichani and Farhi (2016), who reported a change in openness of consumption patterns towards more controlled consumption in traditional societies.

The item analyses of purchase planning and the use of alternatives (item 2 and 9, respectively) have comparatively high weighted averages of 72.37% and 68.42, respectively, which, in turn, indicates that Bedouin women possess the consciousness of the need to distribute resources based on priority criteria and the current market price changes. On the other hand, the food preservation (item 8) evaluation generated a rather low score, which, in turn, demonstrates a serious gap in knowledge related to the at-home food preservation methods. The gap is an issue that can be significantly tackled by using specific educational interventions and reducing food waste, as well as fostering mindful eating habits.

the item "raising poultry at home" (item 10) ranked sixth, suggests that some of the so-called self-sufficient food-production means among Bedouin women still persist even under the conditions of a more extensive economic change. According to Ahmed and Ali (2024), the practices are described as the continuation of domestic production efforts that help to ensure food security. Generally, the results indicate that Bedouin ladies have had a set of positive consumption behaviours that should be reinforced. and avoiding overproduction. These insights highlight the need for targeted extension programs designed to enhance such practices through culturally and economically sensitive awareness tools.

Table 2 Numerical Distribution, Percentage, and Weighted Mean of Respondents Based on Their Responses to Consumer Behavior Items in the Food Sector.

Items	Responses of Respondents				Mean	Weighted Mean	Rank
	Often	Sometimes	Rarely	Never			
	F (%)	F (%)	F (%)	F (%)			
1. I sort the vegetables in the refrigerator.	137 (34.2%)	131 (32.8%)	60 (15%)	72 (18%)	2.832	70.8	5
2. Before going to the market, I am exactly clear about what I need to buy.	154 (38.5%)	105 (26.2%)	86 (21.5%)	55 (13.8%)	2.895	72.37	4
3. While in the kitchen, I do multiple tasks at the same time.	176 (44%)	99 (24.8%)	82 (20.4%)	43 (10.8%)	3.020	75.5	3
4. I pay attention to the scale, and the seller weighs the items for me.	195 (48.8%)	106 (26.5%)	58 (14.5%)	41 (10.2%)	3.137	78.42	2
5. I buy some of my needs in bulk.	85 (21.3%)	105 (26.2%)	116 (29%)	94 (23.5%)	2.452	61.3	9
6. I divide the loaf of bread before eating.	212 (53%)	82 (20.5%)	56 (14%)	50 (12.5%)	3.140	78.5	1
7. I prepare large quantities of food in case a guest suddenly visits.	71 (17.7%)	96 (24%)	120 (30%)	113 (28.3%)	2.312	57.8	10
8. I make preserved foods at home.	61 (15.2%)	131 (32.8%)	108 (27%)	100 (25%)	2.382	59.55	8
9. I use food substitutes when food prices rise.	137 (34.2%)	119 (29.8%)	46 (11.5%)	98 (24.5%)	2.737	68.42	7
10. I raise birds at home.	192 (48%)	66 (16.4%)	37 (9.3%)	105 (26.3%)	2.862	71.55	6

3.3.2. Level of Food Consumption Behavior among Respondents

According to the results provided in Table 3, most of the respondents (97 percent) demonstrates the high level of rational food consumption behavior, 2.8 percent demonstrate the moderate level of behavior, and a small percentage (0.2 percent) of 100 individuals show the irrational consumption patterns. These outcomes describe a rather positive expression of the awareness of food resources management among Bedouin women living in the surveyed villages. This awareness can be based on the everyday life experience and the conventional role of women in the household administration of the food and this aspect is highlighted by Younis, Ali, (2017), as well as Gamie (2005), who opine that women in traditional societies are placed at the centre of consumer decision-making.

The marked tendency toward rational behavior can also be viewed through the prism of the conclusions made by Yalichani 2016 964 and Farhi (2016) who state that consumer awareness is a powerful tool of controlling the consumption trends

and driving them towards the utilization of resources in a sustainable manner, even in the environment with low resources. Simultaneously, the statistics might also be somewhat indicative of a kind of forced economical adjustment caused by the unstable living standards whereby Bedouin women are compelled to dispense food resources rationally in the aftermath of limited income as presented in the table above.

Although these are positive signs, studies, including Ahmed and Ali (2024) and Ragavi and Mosimann (2024), warns not to extend these results to other sociocultural contexts. It is not that apparent rationality might be due to a lack of other choices or to the ingrained tribal traditions to adopt certain norms of consumption, but it might be due to genuine nutritional awareness. This means that the evidence highlights the necessity to expand the nutritional extension programs that conduct systematic assessment of the behavioral outcomes and attempt to extend the understanding of modern dietary paradigms. This necessity is particularly acute in regard to the current economic and social changes that can bring about the further changes in the consumption patterns.

Table 3: Level of Food Consumption Behavior among Respondents.

Category	Frequency	%
Low Level (Irrational) [Score: 10-20]	1	0.2%
Medium Level (Somewhat Rational) [20-30]	11	2.8%
High Level (Rational) [30-40]	388	97.0%
Total	400	100%

3.3. The Relationship between the Studied Independent Variables and the Level of Food Consumption Behavior among Respondents

The results shown in Table 4 indicate the existence of statistically significant correlations between several independent variables and the level of food consumption behavior among the respondents. These correlations reflect the varying influence of social, economic, and psychological factors on the degree of rational consumption among Bedouin women.

The results of the analysis indicated that there was a significant negative correlation at the level of 0.05 and 0.01 between the behavior and the food consumption and the variables, including age ($r = -0.109$), level of education ($r = -0.345$), household size ($r = -0.320$), and monthly income ($r = -0.488$). It means that the higher the age, education, family size or income is, the less rational food consumption behavior is observed. These results can be correlated with the results of Ahmed and Ali (2024), who

suggested that an increase in some socioeconomic indicators does not always result in a rise in rational consumption. Conversely, they can lead to increased excess use practices especially in cultural practices whereby generosity and abundance are socialized as is common in the Bedouin culture.

However, to the contrary, the analysis showed that food consumption behavior has statistically significant positive relationships with various contextual variables, which are participation in household decision-making ($r = 0.192$), leadership traits ($r = 0.237$), and saving orientation ($r = 0.459$), and each of them is significant at the 0.01 level. These results suggest that increased involvement of women in household decision making, increased expression of leadership qualities and tendency of saving are linked with an increased likelihood of participating in rational food consumption. These results support the claims of Heckert et al. (2019), who believed that when women are empowered in the household, it has a direct positive impact on the quality of nutrition and consumer-related decisions.

On the other hand, the results revealed significant negative correlations between food consumption behavior and consumer values ($r = -0.230$), consumer motivations ($r = -0.169$), and consumer attitudes ($r = -0.201$). This could be interpreted to mean that some prevailing beliefs, motivations, or attitudes in the Bedouin context may not be grounded in scientific understanding but are instead shaped by social customs, traditions, or appearances. As a result, these factors may negatively influence behavior despite the presence of strong values or motivations. This

interpretation is supported by Lindsey (2024), who noted that consumer values and attitudes do not necessarily translate into rational behavior unless they are backed by cognitive awareness.

Finally, the study found that informal social participation and cultural openness did not exhibit significant effects on food consumption behavior. This may suggest that these variables have limited influence in relatively closed Bedouin communities, or that their impact requires structured awareness interventions, as highlighted by Ahmed (2023).

Table 4: Values of the Simple Correlation Coefficients between the Independent Variables and Consumer Behavior of Respondents in the Food Sector.

No.	Independent Variables	Simple Correlation Coefficients
1	Age	-0.109*
2	Education Level	-0.345*
3	Family Size	-0.320**
4	Monthly Family Income	-0.488**
5	Degree of Informal Social Participati	0.096
6	Degree of Geographic and Cultural Ope	0.094
7	Degree of Contribution to Family Decision	0.192**
8	Leadership Degree	0.237**
9	Saving Orientation	0.459**
10	Orientation Towards Innovation	-0.080
11	Consumer Values	-0.230**
12	Consumer Motivations	-0.169**
13	Consumer Attitudes	-0.201**

Significance level 0.01** Significance level 0.05*

3.4. Nominal Independent Variables Influencing Food Consumption Behavior among Respondents

Because many Bedouin women have little education, they may not know enough about making healthy food selections. Most of the women in the survey, 78.8%, did not work outside the household. Traditionally, Bedouin women take care of their families and manage what their families eat which is reflected here. Results suggest that women's role in managing family funds and especially food, is just as important as indicated by Younis and Ali in 2017.

The table reports that One-Way ANOVA detected significant differences at the 0.01 significance level between categories of marital status and primary occupation and the amount of food people consume. The F-values for marital status and primary occupation were each very close to each other (7.735 and 7.732, respectively), meaning both have a significant effect on the way Bedouin women choose their food. The results show that marital status explains approximately 3.8% of why people have the eating habits they do ($\text{Eta}^2 = 0.038$). These results show that whether a woman is married, widowed or divorced, her social status plays a role in managing what she eats. This supports what Al-Radami & Al-

Abed have found (2021) which is that shifts in marital status may revise how women control household food management and spending in rural or Bedouin areas, where traditions and social conservatism are common.

Regarding primary occupation, the analysis shows that this variable explains a larger proportion of the variance 7.3% ($\text{Eta}^2 = 0.073$) indicating that a woman's professional status, whether she is a housewife, government employee, or private-sector worker matters a lot in her food habits. As supported by research, having a job often allows women to make smarter decisions when they buy goods. This result is consistent with what Heckert et al. (2019) report: higher levels of economic empowerment in women are linked to healthier decisions about food. Although the explanatory percentages (3.8% and 7.3%) may seem relatively modest, they underscore the independent influence of these two variables within the broader context of factors affecting food behavior. These findings highlight the importance of designing guidance programs that take into account the diversity of Bedouin women's situations in terms of marital status and occupation, ensuring that educational messages are both effective and relevant to their lived realities.

Table 5: Estimation of the Significance of Differences Between Categories of Nominal Independent Variables Regarding Respondents' Behavior for Food Consumption Rationalization Using One-Way ANOVA, F-Test, Eta Squared Statistic, and Percentage of Explained Variance in the Dependent Variable (Respondents' Behavior for Food Consumption Rationalization).

Nominal Independent Variables	Source of Variance	Sum of Squares	Degrees of Freedom	Mean Squares	F-Value	Eta Squared Statistic	% of Explained Variance in the Dependent Variable
Marital Status	Between Groups	419.222	2	209.611	7.735**	0.038	3.8
	Within Groups	10758.688	397	27.100			
	Total	1117.910	399				
Respondent's Primary Occupation	Between Groups	811.702	4	202.925	7.732**	0.073	7.3
	Within Groups	10366.208	395	26.244			
	Total	1117.910	399				

Significance level 0.01

3.5. Estimating the Contribution of Studied Independent Variables in Explaining the Total Variance in Food Consumption Behavior Among Respondents

The results of the step-wise multiple regression analysis presented in Table 6 show that seven independent variables significantly contributed to explaining 34% of the total variance in the respondents' level of food consumption behavior. This is a statistically significant proportion (F = 28.812, at the 0.01 significance level), indicating a robust explanatory model.

The strongest predictor was age which alone explained 22.6% of the variance. The observation highlights the importance of age in determining eating pattern, where young groups tend to have a more rational eating pattern. This observation is consistent with that of Hill et al. (2018), who have indicated that age development might result in the decrease in behavioral flexibility or increase in the tendency to follow traditional consumption patterns, which are less prone to change. Educational attainment was the second most salient variable with a contribution of an extra 4.2 per cent to the variance.

This observation confirms the hypothesis that education is a basic enabling factor of cognitive and consumer empowerment. The increased level of education has always been associated with the increased level of discernment in the food options and the better understanding of the nutritional value, which is supported by Ahmed and Ali (2024) and Heckert et al. (2019). The share of informal social participation and leadership in the variance was 1.7% and 2.2%, respectively. Such statistics indicate that women who are more connected socially or those who are frequently consulted to make decisions in their societies are in a better position to embrace

reasonable food habits. Such a reading is reminiscent of Yang (2023), who highlighted the strong impact of the social environment on the dietary behavior.

Involvement in domestic decision-making serves as an explanation of 1.4 percent of the variance, thus supporting the findings that domestic empowerment is a very important factor in determining the dieting habit of women, particularly in Bedouin contexts where household decisions are often guided by group or traditional authority. Al-Radami and Al-Abed (2021) also highlighted the positive effect of the participation of women in the decision-making processes in the quality of the decisions on the food consumed by the family.

Saving orientation contributed 1.1% to the variance which is logically understandable because the women who are oriented to savings are more rational in the management of food consumption. This fact is consistent with the results of Yalichani and Farhi (2016) who found that there is a positive correlation between a strong saving orientation and more rational use of resources. On the other hand, consumer values were the last to rank, which accounted only 0.8% of the variance. This finding is interesting in that it suggests that high consumer values do not necessarily mean rational behaviour unless they are accompanied by cognitive awareness and practice. Lindsey (2024) supported this idea by stating that in a traditional setting, there can be a significant gap between the stated values and the real practices. All these results capture the complexity of the food consumption behaviour among Bedouin women and highlight the need to implement awareness interventions that can take into account the heterogeneity of the age, education, social roles, and psychological determinants of shaping such behaviour. Based on this, the null hypothesis may be rejected in the variables that prove a significant

relationship with the dependent variable and accepted in the other ones.

Table 6: Independent Variables Most Contributing to Explaining the Variance in Respondents' Consumer Behavior in the Food Sector.

Analysis Steps	Influencing Variables	Level of Consumer Behavior of Respondents in the Food Sector				
		R	R Square	Adjusted R Square	% of Explained Variance in the Dependent Variable	F-Value for Regression Significance Test
Step 1	Age	0.476	0.226	0.224	22.6	**116.444
Step 2	Education Level	0.518	0.268	0.265	4.2	**72.791
Step 3	Degree of Informal Social Participation	0.534	0.285	0.280	1.7	**53.697
Step 4	Leadership Degree	0.554	0.307	0.300	2.2	**43.748
Step 5	Degree of Contribution to Family Decision-Making	0.567	0.321	0.313	1.4	**37.282
Step 6	Saving Orientation	0.576	0.332	0.321	1.1	**32.491
Step 7	Consumer Values	0.583	0.340	0.328	0.8	**28.812

Significance level 0.01 Significance level 0.05

3.6. Differences in the Mean Scores of Food Consumption Behavior among Respondents Based on Their Village of Residence

The results revealed statistically significant differences in the mean scores of food consumption behavior among the respondents across the three study villages. Table 7 presents the outcomes of the One-Way ANOVA test used to assess the significance of these differences. The analysis of variance showed that there were significant statistical differences ($F = 4.899$ at the 0.01 significance level) in the mean scores of food consumption behavior among women, depending on the village in which they resided. The village of Al-Kharba ranked first with a mean score of 22.52, compared to 20.70 in Sadat and 20.44 in Nagila. This indicates that women in Al-Kharba display more rational food consumption behavior than their counterparts in the other two villages.

The noticed differences can be probably explained by the fact that the level of local development in three villages differs. The villages have been chosen to represent a range of various stages of development that the research area was purposely chosen to capture with Al-Kharba being a middle of a range. The medium degree of development in Al-Kharba seems to have made the equilibrium between awareness and availability of resources such that the tendencies towards excessive consumption that can typify more advanced environments and the unpredictable behaviours that can result due to poverty in less developed ones such as Nagila are reduced.

This result is in line with those of Zamir and Jaber (2015) and Ahmed (2023), who show that social changes related to partial development in Bedouin

societies are likely to reorganize the role of women and their consumption patterns. This impact is very strong especially when the women are faced with such lack of educational and cultural opportunities and yet they still remain in their traditional patterns. Based on these spatial differences, it is important to note that it is essential to design extension programmes that are acutely sensitive to the specifics of the situation in this or that village, instead of using a one size fits all approach. These programmes should consider the differences in development, availability of resources and cultural and social infrastructure that defines a locality. The current conclusion consequently supports the practical recommendations developed at the end of the research, which underlines the significance of extending the messages to the particular needs of women based on the local context of the North Sinai Governorate.

Table 7: Results of the Analysis of Variance between the Means of Consumer Behavior of Respondents Classified by the Three Study Villages.

Dependent Variable	F-Value	Village Mean		
		Sadat	Khabra	Nageila
Consumer Behavior in the Food Sector	**4.899	20.70	22.52	20.44

3.7. Proposed Extension Program to Improve the Consumer Behavior of Bedouin Women in North Sinai Governorate

Based on the results of this research that indicated the degree of food consumption behaviour among the respondents in Bir al -Abd district of North Sinai Governorate, the priorities of extension work have

been established to address consumer behaviour among Bedouin women. These priorities are summarized in Table 8 and are aimed at the weaknesses identified in the research, and specifically in areas where the respondents received a lower score than 50%. The program aims at improving consumer behaviour in the three areas examined by addressing the behavioural gaps that

were established in the study. It aims to promote more rational consumption practices, raise awareness, and empower women through practical, culturally appropriate interventions tailored to the local context. The proposed interventions are based on evidence from the field and are structured to be applicable and responsive to the real needs of Bedouin women in the region.

Table 8: Determining the Priorities for Advisory Work to Improve the Consumer Behavior of Bedouin Women in the Food Sector.

Educational Advisory Objectives	Advisory Messages	Advisory Methods and Tools Used	Target Audience	Communication Sources	Suggested Timing	Evidence of Progress
Rationalizing the Consumer Behavior of Bedouin Women in the Food Sector at Bir al-Abed Center in North Sinai	1. Raising poultry at home. 2. Determining the required purchases before going to the market. 3. Buying household needs in bulk. 4. Seeking alternatives when prices rise. 5. Preparing preserved food at home. 6. Sorting vegetables in the fridge.	1. Television programs. 2. Lectures. 3. Advisory seminars.	Bedouin women responsible for managing family affairs at Bir al-Abed Center in North Sinai.	Local advisory staff, such as female advisors or Bedouin leaders.	The most suitable time for both the target audience and the advisors.	- A 30% increase in women raising poultry at home within 6 months. - A 25% decrease in the daily purchase of food items and an increase in bulk buying. - A 40% increase in the preparation of homemade preserved foods among the targets. - A 50% decrease in vegetable waste in the fridge during the program period. - Over 60% of participants will pre-determine their purchases. - 50% of the target families will use alternatives.

4. RESEARCH RECOMMENDATIONS

In light of the study's findings, several practical recommendations are proposed to improve the food consumption behavior of Bedouin women

1. Intensify media campaigns to increase nutritional awareness of Bedouin communities using culturally sensitive programming.
2. Establish and conduct localized extension and training programs to Bedouin women, with a focus on managing household resources, food conservation, preparation of purchases, and the use of low-cost options.
3. Enhance the rural extension system through training female leaders and extension workers to communicate effectively in the Bedouin cultural and social context.
4. Adopt enabling local policies that support women's access to information, decision-making power, and participation in community-based nutrition initiatives.
5. Implement continuous comparative field

research in Bedouin regions to track the changes in behavior and improve programs based on evidence-based assessment instruments.

5. RESEARCH DELIMITATIONS

The study was designed with an accurate methodological framework to guarantee a focused investigation and the accurate achievement of the goals of the research. The study was geographically limited to three villages, namely, Sadat, Al-Kharba and Nagila located in the Bir al-Abd district of the North Sinai Governorate. Such locations were chosen in order to obtain the heterogeneity of development, thus, represent heterogeneity of socioeconomic situations among Bedouin women.

The data were sampled in November 2023-December 2023. This temporal limit might limit the applicability of the results to later times that are marked by faster social or economic changes. Sampling wise the study only considered Bedouin

women who acted as heads of a household and the sample used was 400. Therefore, the findings can only represent this sub-group and not other demographic groups in Bedouin society such as men, young people, or children.

Thematic emphasis was done on food consumption behavior with no other area of consumption like water, energy or clothing being considered. This has a limited area of study making

the findings particular to the food domain. The methodology of the study was descriptive analysis, which was based mainly on the use of a questionnaire to collect data, excluding the qualitative tools of research, including in-depth interviews and direct observation. This methodological option may limit the heterogeneity of data sources and standpoints that are included in the study.

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