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## A study on factors influencing consumption of millets in Coimbatore district of Tamil Nadu

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### Abstract

This paper analyses the various factors that had influenced the consumption of millets among the urban and rural households. The data used in the analysis were obtained through personal interviews of 300 households in 9 villages scattered over 3 taluks of Coimbatore district in 2023. The results revealed that per capita consumption of millets is higher in urban household (2.29 kg/month) when compared to rural (1.83 kg/month). Influence of 11 independent variables on the consumption of millets (dependent variable) was studied using binary logistic regression. The pseudo  $R^2$  of 0.2859, suggesting that the independent variables included in the analysis collectively explain about 28.59% of the variation in millet consumption. The analysis reveals significant factors influencing millet consumption: age positively affects consumption, with each additional year increasing the likelihood by 0.53%. Being female enhances the odds of consumption by 8.79% since the selected population comprises most of Females. Greater awareness of millet benefits escalates consumption by 31.69%. Positive taste perception raises the likelihood by 12.44%. Perceived nutritional value amplifies consumption by 14.82%. Education's impact is minor (0.0594). Higher prices decrease consumption (25.77%). Income shows negligible effect. The parameters that influence the purchase of millet products were identified using Garrett Ranking method. The most influential factor was health benefit (66.09) followed by price (48.99) and taste (47.36). These findings suggest that efforts to promote millet consumption should focus on improving taste, nutritional awareness, and affordability to encourage greater adoption of millet products.

**Keywords:** Millets, household, consumption pattern, factors, consumer preference

### 1. Introduction

Millet is a coarse grain that has been traditionally cultivated and consumed in the Indian subcontinent for more than 5,000 years (Gulia *et al.* 2007) <sup>[7]</sup>. Unlike other grains, millet needs little water and soil fertility. The high affordability of millet also marks them as the poor man's food. The world is now realizing the enormous potential of millet (Dayakar *et al.* 2017) <sup>[2]</sup>. These millets are also known as coarse cereals or cereals of the poor (Kadam *et al.*). In 2018, Millets are considered to be the "next super food" or "Nutri-Cereals", considering their high nutritive value and also anti-diabetic properties. Millets are sustainable food source for combating hunger in a changing world climate. Millets have the potential to help achieve the sustainable development goals (Kumari *et al.*).

The United Nations has designated 2023 as the International Year of Millets in order to maintain this momentum. Millet is a coarse grain that has been traditionally cultivated and consumed in the Indian subcontinent for more than 5,000 years (Gulia *et al.* 2007) <sup>[4]</sup>. Millets provide nutritional security, and there is a need to promote millets since they are extremely nutritious. These have historically been essential food staples, notably in Asia and Africa. Sorghum and other millets consumption as direct food has fallen dramatically during the last three decades.

In recent years, millets have gained momentum due to their high nutritive value and potential anti-diabetic properties. The global consumption of millets reached a staggering 90.43 million metric tonnes in 2022, with India leading the way with 17.75 million metric tonnes consumed. Despite this, the per capita consumption of millets in India has decreased significantly, from 30.94 kg/annum in 1960 to a mere 3.87 kg/annum in 2022.

The decline can be attributed to the changing food preferences and an increase in population, which outpaced production growth (APEDA 2022).

The pattern of millets utilisation revealed that about three-quarters of sorghum production is for self-consumption, which is it is consumed directly by humans. Similarly, bajra (pearl millet) is used for direct human consumption to the extent of 69%. Furthermore, ragi is used in a somewhat different way than sorghum and bajra, with roughly 10% of ragi being used to create value-added goods for the FMCG industry. However, in terms of direct consumption, ragi is similar to sorghum, with around one-third of the yield being consumed directly by people (ICAR-IIMR).

Promoting the consumption of millets has become crucial to achieve sustainable development goals and combat hunger, especially in the face of a changing world climate. Millets have immense potential to contribute to SDG 2 (Zero Hunger), SDG 3 (Good Health and Well-being), SDG 12 (Sustainable Consumption and Production), and SDG 13 (Climate Action). As consumer preferences evolve and the demand for nutraceutical foods rises, millets can play a significant role in promoting better health and preventing chronic diseases (Kumari *et al*; Shobana *et al.* 2009) <sup>[13]</sup>

The objective of the study is to understand the factors that influence millets consumption taking the facts mentioned above into account:

1. To study the consumption pattern of urban and rural households.
2. To determine factors influencing the consumption of millet and millet products.
3. To suggest consumer preference towards purchase of millets and value-added products.

Taking into consideration of the abovementioned facts, the present study is undertaken to understand the millet market in the selected study area. This study points towards the various factors responsible for the acceptance of the millet products by the consumers and also consumer's interests, preferences and tastes towards millets which could further aid in adding feature to the upcoming innovative products.

## 2. Materials and Methods

### 2.1 Data Collection

The primary survey conducted in 2023 in Coimbatore district involved a total sample size of 300 households, with 150 from urban areas and 150 from rural areas. The survey utilized a multistage random sampling technique. In the first stage, three blocks, namely Thondamuthur, Annur, and Kinathukadavu, were randomly selected in the Coimbatore district for the rural category. For the urban category, sample households within the city limits and within a five-kilo meter radius of Coimbatore, Mettupalayam, and Pollachi were chosen. The survey focused on village clusters as the sampling units from the randomly selected blocks.

### 2.2 Percentage Analysis

Percentage analysis was used to examine the general characteristics of respondents based on age, gender, place of residence, income, and level of education. By calculating the percentage for each category within these characteristics, it gains insight into the distribution and composition of the respondent group.

### 2.3 Binary Logit Regression

The study adopts a binary logistic regression model to explore factors influencing millet consumption (Meng *et al.* 2021) <sup>[10]</sup>. The model uses dichotomous data, with 1 representing willingness to consume millet products and 0 indicating otherwise. The empirical model considers attributes like age, gender, residence, income, education, price, taste, appearance, nutritional value, awareness, and promotion as predictors. The estimated coefficients, representing odds ratios, reveal the impact of each attribute on the likelihood of millet consumption. Positive coefficients indicate increased likelihood, while negative ones imply reduced probability. STATA\_15 software was employed for the analysis of household millet consumption patterns.

$$P_i(y_i = 1/x_i\beta_i = 1 - e^{-x_i\beta} / (1 - e^{-x_i\beta}))$$

$$= \frac{e^{x_i\beta}}{1 + e^{x_i\beta}}$$

The binary model is expressed as a regression model using the formula  $y_i = 1 - f(x_i\beta) + \varepsilon_i$  where  $y_i$  represents willing to consume millet goods. A consumer's propensity to purchase millet goods is affected by a vector of parameters called  $x_i$ , and  $\varepsilon_i$  is the residual that represents the departure from the conditional mean.

The empirical model that was chosen to examine customer interest in millet goods may be described as follows:

$$\text{Consumption} = \text{Ln} [p_i/(1-p_i)] = \beta_0 + \beta_1 \text{ AGE} + \beta_2 \text{ Gender} + \beta_3 \text{ Residence} + \beta_4 \text{ Income} + \beta_5 \text{ Education} + \beta_6 \text{ Price} + \beta_7 \text{ TASTE} + \beta_8 \text{ Appearance} + \beta_9 \text{ Nutritional Quality} + \beta_{10} \text{ Awareness} + \beta_{11} \text{ Promotion} + \dots + \varepsilon_i$$

Where  $p_i$  denotes the probability of a consumer's willingness for millet products and  $[p_i/(1-p_i)]$  is the odd ratio in favour of a consumer's willingness for millet products and  $X_1, \dots, X_{14}$  denotes,

Consumption - Dummy dependent variable (1 for willing to consume millet products and 0 for not willing to consume millet products)

$\beta_0$  = Intercept of the model

$\beta_1, \dots, \beta_9$  = Coefficients

$X_1$  = Age (in years)

$X_2$  = Gender (Dummy variable, 1 if female and 0 otherwise)

$X_3$  = Residence (Dummy variable, 1 if urban and 0 otherwise)

$X_4$  = Monthly Income (Rs. /month)

$X_5$  = Education (Dummy variable, 1 if literate and 0 otherwise)

$X_6$  = Price (Dummy variable, 1 if affordable and 0 otherwise)

$X_7$  = Taste (Dummy variable, 1 if good and 0 otherwise)

$X_8$  = Appearance (Dummy variable, 1 if good and 0 otherwise)

$X_9$  = Nutritional Quality (Dummy variable, 1 if improved and 0 otherwise)

$X_{10}$  = Awareness (Dummy variable, 1 if yes and 0 otherwise)

$X_{11}$  = Promotion (Dummy variable, 1 if yes and 0 otherwise)

$\varepsilon$  - Error term

### 2.3 Garrett Ranking

Garrett's ranking technique will be used to rank the consumer preference of millet products indicated by the respondents on different factors (Shadang *et al.* 2007) <sup>[12]</sup>. As per this method, respondents have been asked to assign the rank for all factors and the outcome of such ranking has been converted into score value with the help of the following formula:

$$\text{Percentage position} = \frac{100 (R_{ij} - 0.5)}{N_j}$$

Where  $R_{ij}$  = Rank given for the  $i^{\text{th}}$  variable by  $j^{\text{th}}$  respondents

$N_j$  = Number of variables ranked by  $j^{\text{th}}$  respondents

With the help of Garrett's Table, the percent position estimated is converted into scores. Then for each factor, the scores of each individual are added and then total value of scores and mean values of score is calculated. The factors having highest mean value is considered to be the most important factor which helps to make various strategies and tactics to make millets more appealing and attractive to

consumers. It can effectively suggest consumer preferences towards the purchase of millets and value-added millet products.

### 3. Results and Discussion

#### 3.1 Socio-economic Characteristics of the Sample Respondents

The socio-economic characteristics of the respondents in the study were examined, revealing a diverse sample that included both urban and rural households.

**Table 1:** Socio-economic Characteristics of the Respondents

Sl. No.	Variable	Urban		Rural	
		Number	%age	Number	%age
1.	Residence	150	100	150	100
2.	<b>Age</b>				
	20-35	48	32.00	41	27.33
	36-60	80	53.33	65	43.33
	>60	22	14.67	44	29.33
3.	<b>Gender</b>				
	Male	39	26.00	52	30.33
	Female	111	74.00	98	69.67
4.	<b>Education</b>				
	Illiterates	20	13.33	39	26.00
	Primary	24	16.00	37	24.67
	Secondary	48	32.00	45	30.00
	Graduate	58	38.67	29	19.33
5.	<b>Income</b>				
	Below 10000	2	1.33	12	8.00
	10000-29000	58	38.67	90	60.00
	30000-49000	36	24.00	35	23.33
	Above 50000	54	36.00	13	8.67
6.	<b>Type of family</b>				
	Nuclear	109	72.67	124	82.67
	Joint	41	27.33	26	17.33
7.	<b>Occupation</b>				
	Primary	8	5.33	87	58.00
	Secondary	28	18.67	1	0.67
	Tertiary	114	76.00	62	41.33

Source: Primary data, 2022-2023

The socio-economic characteristics of the respondents in the study were examined to gain insights into the demographic composition of urban and rural households. In terms of residence, an equal number of respondents, 150 in each category (urban & rural), were surveyed. Age distribution revealed that the majority of respondents in both urban and rural areas is within the age group of 36-60 years, with 53.33% in rural areas and 53.33% in urban areas. Out of 300 respondents that were selected to participate in the study, 72% were female and 28% were male participants. The number of female participants was more than of their male counterparts this reflects that makes major decisions about the intake of food was taken by women. Education levels varied, with 32.00% of rural respondents having secondary education and 38.67% having graduate education. In contrast, urban areas had 30.00% of respondents with secondary education and 38.67% with graduate education. Income distribution showed that 60.00% of urban respondents had an income of 10000-29000, while 23.33% of rural respondents fell within the same income range. Family type analysis revealed a higher prevalence of nuclear families in both urban (72.67%) and rural (82.67%) areas. Occupational distribution highlighted that majority of urban respondents were engaged in tertiary occupations (76.00%), whereas in rural areas, primary and tertiary occupations were more evenly distributed.

#### 3.2 Consumption Pattern of food commodities

The average per-capita consumption of food commodities among the households was worked out and is presented in Table 2. The commodities include cereals (rice, wheat, rava, maida), millets (pearl, finger, sorghum, foxtail, little, banyard, kodo), pulses (red gram, black gram, green gram, Bengal gram), oil, milk & milk products (curd, ghee), meat (chicken, mutton, fish, egg), fruits, vegetables, sugar & salt, spices.

**Table 2:** Per capita consumption of food items (Kg/month/ households)

Food Items	Urban	Rural
Cereals	27.07	23.30
Pulses	5.00	4.97
Millets	2.29	1.83
Fruits	12.86	15.92
Vegetables	23.51	25.70
Spices	2.98	2.34
Non-Veg	2.80	2.33
Salt & Sugar	4.53	4.15
Oil	4.17	2.30
Milk	19.64	16.38
Total quantity	104.85	99.22

Source: Primary data, 2022-2023

The results from Table 2 reveals that urban households show higher average monthly consumption of cereals (27.07 kg) compared to rural households (23.30 kg). Millet consumption is higher in urban households (2.29 kg) than in rural households (1.83 kg). Vegetables are the major share in both settings, with urban households consuming 23.51 kg per month and rural households consuming 25.70 kg. However, rural households consume more fruits, averaging 15.92 kg per month, compared to 12.86 kg in urban households. Urban households also consume slightly more pulses (5 kg per

month) than rural households (4.97 kg). Urban households consume significantly more oil (4.17 litres per month) and milk (19.64 litres per month) than their rural counterparts (2.30 litres and 16.38 litres, respectively).

**3.3 Factors influencing consumption of millets**

A logistic regression analysis was performed to determine the factors that significantly contribute to household millets consumption in the Coimbatore district.

**Table 3:** Results of the factors influencing consumption of millets (binary logistic model)

Variables	Coefficients	Marginal Effect	Std. Error	P value	Exp (β)
Age	.033188**	.0053077	.0114333	0.004	1.033745
Gender	.5495609*	.0878912	.3232769	0.089	1.732492
Residence	.3955463	.0632597	.3278901	0.228	1.485195
Income	.0000295***	4.72e-06	.0000084	0.000	1.00003
Education	.3716745	.0594419	.3722742	0.318	1.450161
Price	-1.611184***	-.2576764	.3077195	0.000	.1996512
Taste	.7777338**	.1243829	.3436503	0.024	2.176534
Appearance	.9311973	.1489262	.6151286	0.130	2.537546
Nutritional value	.9268754**	.148235	.3175956	0.004	2.526602
Awareness	1.981547***	.3169086	.5022896	0.000	7.253958
Promotion	.2419254	.0386911	.579809	0.676	1.273699
Log Likelihood ratio	-145.7323				
Pseudo R2	0.2859				
Number of observations	300				

\*, \*\*, \*\*\*- Significant at 10%, 5% and 1% levels respectively

The results reveal that pseudo R<sup>2</sup> value of 0.2859 indicates that the independent variables explain around 28.59% of the variation in millet consumption overall. Age has a statistically significant positive impact on millet consumption. This suggests that for each additional year in age, the likelihood of consuming millets increases by approximately 0.53%. The gender variable shows that being female increases the likelihood of millet consumption by approximately 8.79%. Higher awareness of the health benefits of millets leads to a significant increase in millet consumption. For each unit increase in awareness, the likelihood of consuming millets rises by approximately 31.69%. Individuals with a higher preference for the taste of millets are approximately 12.44% more likely to consume them. This effect is significant at the 5% level, suggesting that taste plays a role in driving millet consumption. Perception of millets' nutritional value influences consumption significantly. For each unit increase in the perceived nutritional value, the likelihood of millet consumption increases by approximately 14.82%. The education level does not have a substantial impact on millet consumption, as indicated by the coefficient of 0.0594. Higher prices act as a deterrent to millet consumption. For each one-unit increase in price, the likelihood of millet consumption decreases by approximately 25.77%. Income has a negligible effect on millet consumption.

**3.4 Factors that influence consumers towards purchase of millet products**

The data presented in Table 4 shows the Suggestions made by Consumers towards Purchase of Millet Products among both urban and rural households millet. It indicates various choices and views of the consumers regarding their millet purchases, with the information ranked in order of importance or preference.

**Table 4:** Factors that influence consumers towards purchase of millet products

S.no	Particulars	Mean Score	Rank
1.	Health benefit	66.09	I
2.	Price	48.99	II
3.	Taste	47.36	III
4.	Influence by social media	45.07	IV
5.	Availability	39.79	V

**Source:** Primary data, 2022-2023

Factors that influence consumers towards purchase of millet products were ranked using Garrett Ranking method. From the table, it indicates that the most significant factor is the perceived health benefits (66.09) associated with millet products followed by price (48.99), taste (47.36), influence by social media (45.07), availability (39.79).

**3.5 Suggestions made towards purchase of millet products**

Health benefit is the most influential factor thus consumers often prioritize products with high nutritional value. To make consumers prioritize products, highlight the health benefits of millet-based products through clear labelling and informative marketing materials. Affordability plays a significant role in purchasing decisions. To make millet-based products more appealing introduce economy-sized packaging for cost-conscious consumers, offer competitive pricing or bundle deals. Palatability greatly influences consumer preference. Enhance the taste and flavour of millet-based products to attract consumers. Leveraging effective social media marketing could further boost consumer interest. Expanding distribution channels, collaborating with local markets, and ensuring online availability are crucial for easy access to millet-based products. This helps to improve accessibility for consumers.

**4. Conclusion**

This study provides valuable insights into the factors influencing millet consumption patterns among urban and rural households in Coimbatore district. The analysis underscores the significance of age, gender, awareness, taste

perception, and perceived nutritional value as significant drivers of millet consumption (Pseudo  $R^2$  0.28). The study identifies the pivotal role of health benefits, price, and taste in influencing consumer preferences for millet products. These findings carry important implications for promoting millet consumption and addressing nutritional challenges. Efforts to enhance taste, raise awareness about millet benefits, and ensure affordability through strategic marketing and distribution strategies can effectively encourage greater adoption of millet products. Ultimately, these strategies can contribute to achieving sustainable development goals, combatting hunger, and improving public health by integrating nutritious millets into dietary practices.

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