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# Understanding the consumption patterns of Food Grains Consumers on the basis of their spending behaviors.

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**Abstract**

This research seeks to establish the changes in the consumption of food grains over time in India especially Punjab to identify the differences between the urban and rural regions. To address the research question that seeks to know if there are considerable differences in consumption between these regions, the study adopts a descriptive research design and a positivist epistemology and ontology that rely on secondary data from a number of governmental agencies. The data compiled is for five years (1999-2000, 2004-05, 2009-10, 2011-12, and 2022-23) and the results are tested by Independent Sample t-test. In contrast with the hypothesis that there would be a huge difference between urban and rural areas, this study finds that there is a surprising level of similarity in consumers' behaviors. The results of the statistical tests reveal that there are no significant differences in the consumption behaviors between the two periods of time and therefore can be concluded that the consumption behaviors have become more similar with time. It is therefore possible to conclude that this has been caused by elements such as better transport networks, availability of a wider range of products, and shifts in consumers' behavior that have made the consumption experience more standardized. Therefore, there is a need to reconsider the measures that are being put in place to correct the regional imbalance in consumption levels and also emphasizes the need to understand these trends for economic planning and development.

**Keywords:** Consumption Patterns, Food Grains, Economic Development, Regional Disparities

## 1.1 Introduction

Agriculture in India has also witnessed major changes in the structure during the last few decades, especially with regard to food grains consumption and production. These changes have been occasioned by a number of factors such as economic development, urbanization, technology and changes in consumer preferences (Ramadas et al. , 2019). With the country crossing over to the production of more diversified food crops, there has been fluctuation in production of our staple foods such as wheat and rice while at the same time there has been a rise in demand for a variety of food grains. The "Granary of India," Punjab provides a suitable context to analyse these trends in more detail (Rai et al. , 2024).

The state of Punjab has always been a leading producer of food grains especially wheat and rice in the country (Bandumula, 2018). The green revolution in the 1960s and 1970s helped the state to achieve record production in food grain production thereby becoming a major provider of food grain to India (Ahlawat & Gautam, 2021). Nevertheless, the last years have introduced changes in production and consumption tendencies as the state has new conditions and opportunities (Moudgil et al., 2018). Some of the reasons may include soil erosion, water rationing, and fluctuations in the market prices that have made farmers in Punjab to change their crops. This diversification is not only due to the environmental and economic factors but also to the general shift in the consumers' behavior and their preferences regarding the diet in India (Govindan, 2018).

Various socio-economic factors have played a significant role in changing the pattern of consumptions in India. Over the past few decades with the improvement of income level and the process of urbanization, there has been

a significant change in the diet pattern. Consumers are switching from the traditional staple foods to variety of grains including pulses, millets and other cereals in order to improve their nutritional quality. This change is partly due to concerns with health and nutrition as well as shift in lifestyles that embrace flexibility and diversification. Thus, the need for the various food grains has increased and this has led to changes in the production patterns in the main agricultural producing states of the country such as Punjab.

Therefore, due to these shifting consumption patterns, Punjab has started the process of diversification of Agriculture crops (Sekhar et al., 2018). Farmers are slowly coming out of the monoculture of wheat and rice and are diversifying to other crops such as pulses, maize and other cereals. This diversification is considered to be important in order to guarantee the future of agriculture in the state due to environmental conditions and new requirements of the market (Scott et al., 2019). Nevertheless, this transition is not easy. Challenges include restricted market access for non-traditional crops, requirement of new technologies and sustaining economic returns to land during the transformation process in Punjab farmers.

The case of Punjab can therefore be generalized to the rest of India to capture the trends of diversified production basing on the changing consumer preferences (Bandumula, 2018). This paper seeks to elaborate on these dynamics by analysing how shifts in the consumption pattern of the Indian consumers are affecting the production patterns in Punjab. The study will therefore identify the factors that are likely to lead to diversification and hence explain the challenges and opportunities that face Punjab's agricultural sector during this era of transformation.

### 1.2 Objective

To examine whether there is a significant difference in consumption patterns between urban and rural areas by analyzing and comparing their spending behaviors and related factors.

### 1.3 Hypothesis

*H1. There is a significant difference in the Consumption Pattern of urban and rural areas.*

### 1.4 Literature review

Eftimov et al. (2020) investigated the impact of the COVID-19 pandemic on food consumption by analyzing two data sets: One is prepared before the pandemic with 69,444 recipes and the other one is from the quarantine period with 10,009 recipes. They used DietHub, an AI technique that tags food products with Hansard semantic tags to compare food intake by looking at the relative frequency of the ingredients. Their findings revealed significant shifts: An increase in the consumption of pulses by 300%, pancakes by 280% and soups by 100%; and decrease in Perciformes fish by 50%, cereals by 40% and wine making by 30%. This analysis therefore emphasizes the importance of AI in monitoring changes in diet during emergencies as well as feeding regulatory decision makers with requisite data.

According to Alae-Carew et al. (2019) the study looked at the potential future diets of India in light of a changing and growing food system. They carried out a systematic search of six peer-reviewed bibliographic databases and grey literature sources up to January 2018, and selected 11 studies, which projected food consumption in India up to 2050. The results suggest that per capita consumption of vegetables, fruits and dairy products will rise in the future while that of cereals (rice and wheat) and pulses is expected to remain almost unchanged. It is also believed that the consumption of meat would continue to be low. It is therefore necessary to have an insight of these projected dietary changes in order to formulate policies on agriculture and health that would benefit the public as well as the environment.

Chakrabarti, Kishore, and Roy (2018) were involved in this research with the help of colleagues from NARS and international organizations which were funded by the donors like ICAR and SDC. CGIAR-Research Program on Agriculture for Nutrition and Health (A4NH) work has been supported by intellectual contributions from government departments, ministries and scientists from National Agricultural Research System and Indian Institute of Pulses Research. The authors also wish to state that the opinions expressed in the paper do not necessarily represent the policy of A4NH and CGIAR.

Darekar and Reddy (2018) employed the ARIMA model to predict the wheat price in India, which helps the farmers in decision making about the area to be brought under the crop. Using the monthly modal price data from

January 2006 to June 2017, they found out that the ARIMA (0,1,1) (0,1,1) model was most appropriate to use in forecasting the future prices during the harvesting season with a 95% level of accuracy. The forecast made for the 2017-18 season put the price of wheat between Rs. 1,620 and Rs. 2,080 per quintal. This model is useful in providing useful information to the farmers and wholesalers when it comes to sowing and marketing respectively.

### 1.5 Methodology

#### 1.5. Research Design

This research uses descriptive research design whereby data is gathered without interfering with the social setting or changing the factors under consideration. The main goal is to analyze and report regularities of income, consumption, and savings of the population of India. The data for the study are collected from secondary sources in the form of NSSO rounds and the government publications. An operational research approach is used whereby the collected data is compared with existing theories concerning economics and psychology. The research follows the Positivism research philosophy that is characterized by the focus on objective facts and measurable outcomes.

#### 1.5. Study Population and Sample

The study population is the entire population of India and this is evidenced by the NSSO data used in the study. This large dataset integrates different demography types, including regional, income, and socio-economic status across the India nation. Due to the large population, a sample is constituted from NSSO data that is a cross-section of various regions and segments. The respondents are selected from both the urban and rural areas so as to incorporate all the economic activities and the difference between the two areas.

#### 1.5. Sampling Technique

The type of sampling adopted by the study is non probability sampling; specifically purposive sampling to obtain the relevant data from NSSO reports. The sample is selected consciously with the help of inclusion and exclusion criteria for the data to be relevant to the research questions and to be diverse in terms of participants' characteristics. This approach helps in ensuring that the sample is in line with the objectives of the study with the target variables being income, consumption and savings across the population segments.

#### 1.5. Data Collection Methods

For this study, only secondary data is used and the main source is the NSSO rounds and other government publications. These sources are a treasure trove of income, consumption and savings data on the country and in this case India. Data is presented in tabular and graphical forms to enhance comparison of one variable with the other. There is no primary research involved in the study through questionnaires or interviews as the study uses secondary data that have already been validated.

#### 1.5. Data Analysis Techniques

The research data for this study employs descriptive statistics as the base for data analysis together with the one sample t-test to test the significance. Quantitative data includes means, mediators, standard deviations where descriptive data gives an insight of the income, consumption and savings of the population within the sampled group. In order to perform a more detailed analysis of the results, the one-sample t-test is used with the help of the SPSS program. The one-sample t-test is especially used to test the null hypothesis that the sample mean is significantly different from a stated population mean. In this study, the one-sample t-test enables the researchers to conduct a more stringent test and determine if the actual data points, for example, the mean income or saving ratio, significantly deviates from the anticipated standard. This approach helps in establishing the reliability and validity of the findings hence improving the understanding of the economic behaviors under analysis.

### 1.6 Data Analysis

#### 1.6. Independent Sample T Test

| Group Statistics | | | | | |
|---|---|---|---|---|---|
| Region | | N | Mean | Std. Deviation | Std. Error Mean |
| 1999- '00 | Rural | 29 | 6.8966 | 12.90695 | 2.39676 |
| | Urban | 29 | 6.8966 | 12.26994 | 2.27847 |
| 2004-05 | Rural | 29 | 6.8969 | 12.48451 | 2.31832 |
| | Urban | 29 | 6.8962 | 12.49973 | 2.32114 |
| 2009-10 | Rural | 29 | 6.8962 | 12.46018 | 2.31380 |
| | Urban | 29 | 6.8966 | 12.28889 | 2.28199 |
| 2011-12 | Rural | 29 | 6.8959 | 12.26329 | 2.27724 |
| | Urban | 29 | 6.8966 | 12.34527 | 2.29246 |
| 2022-23 | Rural | 29 | 6.8962 | 12.25330 | 2.27538 |
| | Urban | 29 | 6.8966 | 12.58084 | 2.33620 |

The hypothesis under consideration assumes that there is a highly significant difference in the consumption patterns of Indian urban and rural areas for various years. Based on the group statistics of the years 1999-2000, 2004-05, 2009-10, 2011-12 and 2022-23, the following observations can be made about this claim.

The consumption pattern for 1999-2000 for the total population for rural as well as urban areas is 6. 8966. Nonetheless, the standard deviation for the rural areas is slightly higher at 12. 90695 compared to 12. 26994 for urban areas, which means that the variability in consumption within the rural areas is slightly higher. The standard error mean is also slightly higher for rural areas 2. 39676 than for urban areas 2. 27847 this means that the sample mean is a bit more reliable for urban areas in this period.

The general consumption pattern for the year 2004-05 is also quite similar for both rural (6. 8969) and urban (6. 8962) areas which shows that it is constant across the regions. The SD and SE mean for rural areas are 12. 48451 and 2. 31832, respectively, and for urban areas these are 12. 49973 and 2. 32114. These small differences mean that variation and the accuracy of the sample mean are similar for the urban and rural regions.

Even in 2009-10, the mean has remained 6 for the rural areas. 8962 and for urban areas it is 6. 8966. The standard deviation for rural areas is 12. 46018, and for urban areas it is slightly lower at 12. 28889. This implies that there was a slight reduction in the volatility of the consumption patterns of the urban population. The standard error mean is also slightly higher for rural areas (2. 31380) as compared to urban areas (2. 28199) which means estimates for urban areas are slightly more accurate.

Even in 2011-12, the means remain relatively similar and the rural areas' mean is 6. 8959 and urban areas 6. 8966. The standard for the rural area is 12. 26329 and for urban areas 12. 34527. The mean of the standard error stays almost the same between the two regions with rural areas at 2. 27724 and urban areas at 2. 29246, this again implies that there is consistency in the precision of the estimates in both the regions.

Thus, the mean values retain their trend and are equal to 6 by the 2022-23 academic year. 8962 for rural areas and 6 for the urban areas. 8966 for urban areas. The standard deviation also rises slightly for the urban areas to 12. 58084, and the standard deviation of rural areas is 12. 25330. Similar to the case of the standard error mean, the rural areas' figure stands at 2. 27538 and urban areas at 2. 33620, which reveals that sample mean has slightly less reliability for the urban areas than the rural areas.

| | **Levene's Test for Equality of** | **t-test for Equality of Means** |
|---|---|---|

| | | Variances | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | F | Sig. | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference Lower | Upper |
| 1999-'00 | Equal variances assumed | 0.058 | 0.810 | 0.000 | 56 | 1.000 | 0.00000 | 3.30694 | -6.62461 | 6.62461 |
| | Equal variances not assumed | | | 0.000 | 55.857 | 1.000 | 0.00000 | 3.30694 | -6.62498 | 6.62498 |
| 2004-05 | Equal variances assumed | 0.048 | 0.827 | 0.000 | 56 | 1.000 | 0.00069 | 3.28059 | -6.57113 | 6.57251 |
| | Equal variances not assumed | | | 0.000 | 56.000 | 1.000 | 0.00069 | 3.28059 | -6.57113 | 6.57251 |
| 2009-10 | Equal variances assumed | 0.031 | 0.862 | 0.000 | 56 | 1.000 | -0.00034 | 3.24979 | -6.51046 | 6.50977 |
| | Equal variances not assumed | | | 0.000 | 55.989 | 1.000 | -0.00034 | 3.24979 | -6.51048 | 6.50980 |
| 2011-12 | Equal variances assumed | 0.015 | 0.905 | 0.000 | 56 | 1.000 | -0.00069 | 3.23128 | -6.47372 | 6.47234 |
| | Equal variances not assumed | | | 0.000 | 55.998 | 1.000 | -0.00069 | 3.23128 | -6.47373 | 6.47235 |
| 2022-23 | Equal variances assumed | 0.001 | 0.976 | 0.000 | 56 | 1.000 | -0.00034 | 3.26117 | -6.53325 | 6.53256 |
| | Equal variances not assumed | | | 0.000 | 55.961 | 1.000 | -0.00034 | 3.26117 | -6.53335 | 6.53266 |

The hypothesis tests given above are centered on the differenced variables of consumption comparing the urban and rural areas in various years. In an attempt to compare the differences in the consumption patterns, Levene's Test for Equality of Variances and the t-test for Equality of Means are used.

Levene's Test for Equality of Variances was conducted for the year 1999-2000 and the obtained F-value is zero.

058 and a significance level of 0. 810, this means that the assumption of equal variances is valid because the p-value is greater than 0. 05. The t-test for Equality of Means gives a t-statistic of 0. 000 and a significance level of 1. 000, that is, the mean difference is 0. 00000 and a standard error difference of 3. 30694. The confidence interval of 95% is -6. 62461 to 6. 62461. The outcomes of these results imply that there is no difference between the consumption profiles of the urban and rural areas in 1999-2000 since the p-value is equal to one. 000, which means that the two are equal in means, or in other words, have the same measure.
In the case of the 2004-05 academic year, the Levene's test F value is 0. 048 at a significance level of 0. 827, which in turn indicates equality of variances. Performing the t-test, we get the t-value equal to zero. 000, and the significance level is 1. 000. The mean difference is 0. 00069 with a standard error difference of three. 28059, and the 95% confidence interval ranges from -6. 57113 to 6. 57251. This analysis reaffirms that there is no substantial difference in the consumption patterns between the two areas in the year 2004-05 as the p-value is equal to 1. 000, which means that the means of all the groups were not significantly different.
Using Levene's Test for the year 2009-10, the F-value obtained is 0. 031 at a significance level of 0. 862 meaning the variances are equal to each other. The results of the t-test also show a t = 0. 000 and a significance level of 1. 000, mean difference -0. 00034 and the difference in the standard errors is equal to 3. 24979. Therefore, the 95% confidence interval is between -6. 51046 to 6. 50977. As in the case of the previous years, it is possible to conclude that there are no essential differences in the consumption between the rural and urban areas during 2009-10, as can be seen from the 'p' value of 1. 000.
In the case of Levene's test for the F-value of the year 2011-12 the F-value is 0. 05, the study sought to examine the influence of perceived organizational support on employee engagement with a view of establishing its impact on employee productivity and organizational commitment among the civil servants in the selected organization. The F-statistic is 905, which means that we reject the null hypothesis and maintain the assumption of equal variances. The t-test for Equality of Means gives t = 0. 000 with a significance level of 1. 000. The mean difference is zero (-0). 00069 with the standard error difference of 3. 23128, and the 95% confidence interval ranges from -6. 47372 to 6. 47234. From the above findings, the study agrees with the hypothesis that there is no substantial difference in the consumption pattern in urban and rural areas in the 2011-12, given the p-value of 1. 000.
Lastly, when applying Levene's Test for the year 2022-23, the F-value obtained is equal to 0. 001, and the last one is with a significance level of 0. 976, which indicates that the equality of variances is valid. The t-test for Equality of Means gives a t=0. 000 and a significance level of 1. 000, and mean difference equals to -0. 00034 and a standard error difference of 0.003. 26117. The 95% confidence interval starts from -6. 53325 to 6. 53256. These findings again imply that there is no marked difference in the consumption patterns between urban and rural areas in 2022-23 annexed with the p-value of 1. 000.
Therefore, for all the analysed years (1999-2000, 2004-05, 2009-10, 2011-12, and 2022-23), the tests also do not show the significant differences in the consumption between urban and rural areas. The p-values of 1. H1 t-tests for all years reveals that the means are equal to 000 thus providing evidence for the rejection of the null hypothesis, while the results of Levene's test for equality of variances also hold for all years. Thus, although the hypothesis formulated at the beginning of the work assumed of a highly significant difference in the consumption patterns of urban and rural areas, the results of the statistical analysis performed enable us to confidently reject the formulated hypothesis and note a high degree of similarity in the consumption patterns in regions in recent years.

**1.7 Discussion**

The comparison of consumption between urban and rural area of India for different years starting from 1999-2000 to 2022-23 also supports the findings made from all the periods. The research therefore sought to test the following hypothesis using Independent Sample t-test and Levene's Test for Equality of Variances; There is a significant difference in the consumption of the two regions. In contrast to the first assumption that there is a large difference in the consumption of these areas, urban and rural, the results of the study show that such a difference is not very large.
The group statistics of each of the analyzed years, namely 1999-2000, 2004-05, 2009-10, 2011-12, and 2022-23 reveal the fact that the means for both urban as well as rural regions are almost the same. The standard deviations and standard error means are slightly different, but are still relatively similar, which indicates that the spread and accuracy of the data are similar for both the urban and rural subjects. This means that data presented herein suggest that consumption patterns have not differentiated between the two areas over time.
All the t-tests for Equality of Means across all the years produced a t-value of 0. 000 with a significance level of

1. 000, this means that there is no major mean difference between the consumption patterns of Urban and Rural consumers. Further, the analysis of Levene's test for equality of variances revealed that there is no violation of the assumption of homogeneity of variances in all cases, which once again supports the conclusion that there is no significant difference in consumption patterns. The 95% confidence intervals for all the years also show this fact since the intervals contain zero.

Based on these observations, the research hypothesis specifying that there would be a difference in the consumption patterns between the two areas was not tenable. On the contrary, the evidence that can be derived from the data presented suggests the hypothesis that the level of consumption in these areas is not significantly different, no matter the period under comparison. Such consistency might be indicative of some trends in India, for instance, the blurring of the divide between rural and urban markets, impact of government policies, and the growing convergence in the consumption patterns across the country.

**1.8 Conclusion**

This paper analyzes the trends of consumption between the urban and rural regions of India from the year 1999 to 2023 and found out that the trends are not as dissimilar as it is expected. Contrary to the hypothesis that could be formulated, the analysis of the dynamics of consumption behaviors shows that the gaps between urban and rural areas have been gradually decreasing in recent years. This shows that the consumption pattern is the same for the urban and rural areas, which might be as a result of better infrastructure, easy access to a broad range of products, and changes in consumer behavior. The causes for this convergence include improved market integration and moderating effect of modern retailing channels which have facilitated the matching of consumption experiences across the regions. As such, these findings do not support the idea of a massive regional divide in terms of consumption, which is evident from the presence of a similar trend towards standardization of consumption pattern. This convergence is attributable to other factors of socio-economic transformation including increase in incomes, and improved access to products and services that have closed the gap in per capita consumption between the urban and the rural populace. Thus, the study implies that the policies and strategies related to the regional consumption disparities might require reconsideration. This means that the observed similarities in the consumption patterns are indicative of the fact that economic planning could be enhanced in both the urban and the rural areas. It is therefore important to understand these trends in order to make proper decision for the promotion of balanced economic development in order to address the needs of the population.

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