Tiwul consumption preferences during the Covid-19 pandemic in Nganjuk, East Java, Indonesia

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Abstract. Households in Indonesia consume rice as the main source of carbohydrates, but in some areas where cassava production centers, the source of carbohydrates is not only rice but also cassava and processed cassava, including tiwul. The purpose of this study was to analyze the preference for tiwul consumption for all carbohydrate foods and to analyze the share of tiwul expenditure on carbohydrate foods. The research was conducted in the village with the highest consumption of tiwul, namely Sudimoroharjo Village, Wilangan, Nganjuk, East Java, Indonesia. The research data using primary data were collected by direct interviews with 46 households. The research data includes tiwul attribute data consisting of color, taste, availability, and price. Also, data on consumption and expenditure of all carbohydrates consumed by the sample households, namely tiwul, rice, corn, cassava, sweet potato, and potatoes. Data analysis used expenditure share analysis and Conjoint analysis. The results showed that the share of tiwul expenditure was the second largest after rice (79.98%), tiwul (16.39%), potatoes (2.78%), sweet potato (0.54%), cassava (0.2%), and the smallest was corn (0.11%). The preference for tiwul consumption was dominated by taste, price, color, and availability with relative importance values of 49.89%, 30.48%, 10.02%, and 9.61%, respectively. Promotion of the Tiwul Consumption Movement is needed, especially for the young generation and children, to increase tiwul consumption and reduce household dependence on rice.

1. Introduction
Rice is a strategic commodity and a staple food for almost the entire Indonesian population [1]. According to the 2016 National Socio-Economic Survey data analysis, the share of grain expenditure at various income quintile levels in a row, from the lowest income household (Q1) to the highest-income household (Q5), is 50.2 percent, 43.7 percent, 40.2 percent, 34.8 percent, and 26.2 percent [2]. As can be seen, the poorest families spend the majority of their income on grains. These grains provide households in Indonesia with carbohydrates. Rice is one of these grain foods. Due to the community's high reliance on rice, demand for rice has continued to grow, particularly during times like Covid-19[3]. The increasing demand for rice results in a decrease in rice availability, and particularly in land availability, which is becoming increasingly scarce. If the public’s demands are not met, there will be a food shortage [4,5].

The COVID-19 pandemic has impacted several sectors, including the economic sector, resulting in a decline in the Indonesian economy and an increase in unemployment [6]. Meanwhile, the community's food needs must be met. Cassava tiwul is the third most common staple ingredient, after rice and corn [7], and has been widely used as a base for a variety of traditional snacks, particularly in the Java region.
[8–10]. However, the use of cassava as a rice substitute is still uncommon, particularly among the young millennials, even though tiwul is a food alternative that contains beneficial types of complex carbohydrates and it’s low in amylose for rice substitutes [11,12].

Numerous countries, including Austria [13], Berlin, and Frankfurt [14] have researched the potential of local food, processed food based on local potential food, alternative food, staple food, food substitute for staple food, or so-called substitute food. The study was also conducted in Indonesia by Ramlah et al. [15] in Sulawesi, [16,17], and Hermaningrum [10], who investigated the genealogy of traditional Javanese cassava-based foods in several districts of East Java. According to Hermingrum, cassava processed foods come in a variety of forms, including gatot, tiwul, and cenil. We want to look more closely at tiwul in this study. In Indonesia, processed food and beverages account for the second-largest household expenditure share, after grains [18]. As a result, it is critical to research tiwul consumption preferences as a possible substitute food in the aftermath of the Covid 19 pandemic.

2. Methods: location, time, sampling technique, and data source

The research was conducted in Sudimoro Harjo, Wilangan District, Nganjuk Regency. A portion of the cassava in this village is used as raw material for tiwul. The study lasted five months, beginning in September 2020 and ending in November 2020. The sample was determined by simple random sampling using the Slovin formula [19] with a margin of error of 10%, yielding a sample of 46 households:

\[
n = \frac{N}{1 + Ne^2}
\]

(1)

\(n = \) number of sample, \(N = \) number of population, \(e = \) margin of error

2.1. Data analysis

Tiwul consumption preferences are analyzed using the Shared Expenditure and Conjoint approaches. Consumption preference analysis is used to derive a preference (order) for tiwul and all carbohydrate foods based on the share of tiwul expenditure on staple foods and also the share of all staple foods. Conjoint analysis is used to determine tiwul consumption preferences to tiwul attributes. The following formula is used in the consumption preference analysis using the expenditure share approach [20]:

\[
\omega_i = \frac{b_i x}{x} \times 100\% = \frac{p_i q_i}{\sum p_i q_i} \times 100\%
\]

(2)

\(w_i = \) expenditure share commodity \(i\), \(b_i = \) commodity expenditures \(i\), \(x = \) total expenditure of the primary food, \(p_i = \) commodity price \(i\), \(q_i = \) the purchase quantity, \(i = 1 \) (tiwul), \(2 \) (rice), \(3 \) (maize), \(4 \) (cassava), \(5 \) (sweet potato), \(6 \) (potato).

Conjoint analysis was used to determine household consumption preferences for tiwul using the tiwul attribute approach [21,22]:

\[
U(X) = \sum_{j=1}^{m} \sum_{k=1}^{k_j} \alpha_{ij} x_{ij}
\]

(3)

\(U(X) = \) overall utility of an alternative \(\alpha_{ij} = \) the part-worth contribution or utility associated with the \(j\) the level \((j,i=1,2,\ldots,k_j)\) of the \(I\) attribute \((i,l=1,2,\ldots,m)\), \(X_{ij} = 1\) if the \(j\)th level of the \(I\)th attribute is present, \(i= 0\) otherwise, \(k_i = \) number of levels of attribute \(I\), and \(m = \) number of attributes.

3. Results and discussions

3.1. Socioeconomic characteristics of the sample households

The socioeconomic status of the sample households that consume tiwul as a source of carbohydrates is summarized in Table 1. Age of 40-55 years \((41\%\) dominated households consuming tiwul, followed by 26-39 years \((30\%\), 56-74 years \((20\%\), and less than 25 years \((9\%\) respectively. This finding is quite intriguing, as it indicates that young households have a relatively high second interest in consuming tiwul at 30 percent. This demonstrates how appealing tiwul is to the
productive age population. In other words, the younger generation is familiar with and comfortable with tiwul consumption.

**Table 1. Socioeconomic characteristics of sample households.**

| Variable                  | Number of samples (people) | Percentage (%) |
|---------------------------|----------------------------|----------------|
| Age (years)               |                            |                |
| 10-25                     | 4                          | 9              |
| 26-39                     | 14                         | 30             |
| 40-55                     | 19                         | 41             |
| 56-74                     | 9                          | 20             |
| Sex                       |                            |                |
| Male                      | 1                          | 2              |
| Female                    | 45                         | 98             |
| Household size (people)   |                            |                |
| 1-2                       | 3                          | 6.50           |
| 3-4                       | 39                         | 84.8           |
| Equal to 5                | 4                          | 8.70           |
| Education                 |                            |                |
| Elementary school         | 32                         | 69.57          |
| Junior high school        | 9                          | 19.56          |
| High school               | 5                          | 10.87          |
| Occupation                |                            |                |
| Farmer                    | 16                         | 34.78          |
| Entrepreneurs             | 7                          | 15.21          |
| Housewives                | 23                         | 50.00          |

Source: Author’s computation (2021)

The gender variable revealed that 98 percent of the sample households were headed by women, while 2% were headed by men. It can be explained by the fact that women are more concerned with food matters, food types, and food shopping than men are. In another word, women are more careful of the food their household members consume than men. This is true in the majority of households in Java and even throughout Indonesia where domestic activities are performed by women, with only a small percentage of households where domestic activities are performed by men. This is consistent with research conducted in Maluku, Indonesia [23].

In terms of the variable number of household members, the results indicated that the majority of sample households had between three and four members (84.8 percent). The household is comprised of four individuals; in general, the household consists of a father, a mother, and two children. It could imply that the sample household is young, with two children in elementary, junior high, or high school. According to this data, tiwul is also a staple food source for young households, and children are also familiar with its consumption.

The education variable reveals that elementary school graduates account for 69.68 percent of household education, followed by junior high school graduates at 19.56 percent and high school graduates at 10.87 percent. The results of this data analysis indicate that the sample households have a low level of education, with only 30 percent completing formal education up to junior high or high school. There is no sample of college graduates. In terms of occupation, the majority of sample
households are headed by housewives (50 percent), followed by farmers (35 percent), and entrepreneurs (15 percent).

3.2. Preferences for tiwul consumption: expenditure share of tiwul

The share value of *tiwul* expenditure on all staple foods as a source of carbohydrate food reveals *tiwul* consumption preferences. The expenditure share column indicates the value of each staple food's proportion of total expenditure on staple foods. Sudimoroharjo Village households rely on staple foods for carbohydrates, including *tiwul*, rice, corn, cassava, sweet potato, and potatoes (Table 2). The percentage value indicates the proportion of household expenditure on carbohydrate sources, and when the share value of overall commodity expenditure is added, the total value equals 100 percent. Table 2 summarizes the results of calculating the proportion of household expenditure on *tiwul* consumption as a source of carbohydrates.

Table 2. Expenditure share of *tiwul* and all carbohydrate sources.

| No | Food       | Expenditure share (%) |
|----|------------|-----------------------|
| 1  | *Tiwul*    | 16.39                 |
| 2  | Rice       | 79.98                 |
| 3  | Maize      | 0.11                  |
| 4  | Cassava    | 0.21                  |
| 5  | Sweet potato | 0.54              |
| 6  | Potato     | 2.78                  |
|    | Total      | 100                   |

Source: Author’s computation (2021)

The shared analysis of household expenditure on carbohydrate sources in Sudimoroharjo Village, Wilangan, Nganjuk is shown in Table 2. Rice accounts for the largest share of expenditure (79.98 percent), while *tiwul* is second only to rice. Cassava production centers are located throughout the research village, and the cassava produced is primarily for personal consumption. According to field data, households rarely consumed cassava fresh (0.21 percent) or boiled only, but the cassava production was peeled and then dried into cassava. Certain processes can be used to transform this cassava into cassava-based processed foods, such as *tiwul*, gatot, and others. Although the majority of cassava is consumed, at the time of the study, rice was still the primary source of carbohydrates, followed by *tiwul*. This can be explained by the fact that the study took place between September and January 2021. That was during the Covid 19 pandemic, and most households received government assistance in the form of rice for poor households known as 'Raskin', so the cassava was stored and consumed staple food for the months ahead. Thus, *tiwul* can serve as a substitute carbohydrate source for households during the Covid 19 pandemic. Potatoes (2.78 percent), cassava (0.54 percent), and sweet potatoes account for the third-largest share of expenditure (0.2 percent). Although potatoes are a staple source of carbohydrates, households frequently use them to make vegetables to accompany *tiwul* or rice (complementary). Corn accounts for the smallest share of expenditure, accounting for 0.11 percent. Field observations reveal that, despite the research village's prominence in cassava production, farmers continue to grow corn. Because the majority of corn is sold as industrial raw materials or feed for livestock, only a small percentage of households consume corn as a staple food.

3.3. Consumption preferences of the *tiwul*: *tiwul* attribute

*Tiwul* is a processed food made from cassava. Apart from *tiwul*, cassava is used to make a variety of processed foods, including cassava chips, sawut, lemet, ongol-ongol, lentho, jemblem, miler, and samiyer[10]. The Javanese have long consumed *tiwul* as a substitute for rice or as a complement to rice. *Tiwul* is frequently consumed by households during times of famine because it is difficult for households to obtain rice and cannot even afford it due to the high price of rice. Conjoint Analysis can also be used
to determine which *tiwul* attributes households prefer. *Tiwul* characteristics include its color (black, brown, or yellow), flavor (savory or sour), availability (self-cooking or purchase), and cost (cheap, medium or expensive). Table 3 details the attributes of *tiwul* as determined by the value of its use.

**Table 3. The utility value of *tiwul*.**

| Attribute | Description | Utility Estimate | Std. Error |
|-----------|-------------|------------------|------------|
| Color     | Black       | 0.263            | 0.878      |
|           | Brown       | -0.251           | 0.878      |
|           | Yellow      | -0.012           | 0.878      |
| Flavor    | Savory      | 2.091            | 0.659      |
|           | Sour        | -2.091           | 0.659      |
| Availability | Self-cooking | 0.400     | 0.659      |
|           | Purchase    | -0.400           | 0.659      |
| Price     | Expensive   | -1.527           | 0.878      |
|           | Medium      | 0.633            | 0.878      |
|           | Cheap       | 0.894            | 0.878      |
| Constant  |             | 4.073            | 0.694      |

Source: Author’s computation (2021)

The value of *tiwul*’s usefulness is shown in Table 3 based on the *tiwul* attribute. The usefulness value of *tiwul* indicates the extent to which households prefer *tiwul*. If the usability value is positive, the household enjoys the *tiwul*; on the other hand, if the usability value is negative, the household dislikes the *tiwul*. The analysis results indicate that black is preferred over brown or yellow for the color attribute. This is indicated by the fact that black has a positive utility estimate, whereas brown and yellow have a negative utility estimate. In terms of flavor, savory flavor is preferred over sour flavor. This is indicated by a savory taste that is positive and a sour taste that is negative. As a result of the availability attribute, households prefer to make their *tiwul* rather than purchase it. This is supported by the results of data analysis that the utility estimate of making yourself is positive while the utility estimate of buying is negative. The price attribute reveals that households prefer moderate or low prices to high prices, as indicated by positive medium and low price utility estimates, but negative high price utility estimates. The color of *Tiwul* is black. The utility estimate indicates the consumer’s or household’s level of preference for an item. From the four characteristics of *tiwul*, it can be concluded that households prefer *tiwul* for its savory taste, low price, and ease of manufacture, with black being the most preferred color.

The following analysis discusses the reasons for households’ proclivity to consume *tiwul* based on *tiwul* attributes. This tendency is demonstrated by the high importance accorded to all *tiwul* attributes. The color, taste, method of obtaining and price of *tiwul* are all analyzed. The more significant the value, the more likely households are to choose that attribute. Table 4 summarizes the findings of data analysis on the relative importance of *tiwul*.

**Table 4. The important value of *tiwul*.**

| Attribute | Importance Values (%) |
|-----------|-----------------------|
| Color     | 10.019                |
| Flavor    | 49.893                |
| Availability | 9.603            |
| Price     | 30.485                |

Source: Author’s computation (2021)

Taste ranks highest in the analysis of *tiwul* consumption preferences at 49.893 percent, followed by price (30.485 percent), color (10.019 percent), availability at 9.603 percent. *Tiwul* has a distinct flavor,
which is the primary reason households consume it. Field interviews confirm that the majority of households describe *tiwal* as savory and delectable. This attribute, it is alleged, facilitates the movement of millennial young people toward consuming *tiwal*, as taste is generally a determining factor in a person's food selection. Price is the second *tiwal* attribute. Price is a significant factor in determining how someone consumes goods. Price is the reason why the two households consume *tiwal* in the *tiwal* attribute. According to field data, *tiwal* is generally cheaper than rice, which explains why households consume *tiwal*. Additionally, the color and method of acquisition are reasons why households consume *tiwal*.

The final analysis is a correlation analysis using Pearson's R and Kendall's Tau correlations to determine the relationship between the observed and predicted values. All observations of *tiwal* attributes in comparison to predicted *tiwal* attributes must be analyzed to determine whether the correlation is significant. If the correlation is significant, no difference exists between the observed and predicted values, indicating that the analysis’s results can be interpreted. If, however, the resulting correlation value is not significant, there is a discrepancy between the observed and predicted values, rendering the analysis result unintelligible. Table 5 summarizes the results of the *tiwal* attribute correlation analysis.

| Correlations  | Value | Sig. |
|---------------|-------|------|
| Pearson's R   | 0.934 | 0.000|
| Kendall's Tau | 0.833 | 0.001|

Source: Author’s computation (2021)

The result of the sig value calculation is obtained Pearson's R was 0.001 less than 0.05, and Kendall's Tau had a highly significant. This indicates that both the actual assessment and the evaluation of the estimation results are highly accurate, and thus that the increase in *tiwal* attributes such as savory taste, low price, self-cooking, and black color increases household preferences for *tiwal* consumption.

4. Conclusions

The findings indicated that *tiwal* expenditure (16.39 percent) was the second-largest item after rice (79.98 percent). Potato (2.78 percent of expenditure), sweet potato (0.54 percent), cassava (0.21 percent), and corn (0.11 percent). According to the utility value of *tiwal*, households prefer it for its savory taste, low price, availability, and black color. According to the important value, the highest preference for *tiwal* consumption is indicated by the highest important value of taste (49.89 percent), price (30.49 percent), color (10.03 percent), and availability (9.60 percent). This finding confirms that *tiwal* consumption acts as a buffer against non-rice carbohydrate consumption patterns in households. Additionally, the high importance value on *tiwal* demonstrates that this type of food can serve as a significant substitute for carbohydrate consumption preferences.

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References

[1] Sa’diyah A A, Anindita R, Hanani N and Muhaimin A W 2019 The strategic food demand for non poor rural households in Indonesia EurAsian J. Biosci. 13 2197–202
[2] Khoiriyah N, Anindita R, Hanani N and Muhaimin A W 2020 Animal food demand in Indonesia: a quadratic almost ideal demand system approach AGRIS -Line Pap. Econ. Inform. 12 85–97
[3] Kathiresan A, Nagai T and Haneishi Y 2020 Policy options for galvanizing Africa’s rice sector against impacts of COVID-19 World Dev. 136 105126
[4] Arifin B, Achsani N A, Martianto D, Sari L K and Firdaus A H 2018 Modeling the future of Indonesian food consumption Rep. Submit. Natl. Dev. Plan. Agency Bappenas World Food Programme WFP Food Agric. Organ. U. N. FAO Jkt. Httpsdocs Wfp OrgapidocumentsWFP-0000073760download

[5] Arifin Z, Hanani N, Kustiono D and Asmara R 2020 Overview of the Indonesian rice economic model Eurasian J. Biosci.14 6249–54

[6] Muhiyiddin M 2020 Covid-19, new normal, dan perencanaan pembangunan di Indonesia (Covid-19, new normal, and development planning in Indonesia) J. Perenc. Pembang. Indones. J. Dev. Plan.4 240–52 [in Indonesia]

[7] Dewi I N and Hapsari E 2019 Manfaat ubi kayu dalam pemenuhan kebutuhan hidup petani HKM Wana Lestari I, Kecamatan Playen, Kabupaten Gunungkidul (The benefits of cassava in meeting the needs of the farmers of HKM Wana Lestari I, Playen District, Gunungkidul Regency) J. Hutan pulau-pulau kecil 3 136–47 [in Indonesia]

[8] Astuti S D, Edi K and Nuraeni I 2019 Pengembangan diversifikasi produk tiwul instan untuk meningkatkan daya saing UKM di Kabupaten Wonosobo (Development of instant tiwul product diversification to increase the competitiveness of SMEs in Wonosobo Regency) Agrokreatif J. Ilm. Pengabd. Kpd. Masy.5 123–34 [in Indonesia]

[9] Riana D, Awatara I G P D and Yulia Y A 2019 IbM pembentukan usaha kelompok pembuatan jajanan pasar dan digital marketing di Kecamatan Jebres Surakarta (IbM the establishment of a business group for snacks making and digital marketing in Jebres District, Surakarta) Wasana Nyata 3 62–7 [in Indonesia]

[10] Herminingrum S 2019 The genealogy of traditional Javanese cassava-based foods J. Ethn. Foods6 1–16

[11] Rahayu S E and Febriaty H 2019 Analisis perkembangan produksi beras dan impor beras di Indonesia (Analysis of the development of rice production and rice imports in Indonesia) Prosiding Seminar Nasional Kewirausahaan 1 pp 219–26 [in Indonesia]

[12] Wardhana A, Kharisma B and Nurul S J 2019 Ketimpangan pendidikan dan pendapatan di Indonesia (Education and income inequality in Indonesia) Bina Ekon.23 29–38 [in Indonesia]

[13] Melkonyan A, Gruchmann T, Lohmar F, Kamath V and Spinler S 2020 Sustainability assessment of last-mile logistics and distribution strategies: The case of local food networks Int. J. Prod. Econ.228 107746

[14] Rosol M 2020 On the significance of alternative economic practices: Reconceptualizing alterity in alternative food networks Econ. Geogr.96 52–76

[15] Ramlah R, Pabendon M B and Daryono B S 2020 Local food diversification of foxtail millet (Setaria italica) cultivars in West Sulawesi, Indonesia: A case study of diversity and local culture Biodiversitas J. Biol. Dives.21

[16] Wijaya M A, Anindita R and Setiawan B 2014 Analisis volatilitas harga, volatilitas spillover, dan trend harga pada komoditas bawang putih (Allium Sativum L.) di Jawa Timur (Analysis of price volatility, spillover volatility, and price trends on garlic (Allium Sativum L.) in East Java) Agric. Socio-Econ. J.14 127 [in Indonesia]

[17] Romlah S 2020 Covid-19 dan dampaknya terhadap buruh di Indonesia (Covid-19 and its impact on workers in Indonesia) Adalah 4 1 213-222 [in Indonesia]

[18] Khoiriyyah N, Anindita R, Hanani N and Muhaimin A W 2020 Impacts of rising animal food prices on demand and poverty in Indonesia Agric. Socio-Econ. J.20 65–76

[19] Sandi A and Nurhayati M 2020 Effect of entrepreneurship education, family environment and self-efficacy on students entrepreneurship intention 4th International Conference On Management, Economics and Business (ICMEB 2019) (Atlantis Press) pp 9–12

[20] Soare B E, Potarniche M and Petre I L 2020 The effect of GDP growth on environmental protection expenditure in Romania Int. Multidiscip. Sci. GeoConference SGEM 20 547–54
[21] Kholibrina C R and Aswandi A 2020 The consumer preferences for new styrax based perfume products using a conjoint analysis approach IOP Conference Series: Materials Science and Engineering vol 935 (IOP Publishing) p 012016

[22] Kinoshita S 2020 Conjoint analysis of purchasing behavior for energy-saving appliances Int. J. Energy Sect. Manag.

[23] Picauly V E, Djamika E T, Wahyono H and Mintari S U 2021 The woman’s role in the dynamics of household economic life: case study in Halong Atas Hamlet, Maluku Islands Ann. Romanian Soc. Cell Biol. 16291–9