

Food Security Conditions in the Border Areas of Riau Province, Indonesia

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Abstract. Access to food is a fundamental requirement for achieving community well-being. Food insecurity reflects the inability of communities particularly those in border areas to obtain sufficient food. This study aimed to identify the factors influencing household food accessibility in the border regions of Riau Province. Using a survey approach and Smart Partial Least Squares (SmartPLS) for data analysis, the study found that economic capacity, physical access, social factors, and food culture collectively explained 63.4 % of the variation in food accessibility. Economic, physical, and social factors had a positive and significant effect, whereas food culture had a negative and significant impact.

1. Introduction

Food security comprises at least two core aspects: the presence of adequate food supplies and the ability of individuals to access sufficient food [1]. Food access refers to the control over various resources such as social, technological, financial, natural, and human that are adequate to acquire or trade for enough food to meet one's [2]. In areas where the level of food availability is high, it tends to provide a better picture of the situation of food consumption [3].

During the 2019–2024 period, the amount of food available for consumption in Riau Province averaged approximately 2,900 kcal/capita/day, based on provincial food availability data. However, this relatively high level of food availability did not necessarily reflect an adequate food consumption situation. Average energy consumption among the population during the same period was only 1,905 kcal/capita/day, which remained below the recommended energy adequacy level of 2,150 kcal/capita/day established by the 2012 Widya Karya National Food and Nutrition consensus [4]. Limited food access in Riau Province is also reflected in the relatively high proportion of the population experiencing food insecurity. The percentage of food-insecure population increased from 47.53% in 2019 to 49.89% in 2023 [5].

Empirical evidence suggests that while food availability at the macro level may be adequate, it does not inherently guarantee food sufficiency at the household or individual level. This condition is largely determined by the degree of accessibility, which includes both the ease of obtaining food and the quantity available to households. Accessibility itself is influenced by various factors, including economic capacity, physical access or geographic isolation, social structures [6], and cultural norms [7].

Food accessibility may vary across regions depending on the economic, physical, social, and cultural resources of each area. This study sought to identify and analyze the factors influencing household access to food, particularly rice, in the border areas of Riau Province. The findings are expected to provide valuable input for formulating national and regional strategies and policies on food security.

2. Research Methods

2.1 Framework.

This study was conducted as an explanatory research aimed at examining the relationships among the variables and testing the formulated hypotheses [8]. These variables

included economic ability, physical availability, social ability and food culture in influencing household accessibility to food. The variable level of economic capability (TKE), level of physical ability (TKF), level of social ability (TKS) and level of food culture (TBP) had a positive influence with the variable level of household accessibility to food (TARTP), meaning the better the level of home economic capability stairs, the level of physical abilities, the level of social ability, and the level of food culture caused the better the level of household accessibility to food.

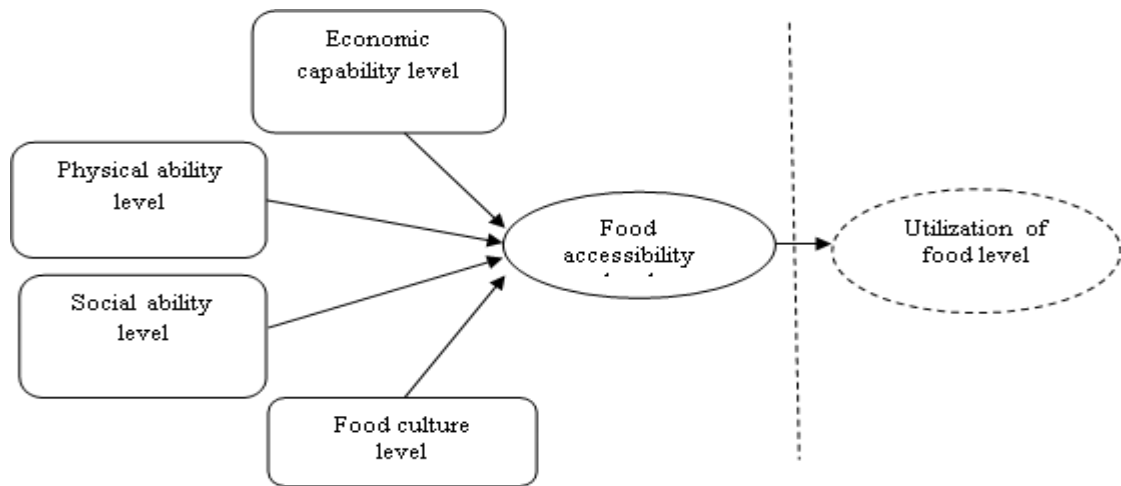


Figure 1. Framework for Correlation Variables Under Study

2.2. Research location and time

This study used a survey approach [9]. This research was conducted in Kepulauan Meranti Regency. The area was determined purposively based on certain considerations namely Kepulauan Meranti Regency had a low average income with a percentage of the population experiencing high food insecurity, and the area closest to the border with Malaysia. Data collection in the field was carried out for approximately four months from August 2024 to November 2024.

2.3. Sampling method.

The selection of sub-district and village locations was based on the consideration of distance (far and near) from the regency and sub-district capitals, so that the total number of sub-districts and villages was 2 sub-districts and 4 villages. In the selected villages the number of households would be determined as the research sample. The sample size was 5-10 observations for each parameter estimate [10], so a total sample of 60 households was determined.

2.4. Data collection technique

The types of data collected in the study were primary and secondary data. Quantitative data collected through a survey using a structured questionnaire on respondents (housewives and/or household heads). Household accessibility to food level, especially rice as measured by the HFIAS (Household Food Insecurity Access Scale) method [11] i.e. the ability of households to fulfill rice needs, for 30 days. respondents would be in the range of 0 (lowest) to 27 (highest), the higher the score, indicating the higher level of household accessibility to rice. Secondary data obtained by documenting obtained Ministry/Agency/ Institutions related to the research objectives.

2.5. Data analysis.

Data analysis was carried out quantitatively and qualitatively. To test correlation between the variables studied, analyzed using partial least square (PLS) program. The PLS method included in the structural equation modeling (SEM) group. The PLS model was a powerful

analysis method because it was not based on many assumptions, the data did not have to be distributed normally multivariate; indicators could be ordinal, interval to the ratio, and sample did not have to be large [12].

Ref [13], the steps to use PLS were as follows: (1) estimation of SEM-PLS parameters; obtained through a three-stage iteration process using ordinary least square (OLS); (2) steps of analysis of fit structural equations with SEM-PLS. Outer models for reflexive indicators were evaluated with convergent and discriminant validity of the indicator and composite reliability for the indicator block. Convergent validity was assessed based on the correlation between item score/component score and construct score. Individual reflexive measured would be high if the correlation (loading value) was more than 0.70 and sufficient if the correlation is between 0.50 to 0.60. Discriminant validity was assessed based on cross loading measurements with constructs. If the correlation of constructs with measurement items was greater than the size of other constructs, this showed that latent constructs predict the size of their block better than the size of the other blocks.

3. Results and Discussion

3.1. Household characteristics

Household economic capability level manifested by income per capita/month, employment opportunities, share of food expenditure, ownership (land and price of rice). The average household income per capita reached Rp. 655.450/month. This showed that 57 percent of the household's income was still used to fulfill their food. The average price of rice reached Rp.12.730/ kg. The average household ownership was 1.05 ha (Table 1).

Table 1. Average value of variable levels of economic capability, physical availability, social capability and food culture of Meranti Island in 2024.

No	Variabel	Value
1	Economic Capability Level	
a.	Income per capita/month (Rp)	655.450
b.	Employment opportunities (n)	1,80
c.	Food expenditure (%)	0,57
d.	Rice prices (Rp/Kg)	12.730
e.	Asset ownership (Ha)	1,05
2.	Physical Availability Level	
a.	Number of transportation facilities owned (unit)	2,28
b.	Transportation costs (Rp)	13.900
c.	Household food reserved (kg)	19,35
d.	Distance of settlement to market (km)	1,65
3.	Social Capability Level	
a.	Mother's education	1,53
b.	Food knowledge	7,93
c.	Family size (n)	4,48
d.	The existence of food institutions	25,03
4.	Food Culture Level	
a.	Food pattern	39,95
b.	Food acceptability	30,15
c.	Food preference	0,45

Source : Survey (2024)

Physical availability level of households to meet their food is measured through the number of transportation facilities owned, transportation costs, distance of the settlement to food sources. The average household has 2 units of transportation. Transportation costs incurred by

households to obtain food averaged Rp. 14.500, this is closely related to the condition of the transportation infrastructure available.

The level of household food culture was measured by food patterns, acceptability of non-rice food (food acceptability) and whether or not to restrict certain foods (food preferences). It was expected that with good food patterns illustrated from the low contribution of rice to the total energy consumed, low food preferences and high food acceptability, households had a higher level of accessibility to food. Household food patterns were measured by the contribution of rice to total household calorie consumption. The average contribution of rice to total household energy consumption reached 39,95 percent. The average value of household food acceptability, namely the ability of households to accept or acceptability of non-rice food, reached 30,15 (high)

3.2. Level of food accessibility

The results of the analysis using the HFIAS method, found that households with a small score and equal to 5 (≤ 5) or very low accessibility levels were 13,33 % households. Whereas households with a high score were more and equal to 18 (≥ 18) or a high level of accessibility to rice as many as 20 (33,33 %) households (Table 2). This was consistent with the results of the study [14] that the HFIAS measurement instrument showed validity and reliability in measuring food insecurity / household food insecurity among households in rural Tanzania, found 20,7% of households were categorized as food security (high food access), and 48.1% are the worst food insecure (very low food access). Food insecurity status was positively correlated with mother's education, husband's education, household wealth status, part of agriculture, not from pastoral tribes, animal food consumption, and negatively correlated with mother's age and household size.

Table 2. Distribution of households by accessibility level in Meranti Island 2024.

No.	Score/Accessibility Level	n	%
1	≤ 5 (Very Low)	8	13,33
2	6-11 (Low)	10	16,67
3	12-17 (Middle)	22	36,67
4	≥ 18 (Good)	20	33,33
5	Total	60	100

Source: Survey Results, Processed Data (2024).

3.3. Effect of factors on the level of economic ability, level of physical availability, social ability and food culture on the level of household accessibility to food.

Model suitability test is based on established criteria called *Goodness of Fit*. The Goodness of Fit of the Inner Model is measured using R-square dependent latent variables with the same interpretation as regression. R-square value is the result (in the form of a percentage) of the representation of the independent variable on the dependent variable. A good R^2 value is above 0.2 (equivalent to 20%). Based on the calculation results obtained R^2 value of 0.634 meaning that it could be explained that: the variable level of food accessibility could be explained by variables of economic, physical, social and cultural level of food by 63.4 %, the rest was explained by other variables not examined. The results of this study were higher than the study [15] showing that 40% of the diversity of latent variables of food security could be explained by the latent variables of food availability, food access and food absorption, the rest was influenced by other factors.

From the analysis of quality used to determine the effect that occurred between exogenous variables with endogenous variables (hypothesis testing). Exogenous variables were stated to significantly influence endogenous variables if the value of t statistics > t table. Hypothesis test results are presented in Table 3 below.

Table 3. Structural coefficient model path results.

Correlation between variables	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Economic Capability Level -> Food Accessibility Level	0.374	0.164	0.048	7.831	0.027
Physical Availability Level -> Food Accessibility Level	0.138	0.065	0.045	3.087	0.002
Social Capability Level -> Food Accessibility Level	0.416	0.417	0.069	6.040	0.012
Food Culture Level -> Food Accessibility Level	-0.155	-0.380	0.078	1.987	0.000

Source: Survey Results, Processed Data (2024).

Table 3 illustrated the Inner model of the variable level of household accessibility to food (TARP), namely: $TARP = 0.164 \text{ TKE} + 0.065 \text{ TKF} + 0.417 \text{ TKS} - 0.380 + \zeta_1$. The results of further analysis showed that the level of economic capability (X1) had a positive effect on the level of food accessibility (Y). The sample mean value of 0.164 meant an increase in economic capacity of 1 unit, would increase food accessibility by 0.164 units. In line with research [16] which found that household economic variables (annual income, number of loans received, size of agriculture, and number of livestock owned) had a significant effect on food insecurity.

The level of physical availability (X2) had a positive effect on the level of food accessibility (Y). The mean sample value of 0.065, implied that each increase in physical availability by 1 unit, would increase food accessibility by 0.065 units. The greater the physical availability score, the higher the food accessibility score. The statistical t value of 3.087 was greater than t table (1.645), meaning that the level of physical availability had a positive and significant effect on the level of food accessibility. Good physical availability would affect the level of household accessibility to food. This was consistent with research [17] which stated that one factor influencing household food security was the amount of rice held for consumption.

The level of social ability (X3) had a positive effect on the level of food accessibility (Y) (Sample mean value of 0.417, implied that every increase in social ability by 1 unit, would increase food accessibility by 0.417 units. T value of statistics of 6.040 was greater than t table (1.645), which meant that the level of social ability had a positive and significant effect on the level of food accessibility. This condition illustrated that a high level of social ability / good would increase household accessibility to rice, this was in line with several studies, namely as conducted by [18]. The level of food culture (X4) had a negative effect on the level of food accessibility (mean sample value of -0.380), meaning that each increase in food culture 1 unit, would reduce food accessibility by 0.380 units. The statistical t value of 1.987 was greater than t table (1.645), meaning that the level of food culture had a negative and significant effect on the level of food accessibility. This was consistent with research [19] showing that behavioral change and acceptability factors positively affect community food diversification.

4. Conclusions

In Riau's border areas adjacent to Malaysia, the level of food accessibility was explained by 63.4% of the variation in economic, physical, social, and cultural variables, with the rest influenced by other unexamined variables. Economic capacity, physical availability, and social ability of households contributed positively and significantly to food accessibility, whereas cultural factors exerted a negative yet significant effect.

References

- [1] Arifin, B. (2014). Analisis ekonomi pertanian Indonesia. Jakarta: Buku Kompas.
- [2] Bappenas. (2020). Rencana aksi pangan dan gizi 2019-2024. Jakarta: Badan Perencanaan Pembangunan RI.
- [3] Suhardjo. (1989). Sosio budaya gizi. Bogor: Departemen Pendidikan dan Kebudayaan, Direktorat Jenderal Pendidikan Tinggi, Pusat Antar Universitas Pangan dan Gizi, Institut Pertanian Bogor
- [4] Gevisioner, Febriamansyah, R., Ifdal., & Tarumun, S. (2015). Kualitas konsumsi pangan di daerah defisit pangan Provinsi Riau. *J.Gizi Pangan*, 10(3), 233-240.
- [5] Badan Pangan Nasional. (2024). Angka rawan pangan . Jakarta : Pusat Ketersediaan dan Kerawanan Pangan.
- [6] Patric., & Rogers. (2003). Addressing the in Food Insecurity. Occasional Paper (1) Feb. 2003. USAID Office of Food for Peace.
- [7] Suhardjo. (1989). Sosio Budaya Gizi. Bogor: Departemen Pendidikan dan Kebudayaan, Direktorat Jenderal Pendidikan Tinggi, Pusat Antar Universitas Pangan dan Gizi, Institut Pertanian Bogor
- [8] Nazir, M. (2003). Metode Penelitian. Jakarta: Ghalia Indonesia.
- [9] Singarimbun, M., & Effendi, S. (2005). Metode penelitian survei. Jakarta: LP3ES.
- [10] Wibowo, A. (2009). Pengantar structural equation modeling. Surabaya: Lembaga Penelitian dan Pengabdian Kepada Masyarakat Universitas Airlangga.
- [11] Coates, J., Swindale, A., & Bilinsky, P. (2007). Household Food Insecurity Access Scale (HFIAS) for measurement of food access: indicator guide: version 3.
- [12] Ghazali, I. (2014). Structural equation modeling, metode alternatif dengan partial least squares (PLS). Semarang: Universitas Diponegoro.
- [13] Haryono, S. (2017). Metode SEM untuk penelitian manajemen dengan AMOS LISREL PLS. Jakarta: Luxima Metro Media.
- [14] Knueppel, D., Demment, M., & Kaiser, L. (2010). Validation of the household food insecurity access scale in rural Tanzania. *Public health nutrition*, 13(3), 360-367. <https://doi.org/10.1017/S1368980009991121>
- [15] Ningsi, B. A. (2012). Pemodelan ketahanan pangan indonesia dengan menggunakan partial least square path modelling (PLS-PM). Tesis. Bogor: Sekolah Pasca Sarjana Institut Pertanian Bogor.
- [16] Bogale, A., & Shimelis, A. (2009). Household level determinants of food insecurity in rural areas of dire dawa eastern ethiopia. *African Journal of Food Agriculture Nutrition and Development*, 9(9), 1914-1926. <https://doi.org/10.18697/ajfand.30.3740>
- [17] Asep, H., Dwidjono, H. D., & Jangkung, H. M. (2014). Ketahanan pangan rumah tangga di Kabupaten Ciamis. *SEPA*, 11(01), 21-34
- [18] Maulana, A., & Hudalah. (2015). Upaya pemerintah daerah dalam peningkatan aksesibilitas pangan di Kota Bandung. *Perencanaan Wilayah dan Kota*, 1, 129-147.
- [19] Subagiyo. (2014). Kajian faktor yang berpengaruh terhadap diversifikasi pangan non beras di Daerah Istimewa Yogyakarta. *Agros*, 16(2), 422-431.

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