Food Security Analysis On District/City In The Island Of Sumatra

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Abstract: Food security is influenced by food availability, food access and food absorption. The amount of food availability in Indonesia is quite large but not sufficient to meet the needs of the Indonesian people, in addition to other aspects of food access and food absorption. This study uses the Partial Least Square Path Modeling (PLSPM) analysis tool and uses a bootstrapping approach in statistical testing. The results of the analysis show that the food access factor has a negative and insignificant effect on food security. Meanwhile, the factors of food availability and food absorption have a positive and significant influence on food security

Index Terms: Food Absorption, Food Access, Food Availability and Food Security

1 INTRODUCTION

Food is a very basic need for humans and for the life of the people of a country, food has a very important role as a human right. Economic instability of a country will occur if the food needs of a country are very large while the amount of food availability in that country is not sufficient. Social and political problems will also be turbulent, even national stabilization will be shaken. The problem of food is an important consideration for Indonesia, with a population that is increasingly spreading and the geographical area of Indonesia is growing. One of the factors that influence food security in Indonesia is the availability of food. The availability of food, especially the availability of sufficient rice, is very important, because the basic need for food for the Indonesian population is rice. [1] Food production every year on average has increased, followed by an increase in population. Therefore, the need for rice will not be sufficient if it is only produced by own production. So, it requires assistance from other countries (imports). Rice exporting countries used in Indonesia include Vietnam, Thailand, Pakistan, India and several other Asian countries. [2]Based on the Food Security Index (IKP) of 416 districts in Indonesia, 26 districts are classified as the first priority and 21 districts are classified as the second priority. Priority first and priority of both can be said as the districts most vulnerable to food or about 17 percent of the entire district in Indonesia. As many as 19 percent classified in the category of vulnerable food was, with details of 34 districts in priority third dam 47 districts in Priority Fourth. Meanwhile, for the category of most low or including groups are relatively resistant food contained 69 percent, with 137 districts in the priority five and 151 districts in Priority. [3] In the group of district priorities first and groups of counties a priority second, variables of principal that indicates the vulnerability of food is the number of poverties, limited access to electricity, limited access road vehicle wheels 4, and limited access to water clean. Meanwhile, in the third priority district group, the main variables that indicate food insecurity are high poverty rates, limited access to clean water, high disparities between food demand and production (Cerealia), and limited access to electricity. The results have showed that the group of district priorities first and second , variable primary that indicates insecurity of food is not the variables were included into the factor of availability of food , but the variables are included in the factor of access to food and the factors absorption of food to groups of district priorities third , factor availability of food becomes one of the things that need to be considered , because the variables that included factors availability of food (high gap between the needs and the production of food) became one of the variables primary that indicates insecurity of food in the area are . The results have demonstrated that the factor of access to food and factor absorption of food becomes a factor that is more dominant influence vulnerability to food in an area compared to factor the availability of food.

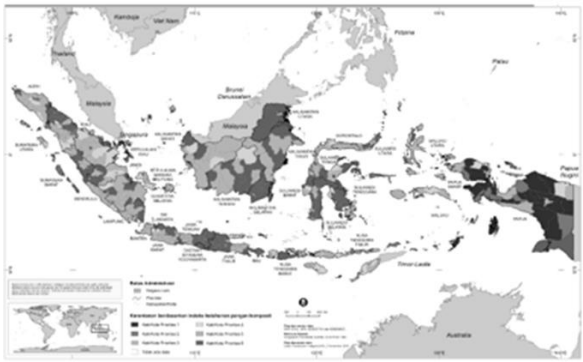

Fig. 1. Map Resilience and Vulnerability of Food

From the picture above can be seen in the line of great on the island of Sumatra incline exist in groups of priority fifth and sixth, and the rest is still there in the group of priority first to the fourth. The island of Java, more than 90 percent are in the priority fifth and sixth, as well as the island of Sulawesi and Borneo. However, there are still many Papua Island and its surroundings that are in the first to second priority groups. IKP score districts in Indonesia is still relatively low or vulnerable to food, as many as 81 districts out of 416 districts. 26 districts are included in the first priority group, 21 districts are classified as second priority and 34 districts are included in the third group. [4]insecurity of food has influence that big on potential growth , health , and behavior of children with poor and nearly poor. [3]in 2007 in food surplus districts in Indonesia, food was

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significantly affected by food access factors and food absorption factors. Meanwhile, the food availability factor only affects a small part of food security. [5] variables that affect food security in eastern Indonesia are the percentage of poor people, GRDP per capita, female illiteracy rate, and average length of study. Judging from the value of elasticity, education affects food security in eastern Indonesia is very large. [6] Determinant resilience of food in China such as income per capita population of the countryside " price of food, the area of disaster farm and the amount of savings population of villages and cities. Wang stated that climate change has a significant effect on food security, but it does not affect food prices. The income of the rural population has a negative effect on food consumption. The amount of savings of rural and urban residents does not affect consumption. [7]food security is a pillar for the establishment of human resources that have qualities that can improve the competition at various levels. In his research, he discusses unlimited and limited analysis in order to be able to distinguish the differences between food availability, food access and food use in Java and outside Java. The results obtained from this study are regions in Java, food availability does not affect access performance, while access affects absorption positively. On the other hand, outside Java availability affects access negatively, which means that outside Java generally does not provide sufficient supply. investigated food security and vulnerability through ten indicators conducted in three regions, namely Ogan Komering Ilir (OKI), Banyuasin and East OKU District. This research shows that most of the sub-districts in OKI and Banyuasin Regency are quite food insecure, the obstacles faced by this area are the low productivity of farmers, especially food crop production, the distance to the trade center is relatively far, the poor are high, access to clean water and health is still limited. Meanwhile, East OKU Regency is generally classified as very food insecure. The availability of food in this area is relatively good, the only indicator that is still not ideal is the ratio of health facilities to population. [8]using a simultaneous equation model approach estimated using the Two Stage Least Squares (2 SLS) method shows that rice production in Indonesia is determined by the price of rice, the price of rice consumption of fertilizers and rice. Rice prices are highly dependent on rice production and wage levels in the agricultural sector. Rice consumption is determined by the price of rice, subsidies and gross domestic product. This condition shows that the government is trying to maintain price stability through subsidies as well as efforts to achieve good food security from both the demand and supply sides.

2 Literature Review

[9]The production function is a function that shows the relationship between production results and production factors. An agricultural production that produces physical production requires the role of several factors such as land, capital, and labor, as well as management (entrepreneurship). Understanding the resilience of food in the laws of the republic Indonesia Number 18 year 2012 about food is the refinement and enrichment of the Law of the Republic of Indonesia Number 7 in 1996. With that, the resilience of food is the condition of the fulfillment of the Food for the state to the individual, which is reflected from availability food which is sufficient, both the number and quality, diverse, nutritious, equitable, and affordable and not contrary with religion, beliefs and culture of the community, to be able to live healthy, active and productive in it sustainable. Definition resilience of food is in line with the definition of the Food and Agriculture Organization (FAO) which states that the resilience of food as a condition where every individual each time have access to food that is sufficient, safe and nutritious are sufficient. In other words, food security means that individuals and countries must always be able to get the food they need to live an active and healthy life.

[2] factors principal that determine the resilience of food is divided into 3. First, availability of food can be interpreted by the availability of food is physically in the area, which can be either of the results of domestic, import, or of trade as well as aid food. Availability of food is determined from production domestically, the entry of food through the mechanism of the market, the stock of food which is owned by merchants and government, as well as relief food either from the government or from the body relief food. Food availability can be calculated at the national, provincial, district, or community level. Second, access food is defined as the ability of home stairs of individuals with available resources to obtain enough food for its nutritional needs, which can be obtained from, both are derived from the production of its own, purchase, barter, gift, loan, and help food or a combination in the fifth. Individual household access consists of economic, physical and social access. Economic access depends on income, employment opportunities and prices. Physical access concerns the level of regional isolation (distribution facilities and infrastructure) while social access concerns food references. In other words, food access is defined as the ease and affordability of households to obtain food. The availability of food in divulging u area may be sufficient, would be but probably not all home household have access to the adequate in quantity and diversity of food through a mechanism that in the above. Third, food absorption is defined as the use by the house stairs, and the ability of individuals to absorb and the formation and decomposition of substances nutrition. Utilization of food also includes means of storage, processing, and preparation of food is the use of water and materials fuel during the process of processing and cleanliness, culture or habit of giving meal, especially for individuals (growth, pregnancy, lactation, and others), and the status of Health respectively - each member of the house ladder. The use of food for the needs of a healthy life, which includes the need for energy and nutrition, water and environmental health.

3 Materials and Methods

The main material in this study is to discuss food security and factors related to food security such as food availability, food access and food absorption. Each of these factors has an indicator. While the objects to be studied are districts and cities on the island of Sumatra. The observation period is from 2017 and 2018. In this study, quantitative data is used, the type of ratio data. Source da ta ' who used ' ' in research this is the data of secondary that is obtained from the Central Bureau of Statistics (BPS), the Ministry of Health, Food Security Agency, and the Ministry of Agriculture for the study was the year 2017 and 2018. Population in research this is whole districts / cities in the island of Sumatra, namely, the district amounted to 120 and the city for 34 with a number of districts / cities amounting to 154. Of the 154 population, all were used as samples. This study only focuses on ten provinces in Sumatra out of 34 provinces in Indonesia which are Aceh, North Sumatra, West Sumatra, Riau, Jambi, Bengkulu, South Sumatra, Bangka

Belitung and Riau Islands. This study uses regression analysis partial (Partial Least Square Path Modeling) [10] Partial least square path modeling is a data analysis technique used to analyze the relationship between variables. In this case, each set of variables studied is assumed to represent the theoretical concept shown in the form of latent variables. Indicators are used to measure latent variables for food security are as follows;

TABLE 1
INDICATORS OF LATENT VARIABLES

Latent Variables	Indicator
Food Availability	Consumption of calories per capita per day Consumption of protein per capita per day Corn production quantity Total production of nuts Total population Total production of tubers
Food Access	Percentage of non- poor population The percentage of the average expenditure house stairs to the consumption of non- food Percentage of households that use electricity The percentage of villages that have access to the vehicle wheels four The percentage of villages that have access to the market
Food Absorption	Percentage head home household who graduated middle school The percentage of home stairs that use water with the quality of physical water well The percentage of home stairs that ' using latrines neck swans Percentage of households that have access to health care facilities
Food Security	Life Expectancy

4 RESULTS

Resilience of food a region defined by a factor of availability, access and absorption of food in the area are. From the 2020 FSVA publication, districts and cities on the island of Sumatra are in priority 4, 5, and 6, this shows that most districts and cities are classified as food insecure. One example of food insecurity in priority 1 Riau Province 1 Regency, priority 2 Aceh 1 district, West Sumatra 1 district, South Sumatra 1 district, Riau Islands 1 district, priority 3 Riau Islands 4 districts, North Sumatra 2, Riau 2 districts and Aceh 1 district.

TABLE 2
RESULTS OF DESCRIPTIVE ANALYSIS OF FOOD AVAILABILITY

Food Availability	Min	Max	mean	Standard Deviation
Consumption of Calories Per Capita Per Day	1,803.12	2,727.11	2,146.78	134,178
Consumption of Protein Per Capita Per Day	47.84	75.89	59,771	4,597
Rice Production	0	1,038,489	110,084	161,708,1393
Corn Production	0	735,743	38,112	102.022.7029
Nuts Production	0	70 9,037	3,220	40,397.3921
Production Umbi- tubers	0	173,289	52.101	2 07,138,379
Total Population	33,889.00	2,259,966.13	371,108.50	342,110.92
Ratio of Normative Consumption to Production	10.43	14.63	12,516	0.778

From the table above, the consumption of calories per capita per day is 80 districts and cities which are below the energy adequacy rate that should be 2,150 kcal, even exceeding 50 percent of the total number of urban districts on the island of Sumatra. So that the average calorie consumption does not meet the energy needs needed. From the data on protein consumption per capita per day, there are 45 districts and cities that are below the protein adequacy rate which should be 57 grams per day. Rice production on the island of Sumatra is still not sufficient to meet the needs of the community, so that in an effort to meet these needs imports must be imported from other countries. The population of Sumatra Island reaches 58.46 million people with a total area of 473,481 square kilometers with a population density of 123 people per square kilometer. Therefore, when viewed as a whole, Sumatra Island is an area with a low population density

TABLE 3
RESULTS OF DESCRIPTIVE ANALYSIS OF FOOD ACCESS

Food Access	Min	Max	mean	Standard Deviation
Percentage of Population Below Poverty Line	1,230	204,220	39,631	35,298.6
Percentage of Average Expenditure Home Appliances to Consumption Non-Food	10.39	55.07	27.025	7.562
Percentage of Home Appliances That Use Electricity	63.98	100	97.125	5.505
Percentage of Villages That Have Four-Wheel Vehicle Road Access	8.57	100	72.695	23,337
Percentage of Villages Which Have Access Market	0	61.15	13.376	11,581

The number of people below the poverty line is still relatively high with an average of 39,631, Medan City has the largest number of people below the poverty line. Data on electricity use on the island of Sumatra is classified as good, there are several urban districts that have 100 percent of their population using electricity . Likewise , villages that have road access for vehicles that can be passed by four-wheeled vehicles, but for villages that have market access, there are still many and do not even have a market in their village, the average is very small.

TABLE 4
RESULTS OF DESCRIPTIVE ANALYSIS OF FOOD ABSOPTION

Food Absorption	Min	Max	mean	Standard Deviation
Percentage Head of Home Appliances graduated from middle school	29.44	80.91	57.746	8,694
Percentage of Home Appliances That Use Water With a Quality Physical Water The Good	0.12	94.41	22,576	21.716
Percentage of Home Appliances That Use latrines Neck Angsas	20.18	99.56	75.411	15,878
Percentage of Home Appliances That Have Access To The Facilities Health	0	89.47	38,825	20,295

The percentage of household heads who graduated from middle school is still quite good compared to the percentage of households using water with good physical water quality. the use of good water on the island of Sumatra is still relatively small, because there are still many villages that use rainwater and river water as their main water. Likewise, households that have access to health facilities are still not good, it can be seen from the table above that there are villages that do not yet have a community Health centers. Validation of measurement model (Outer Model) Reflective Relationship in Food Security Construct : outer model defines how each indicator relates to its latent variable. [11] in the measurement model with a reflexive relationship, the validation of the measurement model is carried out by looking at three criteria , namely (1) loading, (2) composite reliability , and (3) Average Variance Exacted (AVE).

TABLE 5
LOADING FACTOR VALIDITY TEST RESULTS FOR FOOD SECURITY

Indicator	Food Security	Information
Life Expectancy	0.962	Valid

Tabel 5 shows that the value of the loading indicator in the construct resistance has a value in the above 0.6. So the

indicator life expectancy cohabited within the construct endurance food valid measure the construct of the[12]. Validation Model Measurement : relationship Formative on Construct availability , access , and Absorption of Food . On the model of the measurement with the relationship formative , outer weight (weighing) each indicator should be compared to one each other to determine the indicators that give a contribution the largest in a construct .

TABLE 6
VALUE OF WEIGHT, AND VIF FOR EACH INDICATOR IN CONSTRUCT WITH FORMATIVE RELATIONSHIP

Latent Construct	Indicator	Weight	VIF
Food Availability	Consumption of Calories Per Capita Per Day	-0.395	1.972
	Consumption of Protein Per Capita Per Day	0.385	1.975
	Corn Production	-0.014	1.073
	Nuts Production	0.055	1.013
	Total Population	0.403	4.334
	Ratio of Normative Consumption to Production	0.286	4.256
Food Access	Number of Population Below Poverty Line	-0.710	1.231
	Average Expenditure Home Appliances To Consumption Non Food	0.305	1.033
	Home Appliances That Use Electricity	0.770	1.256
	Villages That Have Road Access for Four- Wheel Vehicles	0.606	1.207
	Percentage of Villages Which Have Access Market	0.258	1.131
Food Absorption	Percentage Head of Home Appliances the End SMP / MTS	0.170	1.086
	Percentage of Home Appliances That Use Water with a Quality Physical Water the Good	0.432	1.155
	Percentage of Home Appliances That Use Latrines Neck Swan	0.987	1.198
	Percentage of Home Appliances That Have Access to The Facilities Health	0.308	1.112

Table 6 shows seen that each indicator on each construct has a value of VIF is less than 10. That is, in each construct latent built not appear multicollinearities are high. So that all indicators in each construct can be used in modeling. Thus, the construct formed for each factor is as follows.

a. Food security construct measurement model

$$[Life\ Expectancy] = [0.962]\ \hat{\eta}_{Food\ Security}$$

$\hat{\eta}$= Endogenous Latent Variable

b. Measuring model construct food availability

$$\hat{\xi}_{FAva} = -0.395X_1 + 0.385X_2 - 0.014X_3 + 0.055X_4 + 0.403X_5 + 0.286X_6$$

$\hat{\xi}_{FAva}$ = exogenous latent variable food availability

X_1= Consumption of calories per capita per day,

X_2= Consumption of protein per capita per day

X_3= Total production of Corn

X_4= Total production of nuts

X_5= Total population

X_6= Ratio of Normative Consumption to Production

c. Measuring model construct Food access

$$\hat{\xi}_{FAcc} = -0.710X_7 + 0.305X_8 + 0.770X_9 + 0.606X_{10} + 0.258X_{11}$$

$\hat{\xi}_{FAcc}$= exogenous latent variable food Access

X_7= Percentage of non-poor population

X_8= Percentage of average household expenditure on non-food consumption

X_9= Percentage of households that use electricity

X_{10}=Percentage of villages that have access to four-wheeled vehicles

X_{11}= Percentage of villages with market access

d. Measuring model construct food absorption

$\hat{\xi}_{FAbs}$= exogenous latent variable food Absorption

X_{12}= Percentage of household heads who completed middle school

X_{13}= Percentage of households that use water with good physical water quality

X_{14}= Percentage of households using 'goose neck latrine'

X_{15}= Percentage of households that have access to health care facilities

$$\xi_{FAbs} = 0.170X_{12} + 0.432X_{13} + 0.987X_{14} + 0.308X_{15}$$

TABLE 6
Hypothesis Testing Results

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values	Influence
Food Availability -> Food Access	0.452	0.432	0.163	2,766	0.006	Positive and significant
Food Availability -> Food Absorption	0.404	0.378	0.147	2.750	0.006	Positive and significant
Food Availability -> Food Security	0.240	0.228	0.098	2,462	0.014	Positive and significant
Food Access -> Food Absorption	0.541	0.540	0.042	12.889	0.000	Positive and significant
Food Access -> Food Security	-0.003	0.006	0.083	0.037	0.971	Negative and insignificant
Food Absorption -> Food Security	0.440	0.435	0.086	5.141	0.000	Positive and significant

From the table above, only the effect of the latent variable on food access is negative and insignificant on the latent variable of food security.

TABLE 7
DIRECT, INDIRECT AND TOTAL EFFECTS

Latent Variables		Influence		
Endogenous	Other Endogenous	Live	Indirect	Total
Availability	Access	0.452	0	0.452
	Absorption	0.404	0.244	0.648
	Security	0.240	-0.001 0.178	0.524
Access	Absorption	0.541	0	0.541
	Security	-0.003	0.238	0.235
Absorption	Security	0.440	0	0.440

Based on table 4.9, it can be seen that the latent variable of food access has a direct effect of 0.003 on food security. In statistics, this figure has a significant effect on food security, but theoretically, food access cannot have a negative effect on food security. Therefore, the effect exerted by access to food is not significant. Food availability has a direct influence on the latent variable of food security of 0.240. This means that every increase in the score of the absorption latent variable by 100 percent will increase the score for the latent variable of food security by 24 percent. While the total effect of the latent variable of food availability on food security is calculated from the direct influence and indirect effect with a total of 0.524, meaning that every increase of 100 percent will increase the score of the latent variable of food security by 52.4 percent. The latent variable of food absorption has a direct influence on the latent variable of food security by 0.440, which means that every increase in the score of the latent variable of absorption by 100 percent will increase the score of the latent variable of food security by 44 percent.

4 CONCLUSION

Based on the results of the analysis and discussion of the study, it can be concluded as follows: first, the latent variable of food access has no significant effect on food security, there are still many areas on the island of Sumatra that have inadequate access to electricity, the poverty rate is still high and the level of household expenditure is low included in the bad category and indicated food insecurity. Second, the condition of food availability and food absorption on the island of Sumatra has a fairly good condition, the average AKE and PPA are above, the production of food crops is also quite good in line with the population. Third, districts and cities on the island of Sumatra still need to pay attention to road access, health access and the use of number neck latrines. Fourth, food security on the island of Sumatra is more influenced by food availability than food absorption, while food access does not have a significant effect on food security.

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