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## Food Security Model in North Sumatra Province

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### Abstract

This study aims at provide information about the development of food security model in North Sumatra Province. This study was carried out in the districts and the cities. The data have been collected from various institutions from Agricultural Office, Food Security Office and Statical office of North Sumatera province. It also collects secondary data which are covering various aspects of food production, to enrich the study, I have been interviewing stakeholders who responsible to manage food security development. Analysis Confirmatory Factor Analysis Model is used to analyze factors affecting food security The results of the study shows the results of speed analysis in aspects of food production, so far the value of production has always dropped, general production modeling is only 80% and relatively an average of 20% every year which must be issued by import from other countries.

**Keywords:** *Confirmatory Factor Analysis, Food Security JEL Classification: A19, B41, Q10*

### 1. Introduction

Food is a basic right of every person. Universal Declaration of Human Rights of 1948 food basic right of every person: " .Everyone has the right to a standard of living adequate for the health being of himself and his family, Including for food" which is then refined by emphasizing the right to freedom of famine: "the right of everyone to be free from hunger". With slight definitional changes, 6.5% of the sample households appeared food insecure using DIM and only 1.1% using FIEMS. Given its high definitional sensitivity, food security must be carefully defined according to country specific conditions and should reflect local diversity (Bashir, 2012).

Population North Sumatra (PSU) in 2015 was 13,937,797 inhabitants. The population continued to increase since 1990. The average rate of population growth in 2000 are respectively 1.20% per year, the period from 2009 to 2015 is 1.67% per year and is 1.82% per years. Population distribution is uneven. By 2015, the majority 9.83 million; 70.5% in living in the cities such as in Medan, Sibolga, Tanjung Balai, Siantar, Tebing Tinggi, Padang Sidempuan, Deli Serdang, Serdang Bedagai, Asahan, Langkat, and Simalungun. Furthermore, about 6.98 million or about 50% of the population living in the rural areas and the remaining of 6.95 million or 49.89% living in the urban areas. PSU labor force by 2015 as much as 9.37735 million of North Sumatera population, about 8,472,436 inhabitants or about 90% pertained to work and 904914 people about 10 % is classified as looking for job and. Most of the labor force are working about 57% of North Sumatera Population work in the agricultural sector. The rest is as labor-intensive industries, hotels, and restaurants which amounted to about 18%. Another considerable sector that have contribution absorbing the labor force are services sector such as individuals, companies, governments which is counted about 8%, while the industrial sector absorbs about 17% of the workforce.

Based on the employment status, they work at PSU program is about , 25% are workers or employees, family workers of about 18%, and about 19% of employers who employ by family members, and 4% employers who employ fixed workers /that they are not a member of family. The Labor Force Participation Rate (LFPR) fluctuates. In 2000 was about 57.34%, increased to 72% in 2005, but then decrease to be 67% in 2006. In 2007 and 2008 LFPR increased to be 67 % and 68.33%, but fell back in return to 64.33% in 2009 and increased to 67.25% in 2015. Most of the labor force (40.08%) down to the elementary school education, educated junior high and high school, respectively 25.12% and 32.31%, and the remaining 7.87% above the high school educated.

The number of poor PSU is fluctuation in 2004 by 80 million people (15%) but the increase in fuel prices in March and October 2005 has been impact on the increase by 1.98 million (16%) in 2006. Since 2007 the poor PSU has been steadily decreasing, from 1.77 million (13.90%) to 1.61 million people (12.55%) in 2008, 1.50 million (11.51%) in 2009 1.36 million (9.76%) in 2014. The number of poor people above shows that although the decline still has the potential deficit in PSU AKE relatively high and need to watch out for indication of food insecurity. This survey is intended to determine the spread and the level of hunger and poor nutrition status of PSU. The reasons for this survey is because that most vulnerable population toward AKE deficit. Limitation of poor society in this survey is the household BLT / Raskin. It is generally recognized that food security, and therefore food insecurity, is a multi-dimensional phenomenon. Several indices measuring hunger and the progress in achieving hunger eradication helped understanding the issue and monitoring the progress in eliminating hunger swell as providing targets for national and international political action (Ed. Clay, 2002).

Comprehensive evaluation of China's food security over the years by factor analysis shows that China's food security is in a tense balance state, the sources of which are the supportability factor slowdown and the score of stability factor decrease (Zou, J, e.a. 2015). In Indonesia has developed a definition of hunger that is the condition of someone who is not able to meet the food requirements within a certain period because of the availability of food and economics in this case the person fasting, diet, a disease is not included in this restriction. This definition then developed a time limit, so the definition of a person's hunger to be the inability of the minimum food needs for healthy living, intelligent and productive, for 2 consecutive months because of problems in purchasing power and or availability of food as well as a community value. Operationally the famine was the inability to meet the 70% or more of the energy needs accompanied problem with the weight loss of purchasing power and or availability of food. In the long term, chronic hunger a negative impact upon the health of society and led to high public expenditure for health. Chronic hunger can lead to a degree of high infant mortality. Vulnerable to disease, more than 2 million children die every year due to dehydration caused by diarrhea (Cook et al., 2004). As has been seen, food security and hunger are by no means tightly-defined concepts and different definitions arise depending on the number of factors involved. These include the scope of the analysis, namely whether the causes or the effects of food insecurity are being examined and whether the situation is real or potential; whether the analysis is in qualitative or quantitative terms; and the level at which analysis is being carried out: a macro or country-wide level, a meso or regional level, or a micro or household level (Masset, 2010). The results of this study revealed that age, gender, education, remittances, unemployment, inflation, assets, and disease are important factors determining household food insecurity. Moreover, gender played a dominant role in food insecurity as female headed household were food insecure while male headed household were food secure (Abdullah, e.a., 2019).

**2. Literature Review**

The nutritional status of a person or group of people can be determined by measuring the nutritional status. that can be done are the measurement of the consumption of food as indirect measurement, anthropometric, and clinical as direct measurement. How and indicators used will depend on the stage of the state of malnutrition, time, costs, the level of accuracy desired assessment. According to Jelliffe in Gibson (1990), into-biometric is a measurement of physical dimensions and of composition variations rougher than the human body at the level of age and levels of different nutrient levels. Several kinds of indicators that can be used include the BB, TB, upper arm circumference (MUAC), and age. Nutritional status based on the index BB/U, TB/U, and BB/TB guided the gold standard There are two ways namely percent votes toward the median (Table1) and z scores (Table 2). use z score is the result of arithmetic has been standardized by the standard deviation so that n every age group and anthropometric indices. Determining the prevalence of the z score method is more accurate than the median percent to good outcome varies according to each index.

**Table 1. Criteria Nutritional Status Children According to BB/li, H/A and W/H Based Against Median Percent Calculation**

Category	BB/U	TB/U	BB/TB
Status of Malnutrition	<60%	<85%	<70%
Less Nutritional Status	60 - 70%	85 - 90%	70-80%
Good Nutritional Status	>70 - 80%	>90 - 95%	>80 - 90%
Nutritional Status More	>80%	>95%	>90%

**Table 2. Criteria Nutritional Status Children According to W / A, H / A and W / H Based on the calculation of Z Scores**

Index	Score Z Value	Status
BB/U	$z < -3 \text{ SD}$	Malnutrition ( <i>underweight</i> )
	$-3 \text{ SD} \leq z < -2 \text{ SD}$	Malnutrition ( <i>underweight</i> )
	$-2 \text{ SD} \leq z \leq 2 \text{ SD}$	Nutrition Normal
	$z > 2 \text{ SD}$	Nutrition More
TB/U	$z < -3 \text{ SD}$	Malnutrition ( <i>stunting</i> )
	$-3 \text{ SD} \leq z < -2 \text{ SD}$	Malnutrition ( <i>stunting</i> )
	$-2 \text{ SD} \leq z \leq 2 \text{ SD}$	Nutrition Normal
	$z > 2 \text{ SD}$	Nutrition More
BB/TB	$z < -3 \text{ SD}$	Malnutrition ( <i>wasting</i> )
	$-3 \text{ SD} \leq z < -2 \text{ SD}$	Malnutrition ( <i>wasting</i> )
	$-2 < ; \text{SD } z < 2$	Nutrition Normal
	$z > 2 \text{ SD}$	Nutrition More

**Table. 3 Criteria for Youth Nutrition Status Based IMT Value by Age**

Nutrition Status	IMT Value
Thin	IMT < percentile 5th
Normal	IMT percentile 5th to percentile 85 <sup>th</sup>
Overweight or obese are at risk	IMT > percentile 85th

Determining the limits of normal weight in adults is based on the value of BMI is calculated using the formula weight (kg) divided by the square of height (m):  $BMI = \text{weight} / \text{height}^2$ , limit values for women of normal BMI is 18.7 - 23.8, or about 20.8 (Atmarita V. L., 1992). (Becker JW, 1999) when BMI is less than 20 then classified as an underweight, 20-25 classified as a normal, 25-30 classified as an overweight, and of over than 30 classified as an obese. MOH to categorize five adult nutritional status based on BMI values as shown in Table 4. Body Mass Index (BMI) is the thorough indicator to determine the savings in the form of body fat (body fat) in a population (Forbes, 1988; Berkey et al., 2002). Based on the results of these measurements are known quantities nutritional problems that occur. Adolescent nutritional status assessment is based on the IMT/U based on percentile values BB and TB as recommended by WHO. A teenager relatively thin when BMI/U < percentile 5th, quite normal if the BMI/U between the 5th percentile to the 85th percentile, and classified as overweight or obese are at risk if the BMI/U > 85th percentile.

**Table. 4 Adult Nutritional Status Criteria Based on IMT Value**

Nutrition	IMT Value
Skinny	<17.0
Thin	17.0-18.4
Normal	18.5-25.0
Fat	25.1 -27.0
Very Fat	>27.0

### 3. Methodology

This study aims to provide empirical evidence about the development of the development of food security in the province of North Sumatra. Based on the background of the problem, research objectives that have been formulated, the proposed hypothesis of the study as follows Program Food Security which does affect the development of the region villages around the plantation views of socio-economic indicators surrounding communities. Indicator - indicator of Food Security, such as: Food Production (Y1), Y11 (Agricultural production), Y12 (Productivity levels), Y13 (Production distribution), Wetland (Y2), Y21 (Land area), Y22 (Rent of agricultural Land), Y23 (Expanding of agricultural land), Y24 (Land distribution), Population (Y3), Y31 ( Total population), Y32 (Distribution of Population), Y33 (Growth rate). The research will be conducted in several villages/villages in North Sumatra province. This research will conducted in May 2017 until the completion of the drafting of the study in September 2017. In social science research study design is generally divided into three (3) forms an exploratory study, descriptive and research explanations ((Umar, 1999): 36). Exploratory research is a type of research that seeks ideas or new relationships. While the descriptive research is research aimed at outlining the properties (Bazeley, 2002) or characteristics of a particular phenomenon. Lastly, explanatory research is research that aims to analyse the relationships between one variable with another variables or how a variable affects other

variable. This research is more accurately described as the study of a mixture (mixed research) is research that combines qualitative and quantitative methods simultaneously (Bazeley, 2002). Quantitative methods are used to assess food security. While qualitative methods are used to obtain creative programs, according to the interests and needs of local stakeholder.

**Table. 5 Definition, Measurement Indicators, and Variables**

Variable	Notation	Indicator	Measurement scale
Food Production (Y <sub>1</sub> )	Y <sub>11</sub>	Agricultural production	Interval
	Y <sub>12</sub>	Productivity Levels	Interval
	Y <sub>13</sub>	Production distribution	Interval
Rice Field (Y <sub>2</sub> )	Y <sub>21</sub>	Land area	Interval
	Y <sub>22</sub>	Rent Agricultural Land	Ratio
	Y <sub>23</sub>	Extensification	Ratio
Population (Y <sub>3</sub> )	Y <sub>31</sub>	Land Distribution	
	Y <sub>32</sub>	Total population	Ratio
	Y <sub>33</sub>	Population Distribution	Ratio
Aspect of Food Security (Z)	Z	Growth rate	Ratio
		Food security	

Determination of survey respondents use the sample retrieval method by purposive sampling as much as 6 respondents who meet certain criteria, namely an experienced has the capacity and mastery of issues related to agriculture and social understanding. The data obtained will be processed in accordance with the needs for analysis. For the sake of discussion, the data is processed and presented based on the principles of descriptive statistics, whereas for analysis and hypothesis testing inferential statistics were used. A test or instrument can be said to have a high validity if the device running the measuring function or provide measurement results in accordance with the measurement objectives. A valid measurement tool not only able to disclose the data properly and provide a careful description of the data. Meticulously measurement means that can give a description of the smallest differences between subjects with each other. Is a valid measuring tool that has a small error variance so that the resulting figure can be trusted as a figure closer to the truth. This test was conducted to determine the internal consistency of the indicators of a construct that indicates the degree to which each indicator that identifies a construct or a common latent factor. Or in other words how specific matters of mutual help explain a common phenomenon. The approach used is a great judge construct composite reliability and variance extracted from each construct. With the following formula:

$$Construct-reliability = \frac{\sum Std\ Loading^2}{\sum Std\ Loading - \sum \epsilon_j}$$

Where; Standard Loading obtained directly from the standardized loading for the indicator (calculation AMOS) and  $\epsilon_j$  is the measurement error of each indicator (Ferdinand, 2002).

**4. Result and Discussion**

Distribution of members of poor households the district/city and North Sumatra province in 2016 according to their nutritional status. In this case the nutritional status was listed on 4 that is a bad combination of malnutrition in children, and bony in adults), thin (combined nutritional status of underweight in children, skinny adolescent, and thin in adults), normal (a combination of normal nutritional status in children, normal in teenagers, and normal in adults), and more (a combination of nutritional status in children, adolescents obese, obese and obese adults). Survey results indicate malnutrition has not been a problem in poor households in North Sumatra 2016 prevalence is 4.3%, smaller and cut off point of malnutrition as well as throughout the district/city, except Nias and Serdang Bedagai. Malnutrition is poor is not a problem in district/ other cities, because of the prevalence of poor nutrition of less than <5%.

**Table. 6 Distribution of Household Member According Poor Nutritional Status**

No.	Regency / City	Members Distribution RTM based on the nutritional status (%)			
		Bad	Less	Normal	More
1	ASAHAN	0.0	0.0	100.0	0.0
2	DAIRI	0.0	3.7	96.3	0.0
3	DELI SERDANG	0.0	7.1	92.9	0.0
4	HUMBANG HASUNDUTAN	0.0	2.2	97.8	0.0
5	LANGKAT	1.1	3.4	95.5	0.0
6	NIAS	2.1	3.2	94.7	0.0
7	NIAS BARAT	0.0	1.9	98.1	0.0
8	NIAS UTARA	1.4	0.0	98.6	0.0
9	PAKPAK BHARAT	0.0	7.7	92.3	0.0
10	SERDANG BEDAGAI	2.5	0.0	95.0	2.5
11	SIMALUNGUN	0.0	0.0	100.0	0.0
12	TANJUNG BALAI	0.0	0.0	100.0	0.0
13	LABUHAN BATU	100.0	0.0	0.0	0.0
14	LABUHAN BATU SELATAN	100.0	0.0	0.0	0.0
15	PADANG SIDEMPUAN	100.0	0.0	0.0	0.0
16	TEBING TINGGI	100.0	0.0	0.0	0.0
17	TAPANULI TENGAH	93.3	6.7	0.0	0.0
18	LABUHANBATU UTARA	100.0	0.0	0.0	0.0
19	BINJAI	100.0	0.0	0.0	0.0
20	KARO	100.0	0.0	0.0	0.0
21	PADANGLAWAS UTARA	100.0	0.0	0.0	0.0
22	TAPANULI UTARA	100.0	0.0	0.0	0.0
23	TOBA SAMOSIR	0.0	0.0	100.0	0.0
24	SUMATERA UTARA	14.9	2.2	82.8	0.1

**Table. 7 Test of Validity & Reliability**

Variable	Notation	Indicator	R-Count	Critical Number	Reliability Value	Information
Food Production (Y <sub>1</sub> )	Y <sub>11</sub>	Agricultural Production	0,784	0,374	RELIABEL	VALID
	Y <sub>12</sub>	Productivity Level	0,719	0,374	RELIABEL	VALID
	Y <sub>13</sub>	Production Distribution	0,766	0,374	RELIABEL	VALID
Paddy Fields (Y <sub>2</sub> )	Y <sub>21</sub>	Land area	0,552	0,374	RELIABEL	VALID
	Y <sub>22</sub>	Farm Rental Land	0,649	0,374	RELIABEL	VALID
	Y <sub>23</sub>	Extensification	0,713	0,374	RELIABEL	VALID
	Y <sub>24</sub>	Land Distribution	0,746	0,374	RELIABEL	VALID
Population (Y <sub>3</sub> )	Y <sub>31</sub>	Population	0,829	0,374	RELIABEL	VALID
	Y <sub>32</sub>	Population Distribution	0,700	0,374	RELIABEL	VALID
	Y <sub>33</sub>	Growth rate	0,790	0,374	RELIABEL	VALID

Identification of the model based on the degree of freedom (degree of freedom) obtained models with  $df = 54$  which shows a model of over-identified, the results of this estimation allow the model to be rejected, a model with this condition is the desired model in an analysis. From Figure 4.1, can be explained great influence (direct effects) of a latent variable exogenous to endogenous latent variables. While on variables Food Security (Z) is formed by two aspects, which contributes Aspects of Food Security (Z) of 0,548 per unit time, while the variable of Food Production (Y1) accounted for 0.799 to Food Security (Z) and variable Wetland (Y2) contributed 1.02 and Population (Y3) of 0.9 to Food Security (Z).

The food security situation in our country is still weak. This is indicated inter alia by: (a) the number of food-insecure population (consumption rate <90% of recommendation 2.000 kcal / cap / day) and very insecure (consumption rate <70% of the recommendation) is still quite large, respectively 36.85 million and 15.48 million for 2002; (B) children of malnourished children is still quite large, which is 5.02 million and 5.12 million for 2002 and 2003 (khomsan, 2003).

By looking at the results of the analysis that the trend of food security in the aspect of food production, during production value constantly has decreased in general, so that the fulfillment of food production is only 80% and leaving a shortage on average by 20% per year to be met by imports from other countries. It is seen from the parameter that is evident from the production side of agriculture alone still does not meet national food needs, plus a productivity rate of 72% is expected to be 100% even with the concept of vertical farming is expected to reach the optimum of 100%, then the aspect of wetland which has a significant reduction value, depreciation of the national rice area harvested area in 2010 shrinking area of 12.63 thousand hectares or 0.1% of total land area. Overall, agricultural land in Indonesia was reduced to 27 thousand hectares per year. Food self-sufficiency cannot be achieved without the role of government and community. Farmers who are spearheading the provision of food locally should receive special attention and support by the government of Indonesia.

The welfare is determined by various factors and limitations, of which the main ones are:

- a. The majority of poor farmers because it does not have a productive factors except labor, they are poor because they are poor., in this case, the limited human resources that exist due to low quality

of education owned by farmers in general. It is a particularly complex issue. On the other hand, structural poverty makes farmers' access to education was minimal.

- b. Small farmers are under pressure to convert their land to non-food production area. In general, farmers in Indonesia averaged only have less than 1/3 hectare of land. From point of view the production cannot be used to meet everyday life.
- c. Limited access to finance services, as availability of capital needs to get more attention by the government, the most fundamental problems faced by farmers is the lack of capital both for provision of fertilizer or seed.
- d. The absence or limited access to information and better technology. Farmers in Indonesia mostly still cultivate the land in the traditional way only a small percentage of farmers are already using advanced technology. A course of the production is very low and cannot be maximized.
- e. Production infrastructure (water, electricity, roads, telecommunications) are not adequate. So that access to such facilities and infrastructure are very limited.
- f. The market structure would be unfair and exploitative due to low bargaining position of farmers is very weak.

During “no individual measure suffices to capture all aspects of food insecurity” and it was proposed that a “suite of indicators was needed to cover the different dimensions of food security: availability, access, utilization and stability of access. Food availability is the first of the three subsystems in the food security system and the base of efforts to achieve food independence and sovereignty. The main capital in realizing food availability is the wealth of diverse resources, the availability of technology, and the development of strategic partnerships with various component stakeholders. The importance of food security in the global and national economic order has been understood by various groups, both heads of state and government, heads of international organizations, managers of the private sector, and social institutions, with different reasons and interests. One thing that becomes a shared awareness is the fulfillment of food for each individual is a human right and its fulfillment becomes a joint obligation, including the individual himself.

## **5. Conclusion**

Food security is closely related to national food security issues, economic stability, especially in food production, agricultural system, and level of population. Make new mainstream urban farmers who will hold a strategic role in food security strategy. Strengthening food security system will make food availability at household level by developing local commodities production, increasing agricultural productivity through accelerated use of technology in accordance with the capacity of local people, coaching and intensive assistance and sustainable community development programs, strengthen networking and commitment of all stakeholders as the efforts to improve the welfare of poor community through increased household food security status. In light of this, policies and innovations oriented to increase the availability of food (such as the Green Revolution) certainly contributed to the improvement of the food security situation in developing countries, but a concomitant action is needed to ensure access to food is also guaranteed, being this the component that mostly affects countries' performances.

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