

# HOW FOOD CONSUMPTION PATTERN AND DIETARY DIVERSITY DESCRIBE FOOD SECURITY: EVIDENCE FROM YOGYAKARTA AND EAST NUSA TENGGARA

## *BAGAIMANA POLA KONSUMSI DAN KEANEKARAGAMAN PANGAN MEMPENGARUHI KETAHANAN PANGAN: STUDI KASUS YOGYAKARTA DAN NUSA TENGGARA TIMUR*

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### **Abstract**

According to Food Security Agency, food consumption pattern should meet nutrition standards and follow desirable dietary pattern (Pola Pangan Harapan/PPH). PPH is an indicator for nutritional dietary intake. This study aims to analyse food consumption pattern and dietary diversity in Yogyakarta and East Nusa Tenggara; and how they influence food security. The household data survey (Susenas) 2014 showed that PPH scores for Yogyakarta is higher than East Nusa Tenggara. From these scores, Yogyakarta has better food consumption pattern and led to diverse food intake. In Yogyakarta, people have been diversifying their consumption in accordance with the concept of PPH. This means that people have realised to meet their nutrition by consuming nutritious food and help them not only to achieve food security but also nutrition security. Moreover, people have used local-based food to be consumed so that they do not depend on their current food. Meanwhile, in East Nusa Tenggara, people tend to meet their needs regardless their food has good nutrition or not. In addition, dietary diversity or PPH is influenced by some factors, such as education, family size, age of the household head, and expenditure. These results confirm that diverse consumption pattern showed high food security and those factors should be concerned to improve the quality of food consumption.

**Keywords:** dietary diversity, food consumption pattern, food security

**JEL Classification:** Q18, E21

### **Abstrak**

*Pangan adalah kebutuhan yang esensial dan perannya penting bagi kehidupan manusia. Pangan juga memiliki kontribusi positif terhadap pengembangan sumber daya manusia. Merujuk pada Badan Ketahanan Pangan, pola konsumsi pangan seharusnya memenuhi standar gizi dan mengikuti pola pangan yang diharapkan (Pola Pangan Harapan/PPH). PPH mengindikasikan sebuah gambaran pangan yang dikonsumsi oleh setiap orang apakah mengandung gizi yang baik atau tidak. Studi ini bertujuan untuk menganalisis pola konsumsi pangan dan keragaman pangan di Yogyakarta dan Nusa Tenggara Timur; dan bagaimana keduanya mempengaruhi ketahanan pangan. Survei Sosial Ekonomi Nasional (Susenas) 2014 menunjukkan bahwa skor PPH untuk Yogyakarta lebih tinggi dibandingkan dengan Nusa Tenggara Timur. Dari skor ini, Yogyakarta memiliki pola konsumsi pangan yang lebih baik dan mengarah pada konsumsi pangan yang terdiversifikasi; sebaliknya, konsumsi pangan di Nusa Tenggara Timur yang belum mengarah pada pola yang sehat. Di Yogyakarta, masyarakatnya telah mendiversifikasi konsumsi pangannya sesuai dengan konsep PPH. Ini artinya bahwa mereka telah menyadari untuk memenuhi kebutuhan gizinya dengan mengkonsumsi pangan yang bergizi dan membantu mereka tidak hanya mencapai ketahanan pangan tetapi juga ketahanan gizi. Selain itu, masyarakat Yogyakarta telah memanfaatkan pangan lokal untuk dikonsumsi sehingga tidak bergantung pada pangan yang dikonsumsi saat ini. Sementara itu, masyarakatnya cenderung mengkonsumsi pangan tanpa memperhatikan pangan tersebut memiliki gizi yang baik atau tidak. Keragaman pangan atau PPH dipengaruhi oleh beberapa faktor, seperti pendidikan, ukuran keluarga, usia kepala rumah tangga, dan pengeluaran. Hasil ini mengkonfirmasi bahwa pola pangan yang beragam menunjukkan ketahanan pangan yang tinggi dan faktor-faktor tersebut sebaiknya diperhatikan untuk meningkatkan kualitas konsumsi pangan masyarakat.*

**Kata kunci:** keragaman konsumsi pangan, pola konsumsi pangan, ketahanan pangan

**Klasifikasi JEL:** Q18, E21

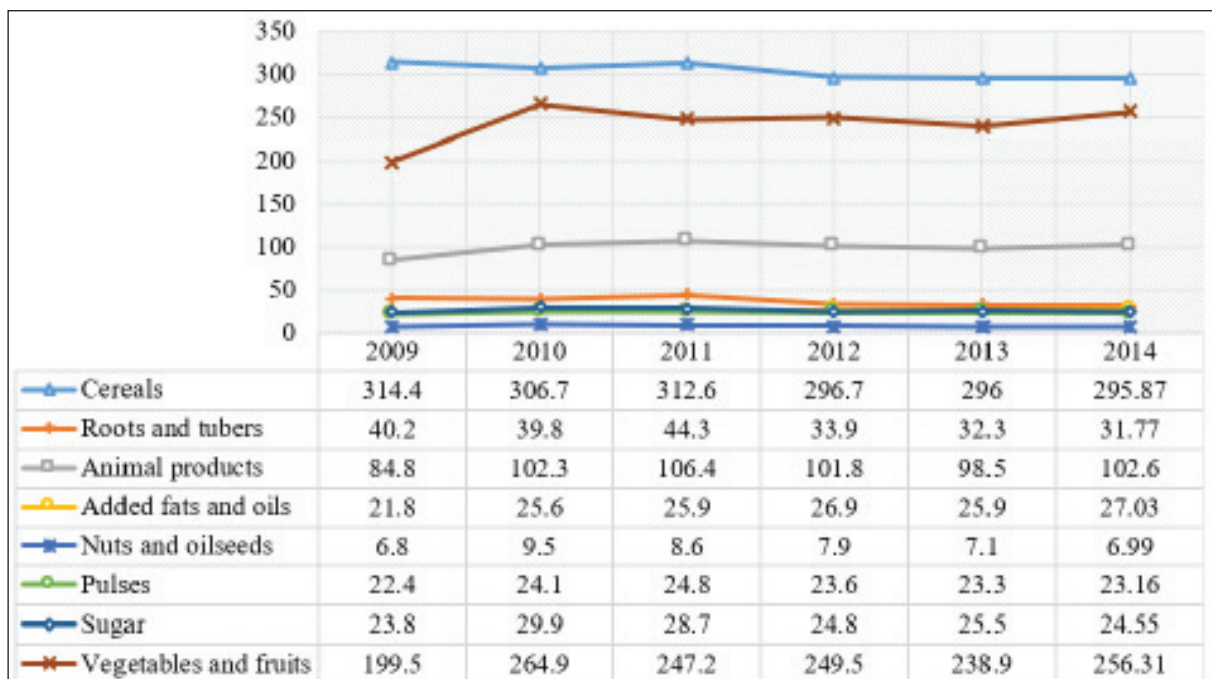
## INTRODUCTION

Food is an essential of human needs that plays an important role for life. It also helps to move actively, develop new cells and build endurance, as well as prevent the body from illness or infection. Moreover, food may have a positive contribution to human resources development and as a result, food needs that accord with nutrition standards should be concerned at both individual and national levels.

According to Parappurathu et al., (2015), nutritious food consumption habit has a positive impact on the quality of life. A good food consumption pattern cannot be separated from diverse food consumed containing both macronutrients (carbohydrates, protein, and fats) and micronutrients (vitamins, minerals, and water). This consumption pattern has been in line with the concept of desirable dietary pattern (DDI—in Indonesia, called as Pola Pangan Harapan/ PPH). PPH indicates an overview

of food that is consumed by people whether containing good nutrients or not. Basically, PPH is the concept of dietary diversity that consists of nutrients tailored to what the body needs.

Indonesian Food Security Agency (Badan Ketahanan Pangan/ BKP) states that PPH can measure the quality of food consumption. The household data survey (Susenas) in 2014 reported that there was an improvement in the quality of consumption demonstrated by increased PPH scores from 81.4 to 83.4 (BKP, 2015). This score was obtained from calories intake according to nutrient requirement that has been agreed in National Workshop on Food and Nutrition VIII (WNPG VIII) 2004 (2,000 kcal/cap/day). This improvement showed that food consumed has been diversified. However, there are some food groups that have not met the amount required. For instance, the consumption of cereals exceeded while roots and tubers have not reached the standard (Fig. 1).



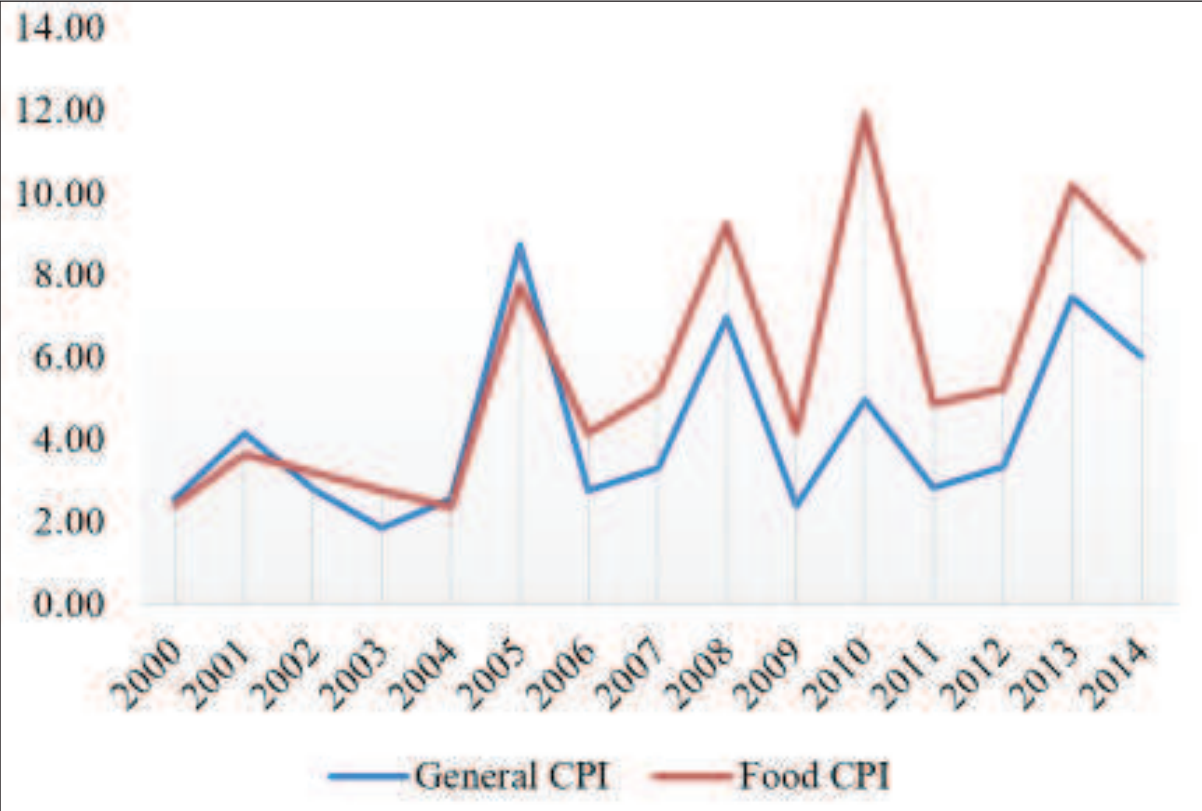
Note: Ideal standard for each food group (per day): (a) cereals: 275 gr; (b) roots and tubers: 100 gr; (c) animal products: 150 gr; (d) added fats and oils: 20 gr; (e) nuts and oilseeds: 10 gr; (f) pulses: 35 gr; (g) sugar: 30 gr (h) vegetables and fruits: 250 gr.

Source: Indonesian Food Security Agency (2015)

**Figure 1.** Development of Food Consumption from 2009-2014 (gram/cap/day)

Diversified food consumption is essential as it affects body positively and build food security. This means that food consumed should not depend on particular food. However, Indonesian people have high dependency on rice. Therefore, dietary diversity becomes an effective way to lessen rice consumption (Poerwanto et al., 2012). According to Suryana (2014), building sustainable food security can be implemented through policies that focus on improving the quality of consumption. This is because high dependency on rice will discourage people from diversifying their diet. This is in line with Parappurathu et al., (2015) that confirm dietary diversity correlates positively to food security pillars.

Discussing about dietary diversity cannot be separated from the society’s condition and it is influenced by some factors, such as social, economic, demographic, and physical environment. These factors may affect food consumption pattern in the society. In addition, by understanding dietary diversity pattern, it becomes easier to measure the evaluation of food security at micro level (Thorne-Lyman et al., 2010; Taruvinga, Munchenje, and Mushunje, 2013; Headey dan Ecker, 2013; Parappurathu et al., 2015). This means that people who consume diversified food will have higher food security as food security does not only consist of availability aspect, but also usability aspect which is reflected by nutrition security.



Source: FAO (2014)  
**Figure 2.** CPI Volatility (2010=100)

Building food and nutrition security is not easy because people who have limited access to food are vulnerable, particularly poor people. Access to food has a strong association with its prices. According to FAO (2014), Indonesia has been experiencing food volatility since 2004

(see Fig. 2); and it was caused by domestic and international factors. In 2010, extreme weather and distribution problems that occurred had serious effect on food prices. In addition, Salim (2010) reveals that international condition, such global food crisis has a significant impact on

domestic food prices. This is in line with FAO (2014) that reported global food crises happened in 2006-2008 led to a substantial increase in Indonesia's domestic price. Timmer (2010) briefly stated that the transmission process from global price to domestic price depends on how far trading volume (both export and import) performed by the country. Furthermore, if the country has a high degree of dependency to one commodity, the food price in domestic market will correlate with the global price.

Furthermore, volatile food prices will contribute to reduce purchasing power and exceed the average rate of inflation so that low income consumers spend a higher percentage of expenditure on food; therefore any increase in prices can create a reduction in affordability as well as diminished food security (O'Connor, Farag, and Baines, 2016). In microeconomics view, an increase in food prices has two effects on consumer demand, namely the income effect and the substitution effect (Dorward, 2011). Therefore, food price is important for people when they decide to what food will be consumed. People consider what they have to purchase and it influences their decision regarding to food choices. As a result, they will limit their spending to food and may not diversify their consumption.

As the problem stated above, this study examines two provinces, Yogyakarta and East Nusa Tenggara (NTT). These two provinces were chosen because they have unique characteristics. Yogyakarta have good dietary diversity compared with other provinces and has led to nutritious food consumption. In Yogyakarta, there are some local foods that have been utilized by people. In contrast, NTT that has dry land and limited food stock and its PPH score was the lowest in Indonesia. People in East Nusa Tenggara tend to consume lower nutrients as their consumption relies on energy-based food. Although, they consume vegetables and animal products, the amount of those foods is relatively low.

The overview of food consumption both in Yogyakarta and NTT is interesting to be analysed profoundly, particularly factors that influence food consumption pattern. This study aims to identify factors that affect food consumption pattern and dietary diversity by considering some aspects,

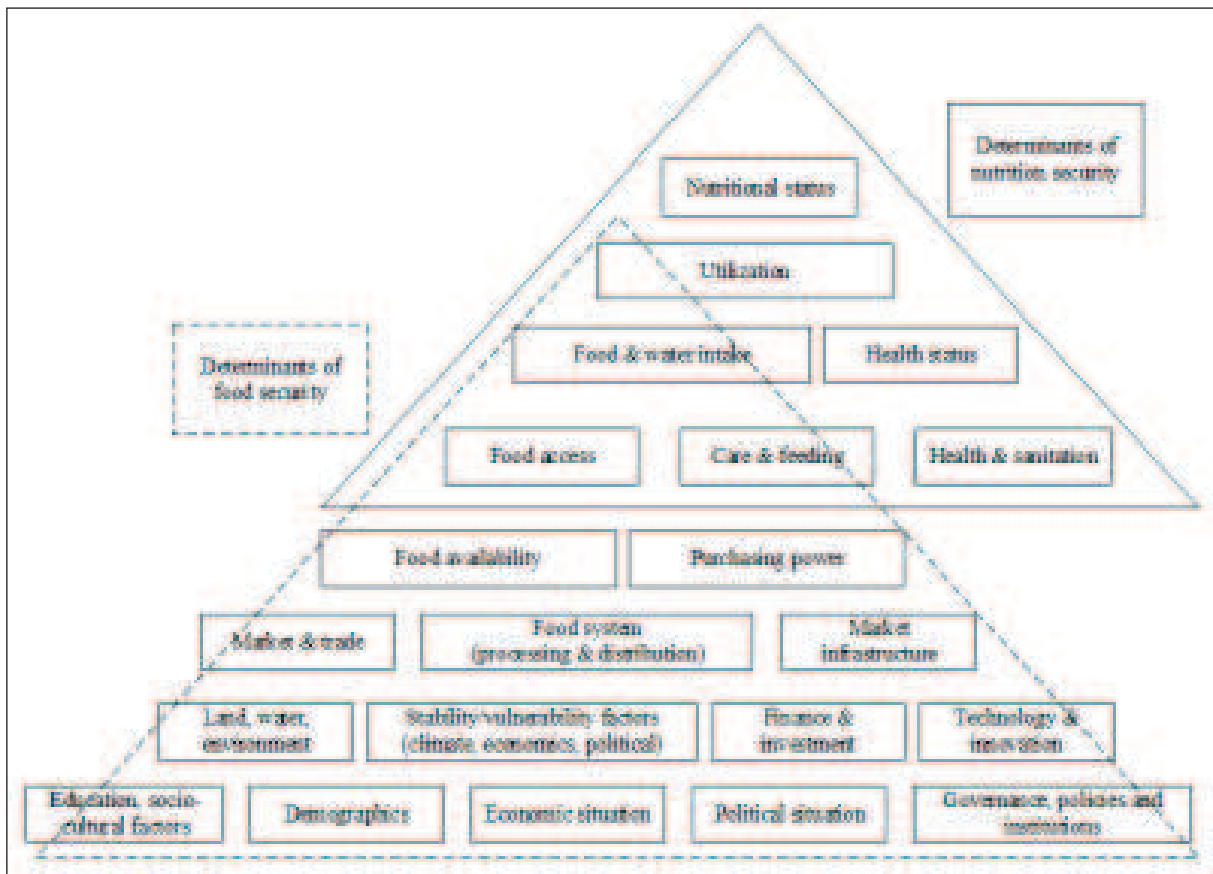
such as social, economic, and demographic. This examination also correlates with the evaluation of food security. The result of this study is expected to be policy recommendations regarding with the improvement of food consumption and building food security.

## LITERATURE REVIEW

The conceptual framework of food security does not only focus on availability and accessibility to food, but also how people utilize food to meet their nutrition needs. Thus, food security is accord with nutrition security. According to Maxwell (2001) and Niehof (2010), food security is "*access to enough food by all people at all times for an active and healthy life*". Therefore, building food security should harmonize with food nutrition as well.

Figure 3 demonstrates food security covering nutrition security as it emphasizes both demand and supply side. *Centre for Alleviation of Poverty through Sustainable Agriculture (CAPSA, 2015)* defines food and nutrition security as follows: "*Food and nutrition security exists when all people at all times have physical, social and economic access to food, which is safe and consumed in sufficient quantity and quality to meet their dietary needs and food preferences, and is supported by an environment of adequate sanitation, health services and care, allowing for a healthy and active life.*" This definition shows that food security is basically attached to the nutritional aspects.

The overview of food consumption may represent food condition in the society, specifically how people meet their nutrition. Food consumption pattern that meets nutrition needs and diversified is known as desirable dietary pattern. Diverse food can be the proxy to measure the quality of consumption and describe accessibility to food in the context of food security (Drimie et al., 2013). In line with Drimie et al. (2013), dietary diversity is the predictor to analyse economic status and malnutrition, as well as food shock sensitivity; and it is relatively measurable (Headey and Ecker, 2013). Therefore, the measurement of dietary diversity can be an instrument to measure food and nutrition security (Thorne-Lyman et al., 2010).



Source: FAO, in CAPSA (2015)

**Figure 3.** Determinants of Food and Nutrition Security

Diversified food consumption pattern is determined by some factors (Fig. 3). At the base of pyramid, there are a number of factors that determine food and nutrition security. However, according to several studies, general factors that affect food consumption are culture, social, demographic, and economic (Kuhnlein, 1989; Niehof, 2010; Parappurathu et al., 2015). These factors may have a significant impact to influence people's decision in food consumption. For example, people who are wealthier may consume nutritious food compared with people with low income who cannot access various foods to improve their consumption and are vulnerable to secure their food needs.

## RESEARCH METHODS

This study used a quantitative approach to examine food consumption pattern and dietary diversity. In this study, Yogyakarta and NTT

were chosen as the sample households. Data was obtained from Susenas 2014 and by interviewing and conducting focus group discussion with some informants. The variable of food consumption pattern and dietary diversity used is PPH concept with 2,000 kcal/cap/day that covers food groups such as cereals, roots and tubers, animal products, added fats and oils, nuts and oilseeds, pulses, sugar, as well as vegetables and fruits. They included foods prepared and consumed within the household but those were consumed outside did not. To measure dietary diversity, this study used PPH formula:

The PPH formula,  $P_i$  is the PPH score of  $i^{th}$  food item in daily consumption of all food by the members of the household. The daily estimates ranges between 0 (low diversity) and 100 (high diversity). Furthermore, a multiple liner regression was used to under-

**Table 1.** PPH Formula

No.	Food Group	Energy (kcal)	Weighted	PPH Score
1.	Cereals	1,000	0.5	25.0
2.	Roots and tubers	120	0.5	2.5
3.	Animal products	240	2.0	24.0
4.	Added fats and oils	200	0.5	5.0
5.	Nuts and oilseeds	60	0.5	1.0
6.	Pulses	100	2.0	10.0
7.	Sugar	100	0.5	2.5
8.	Vegetables and fruits	120	5.0	30.0
9.	Others	60	0	0
Total		2,000	-	100

Source: Indonesian Food Security Agency (2015)

$$PPH = \sum_{i=1}^n P_i \quad (1)$$

stand determinants that influence the variation level of food consumption, as shown below:

The second equation, follows Parappurathu et al. (2015),  $PPH_i$  is the dependent variable representing dietary diversity score of the households. This variable is used to obtain how a household diversifies its food consumption and it becomes an instrument

$$PPH_i = \alpha + \beta S_i + \gamma E_i + \varepsilon_i \quad (2)$$

to measure food and nutrition security.  $S_i$  is a vector containing variables on social and demographic characteristic, such as age, sex, education of housewife, and household size.  $E_i$  is a vector that represents economic status and access of the household and includes variables, such as family expenditure and source of income.  $\varepsilon_i$  denotes the error term and is assumed to be normally distributed.

## RESULTS

Table 3 demonstrates the statistic descriptive of household condition in Yogyakarta and NTT. Households in NTT consumed more calories than Yogyakarta. Consuming more calories does not reflect having good PPH score as people usually

**Table 2.** Variables Operationalization

Variables	Indicator	Measurement
Dietary diversity	Desirable dietary pattern/ PPH	PHH score in percentage
Social and demographic	Education of the household head	Secondary and above= 1; otherwise=0
	Gender of the household head	Male=1; female=0
	Household size	Log(household size)
	Age of the household head	Log(Age)
	Regional Dummy	Yogyakarta=1; NTT=0
Economic	Food expenditure	Log(Food expenditure)

consume more food without considering their nutrition needs. Furthermore, their consumption relates with their spending and it also represents their economic status. As shown on the Table 2, the total expenditure of household in Yogyakarta is higher than in NTT. On average, people in Yogyakarta spend their money to buy food reaching 69 percent while NTT reached 75 percent. Moreover, the level of education affects food consumption pattern as people who have higher level of education tend to consume diversified food and they also care about their dietary intake. In Yogyakarta, people are more educated rather than NTT.

Dietary diversity can be a proxy for nutritional adequacy measurement (Jones et al., 2014) and it can measure food and nutrition security (Thome-Lyman et al., 2010). In Indonesia, dietary diversity is measured by calculating calorie intake using PPH formula. PPH becomes a common instrument used by the government to identify and asses the food consumption quality as it shows diverse food that meets nutritious requirement. Figure 5 shows mean of PPH score that is classified by expenditure. The figure has shown that people who have more money tend to

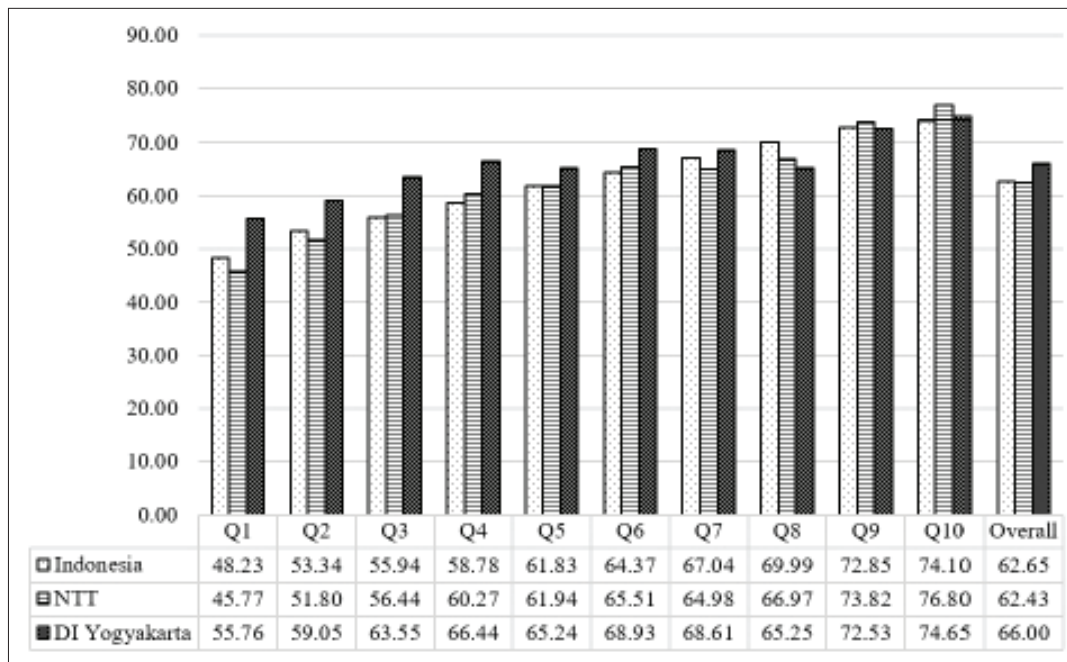
diversify their food consumption. Furthermore, there are some interesting facts that emerge from the figure, particularly NTT. According to BKP (2015), NTT has the lowest PPH score in Indonesia. From the estimation, the average PPH score of NTT is only 62.43 while Yogyakarta is 66.00. There is a significant gap between poor and rich people in NTT. People who are at the Q1 have 45.77 and at Q10 have 76.8. NTT is at the third position as the poorest province in 2014. The poverty line of NTT is 19.6 percent. In addition, people in NTT spend more money to food with 54.8 percent. This indicates that poor people tend to allocate their expenditure to food consumption and firmly confirms to Engel curve. NTT has been known as the driest province in Indonesia and classified as a chronically food insecure (World Food Programme, 2015).

As the explanation above, dietary diversity can be influenced by some factors. Socio-economic and demographic variables, such as age, gender and education of the household head, household size, and expenditure are the predictors to examine dietary diversity. These variables in the analysis were guided by previous empirical

**Table 3.** Statistic Descriptive of Households

Variable	DI Yogyakarta	East Nusa Tenggara (NTT)
Calorie Intake	1,535.03	1,741.43
Education of the household head		
- Secondary and above	304	1,493
- Otherwise	469	844
Gender of the household head	824	2,337
- Male	141	345
- Female	683	1,992
Household Size	3.404126	4.532642
Age of the household head	52.42233	48.52343
Food expenditure	335,176.5	286,414.4
Total expenditure	482,722.4	377,213.7

Source: Susenas (2014)



Source: Susenas (2014)

**Figure 5.** The PPH Score in 2014 by Expenditure

literature, such as Kuhnlein (1989), Niehof (2010), Thome-Lyman et al., (2010), Jones et al., (2014), and Parappurathu et al., (2015). To predict factors that influence dietary diversity, a multiple linear regression model was used. Table 4 shows that there are some variables that affect how people diversify their food consumption. The adjusted  $R^2$  is 0.313 that indicates the independent variables can describe for the 31.2 percent of the dependent variable in the model. Moreover, the

F test is perfectly significant which means all independent variables affect the food diversity significantly.

From Table 4, demographic factors, such as education of the household head, household size, age of the household head, and regional dummy influence dietary diversity significantly. Education level influence positively to dietary diversity (Doan, 2014; Parappurathu et al., 2015). Education level is important to make people

**Table 4.** Food Consumption Pattern and Dietary Diversity in Yogyakarta and East Nusa Tenggara

	Coefficient	Std. Err.	T	Prob.
Education of the household head	1.099166**	0.542439	2.03	0.0430
Gender of the household head	0.031877	0.712772	0.04	0.9640
Log (Household Size)	-1.791661***	0.514692	-3.48	0.0010
Log (Age of the household head (years))	6.770649***	0.796034	8.51	0.0000
Log (Food Expenditure per Capita)	17.29449***	1.410928	12.26	0.0000
Dummy Regional	3.844225***	0.569128	6.75	0.0000
Cons_	-178.2714***	7.994205	-22.56	0.0000
Number of obs	3110.00			
F(6, 3103)	247.14			
Prob > F	0.00			
R-squared	0.32			
Adj R-squared	0.32			
Root MSE	12.8			



diversified their food intake. People who have higher education level have good knowledge and know more about nutrition aspects so that they tend to prepare and serve nutritious food for their family. This is in line with Doan (2014) that stated that better educated people are likely to be more knowledgeable and/or more concerned about health and nutritional balance and therefore on average, they tend to be well informed food consumption decisions. In addition, people with higher educational level usually have the higher income and they can access higher quality of food. However, households that have more family members will reduce dietary diversity. This means that the greater household size will spend more to buy food and if they do not have enough money, their consumption will be less diverse.

Furthermore, another factor that influences positively dietary diversity is age of the household head. This finding is similar with other studies like Taruvinga et al., (2013) and Sarkar (2014). Regional difference is matter in this context, it is discribed in the Regional dummy variable. Since this variable is positively significant, means that people who live in Yogyakarta have better access to foods rather than in NTT. For economic factors, expenditure per capita affects dietary diversity significantly. In general, food expenditure will depend on how much money people have. When people have more money, they are capable to buy diverse food. This shows that household's purchasing power is the important thing for the accessibility of food. This finding is line with Parappurathu et al., (2015) that found food expenditure had strong relationship with the level of dietary diversity. This means that the issue of poverty has relation with people's consumption. The poor people have limited access to food and they pay less attention to diversify their consumption as their focus is how they can meet their food need. Therefore, food expenditure can be a good predictor to analyse food diversification as people who have more money will allocate their spending to improve their quality of consumption.

## **DISCUSSION**

Dietary diversity is the reflection of food security and this measurement is useful to describe food consumption pattern at micro level. Food

consumption correlates with people's habit but other factors may affect as well, such as socio-economic and demographic aspects. These factors are believed as the contributor to foster food consumption. From the estimation result, socio-economic and demographic factors affect dietary diversity. Nevertheless, by viewing PPH score, people generally have not diversified their consumption that follows the amount required.

Food consumption pattern is a micro aspect but it can be analysed as an instrument to measure food and nutrition security. In addition, pillars of food security can be described by analysing food consumption pattern. Therefore, people who have diversified their consumption will not depend on certain kind of foods and their status is more secure. This is in line with De Cock et al., (2013) that state higher dietary diversity score indicates better food security status. Moreover, people will be more adaptive when there will be shocks that caused by price or disasters.

Furthermore, this study shows that people in Yogyakarta have performed food diversification. On the other side, in NTT, people have not diversified their consumption while they have some food alternatives that can be consumed, particularly staple food; however, people have not utilized well. For instance, people tend to consume single staple food and they focus on rice; while their staple food which is corn, currently shows a downward trend (BKP, 2015). In contrast, Yogyakarta, especially Gunung Kidul Regency, has developed food alternatives to be consumed and they also have been commercialized. In Yogyakarta, some staple food alternatives have been converted to flour form so that they become easier to be consumed by people.

Dietary diversity that is reflected by PPH score mainly helps to conduct the assessment of the quality of food consumption. This means that dietary diversity plays the key role for people to meet their nutrition by enriching diverse food intake. In here, people's mind set should be developed. Since there is an increasing price of one commodity, people may have other commodities to be consumed. However, according to BKP (2015), there were food consumption pattern changes in Indonesia, particularly eastern Indonesia. For energy intake, NTT has some

commodities in the past, but nowadays, NTT has fewer. Moreover, for protein intake, people in NTT consumed foods that were from seven commodities in 2009, but in 2014, they are estimated only four commodities. Therefore, these food consumption pattern changes should be concerned to achieve food and nutrition security in the future.

In addition, food consumption pattern may have impact at macro level. When people have diversified their food consumption and less depend on certain kind of food, availability aspect will be influenced. The government do not need to supply certain food more because people have been adaptive to consume diverse food. However, food diversification should be performed by people and must be one of priority agendas for the government. It has been already known that food diversification is such an unpopular policy. For instance, PAJALE (rice, corn, and soybean) program, the government seems to focus on how to produce and increase supply while consumption aspect is less concerned. It has been realized that for many years, rice, for example, has played a significant role as a staple food and a source of livelihood for Indonesian people. Besides, rice is also a strategic agricultural commodity that occupies an important position in the Indonesian economy. This mean that PAJALE Program would be the best policy adopted by the government to ensure availability and support its economy, but the government is likely to pay less attention on how to improve the quality of consumption and reduce rice consumption as Indonesia is one of the largest rice consumers in the world, with consuming 114 kilograms per capita per year.

Consumption in economic aspect is a tool to measure people's well-being. Improving people's consumption will create people to be wealthier and in the long-term, the improvement of human resources can be achieved. The issue of food diversification is not only about how to make people feel secure in fulfilling their food needs, but also the government can rely on their domestic production as Indonesia has a wealth of agricultural resources. This means that the government will have an opportunity to become self-sufficient and reduce food imports, particularly rice.

## CONCLUSION

As the fundamental aspect of human needs, the issue of food security becomes important both at micro and macro levels due to food are the central part that covers how to develop high quality of human resources. The need of food should be in line with the need of nutritious food. This means that the concept of food consumption pattern that accord with nutrition requirement should be done as it is reflected by PPH score.

According to this study by taking samples from Yogyakarta and NTT, their each PPH score are still far from expectation although DI Yogyakarta's PPH score is better than NTT's. PPH score that is the reflection of dietary diversity shows how far people diversify their consumption to meet their nutritious food. Moreover, dietary diversity may be influenced by various factors, such as socio-economic and demographic. From these factors that play important roles and affect dietary diversity are education, family size, age of the household head, as well as food expenditure.

Furthermore, the factors that influence dietary diversity can be consideration as an intervention to improve the quality of food consumption. It will contribute positively not only to develop human resources, but also to build food and nutrition security. Therefore, even though food diversification program that is the treatment for demand side in the context of food security broadly, it has not received serious attention and tends to be an unpopular policy compared to increasing the production of food to remain availability aspect or focus on supply side while food diversification plays an important role to achieve food and nutrition security in the future.

This study would be an initial step to support the government in making food policy, but it still needs to be explored more comprehensively regarding the food security pillars in order to analyse how dietary diversity can be a good instrument to asses food and nutrition security. In this study, there are some limitations, particularly related with the amount of calories intake as it is difficult to make conversion. The future study may include the category of prepared food because the amount of calories consumed by people is significant.

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