MACRO DIMENSIONS OF FOOD SECURITY IN THE PHILIPPINES

Jenny Beb Ebo[1, a]
[1]*Graduate Student, The Graduate School, University of Santo Tomas*
[a]*jennybeb_ebo@cvsu.edu.ph*

ABSTRACT

Time series data of the selected commodities and crops based on the Food Staples Sufficiency Program (FSSP) covering 27 years from 1990 to 2016 were used in the study. In terms of the food availability, accessibility and utilization, there is a negative or a declining pattern showing threats on food security condition of the country. As a whole, however, the food security index measured using the principal component analysis, shows an upward trending pattern condition of food security. This result suggests that the Philippines is food secure taken collectively the interaction of the three dimensions. Empirical results validated the major role of experts in agriculture in sustaining the food security condition of the country.

Keywords: *availability, accessibility, utilization, OLS*

INTRODUCTION

Food security is the state "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preference for an active and healthy life (World Food Summit, 1996). The definition stressed the multi-dimensionality of food security that incorporates the interaction of among food systems, nutrition and health. The continuing evolution of food security as a concept facing the rapid industrialization issues and difficulty of technical and policy issues involved are just a few of the reasons why it must be the major concern of every government.

In 2017, the Philippines ranked six among the nine rated ASEAN countries in terms of Global Food Security Index (GFSI). Given that, the country is in good food condition compared to its neighbouring Asian countries in terms of affordability, availability and quality and safety criteria. This status is backed up by the country's rapid economic growth maintaining a gross domestic product (GDP) growth of 6.2% annually on average since 2010. Regardless of this economic recovery, hunger remained high and malnutrition continuous to persist. This hunger and malnutrition is associated with the situation of food security. Hence, the country missed the Millennium Development Goals (MDG) target of halving the childhood malnutrition by 2015.

Given the economic performance of the country, incongruity food system is weak. A food system is considered weak when one or more of the three aspects of food security such as food availability, accessibility, and utilization is unclear and insecure. According to Briones, et.al (2017), many Filipinos suffers from lack of food or poor diets despite of rising food availability because of inadequate access to food due to low income especially among the rural population that are generally engaged in agriculture. Higher food prices especially the staple food rice aggravate the situation.

The strength of one's food system therefore mainly depends on the interconnection among the macroeconomic dimensions of food security. Sufficient food supply does not ensure that a person can obtain and consume food; a person must have access to the food through his/her entitlements. However, raising income is no guarantee that a person will spend it to right food.

While extant literatures on food security was analysed on availability dimension (Gallero et.al, 2014, Gadhi et.al, 2014 and Ghattas et.al, 2013), the other macro dimensions based on accessibility and utilization are considerably missing in the literatures. This missing information on the three dimensions is beneficial on the analysis of the real picture of food security in the

Philippines. By examining these dimensions will be able to make policy proposals for more food secure Philippines.

THEORETICAL BACKGROUND

Food security has been said to be an open-ended concept as reflected in the many attempts at defining it in research and policy observance. As an idea, it originated only in the mid-1970s in the consultations concerning international food problems at a time of world food crisis. During that period, the initial focus of attention was primarily on food supply problems in which they tried to assure the availability as well as the price stability of foods in the international and national levels. This was followed by the international negotiation leading to the World Food Conference of 1974 which covered a new set of institutional arrangements, information, and resources for promoting food security. Issues of famine, hunger and food crisis were also examined and the result was a redefinition of food security which acknowledges the critical aspects of the behaviour of possible susceptible and affected people.

The initial focus which was reflecting on the global interests of 1974 was on the reliability of food supplies. Food security was defined in the 1974 World food Summit as "the availability at all times of adequate world food supplies of basic foodstuff to sustain a steady expansion of food consumption and to offset fluctuations in production and prices" (Unites Nations, 1975). In 1983, FAO extensively defined its concept that includes ensuring access by susceptible people to available supplies, implying that attention should be well adjusted between the demand and supply side of the food security equation: "ensuring that all people at all-time have both physical and economic access to the basic food that they need" (FAO, 1983). In 1986, the World Bank report "Poverty and Hunger" (World Bank, 1986) aimed on the temporal dynamics of food insecurity. It differentiated persistent food insecurity which was associated with problems of continuing structural poverty and low incomes, and temporary food insecurity which involved periods of heightened pressure triggered by natural disasters, economic collapse, or conflict. This idea was further enhanced in terms of "attainment of all people at all times to have enough food for an active healthy life".

By the mid-1990s food security was accepted as a range from the household to the international level. Nevertheless, access involves sufficient food, indicating prolonging concern with protein-energy malnutrition. But the statement was expanded to integrate food safety and nutritional balance, indicating concerns about food consumption and minimal nutrient requirements for an active healthy life. According to UNDP (1994), the Human Development Report promoted the construct of human security, including a number of component aspects. This notion is similar to the human rights view of development. It also aimed on a wider form of social security which has many distinct components including health and nutrition.

The 1996 World Food Summit adopted a more compound definition: " Food security, at the individual, household, national, regional and global levels is achieved when all people, at all times, have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (FAO, 1996). This definition is again reformulate in The State of food Insecurity 2001, that is "Food security is a situation that exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2002). This new significance on consumption, the demand side and the issue of access by helpless people to food, is most closely identified with the theory purported by Amartya Sen (1981). Sen emphasizes on the entitlements of individuals and households.

With continuous complexities on defining food security, the international community is calling for confined, straightforward objectives from which to organize international and national action. The 1996 World Food Summit illustrate this regulation of policy by making the primary objective of worldwide action on food security halving aggregate of wasted or undernourished people by 2015.Various studies around the world had been carried out to explain food security and its determinants. In terms of literature, different conceptual definitions of food security as well as its determinants at individual, household, and national level was identified. Therefore, food security can be examined at many levels such as national or country, household, and individual level.

Food is divergent from other commodities because there is no substitute for it. All human beings need sufficient food to survive. Food security also means assurance about future meals. Uncertainty of where the next meal will come from alters economic behaviour. In the micro level, providing for future meals takes priority over other expenditures, such as education, health, and shelter. Beyond household concerns, food price inflation can elicit the demand for wage increases, ignite a vicious inflationary cycle that could deter from private investment, and slow down economic activity. This will then reduce investment in human and physical capital and can weakens a country's long-run growth aspects.

METHOD

The three dimensions of food security in the Philippines: availability, accessibility and utilization had been taken into analysis. Each dimension is composed of indicators and is then translated into composite

index or indices. The index is captured by including the weighted average of many different components. This is done to come up with a coefficient that will best describe the effect of each condition and dimension. Firstly, food availability addresses the supply side of the food security and expects the sufficient quantities of quality food from domestic agriculture and production. Secondly, food accessibility refers to the access of by individuals to adequate resources for acquiring appropriate foods for a nutritious diet. This addresses whether the households or individuals have enough resources to acquire appropriate quantity of quality food, thus it encompasses their income, expenditure and buying capacity. Thirdly, food utilization is the ability of the human body to ingest and metabolize food through adequate diet, clean water, good sanitation and health care to reach a state of nutritional well-being where all physiological needs are met. In this dimension, it is essential to know if the food available in a given period of time had been accessed and well utilized.

The annual data from the year 1990 to 2016 for a period of 27 years are used in the study and sourced from published statistical reports from the Bureau of Agricultural Statistics, Department of Agriculture, and Philippine Food Security Information System under the Philippine Statistical Authority. The selection of the commodities and crops was based on the priority crops under the Food Staples Sufficiency Program (FSSP) of the Department of Agriculture (DA). Rice is the main staple food while corn, cassava, sweet potato and banana (saba) are substitutes. Pork, chicken, chicken egg, tilapia and milk fish are the common commodities purchased by wage earners. Moreover, the time series data on food available per capita and food production index focused on the following commodities: rice, corn, cassava, sweet potato, chicken meat and egg, pork, milkfish and tilapia. The stock and cropping intensity indices covered rice/ palay and corn. The import dependency ratios were examined for the focused commodities with imports such as rice, corn, cassava, pork, chicken and chicken eggs, milk fish and tilapia. Additionally, the food accessibility indicators such as the time series data on farmer's share in consumer peso were examined for rice, corn, sweet potato, banana (saba), pork, chicken, tilapia and milkfish. The CPI was analysed by commodity group except for rice and corn. Lastly, the determinants of food utilization that look at the nutritional status of individuals are the percentage of children under five years old who are stunted, underweight and wasted and infant and under five mortality rates. Adequacy of food is determined by the indicator on the ratio of food to total family expenditures. Nutrient intake of food is measured through Dietary nutrients (energy) consumed as proportion to RENI and dietary energy supply (DES) of cereals, roots and tubers.

Similarly, each dimension of food security is correlated with each other to determine the relationship using Ordinary Least Square Regression estimation. Since the variables in the study are ratio in nature and the type of data set has a time series component, time series model was the tool utilized in the estimation of the parameters. Since rice is considered as the staple food for Filipinos, it is used as the benchmark data in the analysis. The functional models were:

(1) $F_{availability} = f(Fac, Fpi, Csi, Cii, Idr)$
(2) $F_{accessibility} = f(Fsc, Cpi)$
(3) $F_{utilization} = f(Ps, Im, Sf, Desupply, DeRENI)$
(4) $Fsi = f(F_{availability} + F_{accessibility} + F_{utilization})$

Where the dependent and explanatory variables are given as:

Dependent variables:

- $F_{availability}$ = Food availability (composite index)
- $F_{accessibility}$ = Food accessibility (composite index)
- $F_{utilization}$ = Food utilization (composite index)
- Fsi = Food security index

Explanatory variables:

- Fac = Food availability per capita (volume of food commodity available in its original (unprocessed) form for consumption by each member of the population) ***Computational formula: FAC = Net Disposal Income / Population***

- Fpi = Food production index (measures the change in the production of food commodity in a given year in relation to base year) ***Computational formula : FPI = (Production in current year/ Production in the base year) x 100***

- Csi – Cereal stock index (determines the changes in the quantity of cereals inventory held by the households, commercial and NFA warehouses in a given year relative to a base year) ***Computational formula: CSI = (cereal stock in the current year/ cereal stock base year) x 100***

- Cii – Cropping intensity index (refers to the changes in the cropping intensity of crop in a given year compared to a base year) ***Computational formula: CII = (Cropping intensity in the current year/cropping intensity in the base year) x 100***

- Idr = Import dependency ratio (extent of dependency on importation in relation to domestic consumption. ***Computational formula: CII = (Cropping intensity in the current year/cropping intensity in the base year) x 100***

- Fsc = Farmer's share in consumer peso (the ratio of food farm price to food retail. It indicates how much of the price paid by the consumer goes

back to the farmers)
Computational formula: FSC = (conversion factor of farm products x farm price at time) / retail price at time

- Cpi = Consumer price index- (hand measures the change in the average prices of a fixed basket of goods and services commonly purchased by households relative to a base year).

- Ps = Prevalence of stunting, underweight and wasting among children 0 to 5 years old (refers to the number of children aged 0 to 5 years whose height for age is lower than that of a normal person of the same age indicated as a percentage of all children aged 0 to 5 years who were measured in the same period. On the other hand, percentage of underweight children 0 to 5 years old refers to the number of children aged 0 to 5 years whose weight for age is lower than that of a normal person of the same age expressed a s a percentage of all children aged 0 to 5 years who were weighed in the same time period. While, the percentage of wasted children 0 to 5 years old refers to the number of children aged 0 to 5 years whose weight relative to his/her height or length s lower than that of a normal person of the same age indicated as a percentage of all children aged 0 to 5 years who were measured in the same time period)

- Im = Infant and under mortality rates (refers to the probability of dying between birth and age indicated as the number of infant deaths or death occurring before reaching 12months of life in a given period per 1,000 live births)
**** Computational formula: IMR = (No. of infant deaths under one year old in a given period/ total live births in a given period) x 100***

- Sf = Shares of food in total family expenditure (indicates the adequacy of expenditure on food)

- Desupply = Dietary energy, supply of cereals, tubers and root crops (the food available for human consumption, usually expressed in kilocalories per person per day).

- DeRENI = Dietary energy consumed as proportion to RENI (refers to the level of intake of energy as percentage of Recommended Energy and Nutrient Intake (RENI) which is an average of 2000 kilocalories per capita).

RESULT AND DISCUSSION

The assessment of the food security situation of the Philippines was substantiated on the World Food Security (2012) which states that food security exists when all people at all time, have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life. The statement embodies the three dimensions of food security namely: availability, accessibility and utilization.

Food availability

Food availability dimension addresses the supply side of the food security and require adequate quantities of quality food from local agricultural production or imports. The indicators covered by this dimension are food available per capita, food production index, cereals stock index, cropping intensity index and import dependency ratio.

The data from the last five years show a decreasing pattern of food availability in terms of food available per capita as represented by rice statistics. Rice being the staple food of Filipinos, posts a serious threat to supply for the country's basic food. The contraction of harvest areas and lower yields is a result of La Nina Phenomenon (PSA, 2016). Notwithstanding the food situation, in terms of food production side and cereal stocks, statistical data shows opposite of the food available per capita, showing an increasing pattern throughout the years under analysis. Given the food supply situation, the country still imported foods. FAO (2006) stressed the importance of international trade and domestic production in assuring that a country's food supply is sufficient. According to Mina and Reyes (2009), the reason why the Philippines had to remain a net importer of rice was because domestic production could hardly meet local demand. But by adding imports in the equation, the supply could already meet the local demand. However, Madley (2000) in his analysis on trade and food security argued that increased competition from imports will intensify rural poverty. Many households whose livelihoods is on major corn producing areas in the Philippines could be lost as cheap imports flood local markets driving down prices and household income. Sixty nine percent of the available food for consumption is rice. Rice is the main staple food while corn (11%), sweet potato (5%), and cassava (2%) are substitutes. Moreover, pork (9%), chicken egg (2%), tilapia (1%) and milkfish (1%) are the common commodities purchased by wage earners.

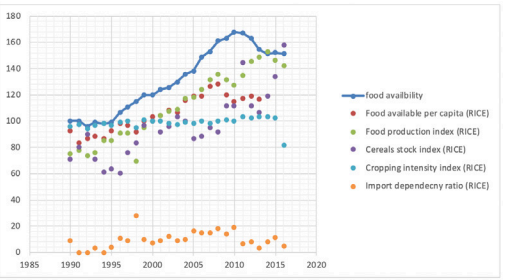

Figure 1. Food availability index, Philippines, 1990-2013

Results show that food availability is positively related to food availability per capita, food production index, cereal stock index and import dependency ratio. However, cropping intensity index has shown to have no effect to food security. The exogenous significantly related variables to food availability are conditions that are related to the supply of food. Hence the model for food availability in the Philippines is expressed as follows:

$$(1)\ F_{availability} = f\ (Fac, Fpi, Csi, Cii, Idr)$$
$$Fav = -55.57 + 0.68\ Fac + 0.33\ Fpi + 0.30\ Csi + 0.63\ Idr$$

The model explains that an increase in food availability per capita of rice by one kilo will increase the food availability index by 0.68 points. Rice is the most common staple food of the country. An increase in the food availability per capita elucidates an increase in the food per person. Likewise, food production index explains the increase in the production of rice by one point will increase food availability index by 0.33. The increase in the production of rice plays an important role in food availability. Moreover, the cereal stock index yields positive relationship to food security. Import dependency ratio also has weight on the food availability. A one point increase in the dependency of the country to imported rice will increase food availability by 0.63. Needless to say, international trade plays an important role partly on food security of the Philippines in terms of its one dimension that is availability of food in the country and regarded as one of the important factors of food availability (Ali Khan et.al, 2012). Improving food availability through imports can be a solution to the decline in local food production (Diaz-Bonilla et.al., 2000). Developing countries resort to imports because this is the only solution at short run which may resolve the food gaps between local demand and local production.

Table 1. Result of OLS model for food availability

Variables	β –coefficient	t-statistics
Constant	-55.57	(-1.59)
Fac	0.68	(2.61)*
Fpi	0.34	(2.29)*
Csi	0.30	(3.38)**
Cii	0.44	(1.34)
Idr	0.63	(2.53)*

Notes: Significant at: * 5 and ** 1 percent levels, respectively; dependent variables, no. of observations= 27; R^2= 0.96 and F = 87.41.

Food accessibility

The accessibility dimension of food security addresses whether the households or individuals have sufficient resources to acquire relevant quantity of quality foods, encompassing their income, expenditure and buying capacity. The trend shows that in terms of food accessibility, the food security situation is threatened by the continuous increase of food price as depicted by the upward trending line of consumer price index. Farmer's share is the ratio of food farm price to food retail. It indicates how much of the price paid by the consumer goes back to the farmers. Tilapia (19%) had the biggest farmer's share in consumer peso followed by milkfish (17%), corn (15%), chicken (12%), sweet potato (11%), banana (10%), pork (9%), and rice (7%). However, statistical data on consumer price index shows that prices of basic commodities were generally increasing particularly rice. The rice crisis in 2008 brought prices up causing a notable increase in the index by 26.20 index points from the base year.

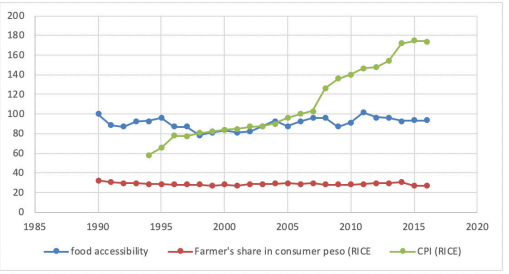

Figure 2. Food accessibility index, Philippines, 1990-2016

Since food availability means national food security, it is important to differentiate it to food security because enough food does not mean that the poor have access to food. Hence the model for food accessibility in the Philippines is expressed as follows:

$$(2)\ F_{accessibility} = f\ (Fsc, Cpi)$$
$$Fa = 22.28 + 0.08\ Cpi$$

The model elucidates the direct relationship of consumer price index to the accessibility dimension of food security. An increase in the consumer price index by one will increase the accessibility by 0.08. Consumers still purchase foods even its price went up because of necessity. However, because of the continuous increase in food prices accessibility to food is diminishing having a slope of less than one.

Table 2. Result of OLS model for food accessibility

Variables	β –coefficient	t-statistics
Constant	22.28	(0.76)
Cpi	0.08	(2.69)*
Fsc	2.08	(1.99)

Notes: Significant at: * 5 and ** 1 percent levels, respectively; dependent variables, no. of observations= 27; R^2= 0.38 and F = 6.19

Food utilization

The utilization dimensions of food security know if the available food in a given period of time had been accessed and utilized. A household makes decisions on what food to consume and how to allocate food within the household. Appropriate food intake is essential for the nutritional status of the populace. The highest peak

of food utilization was experienced in 2016 and the increasing share of food in total family expenditures were noted 1994. According to Philippine Statistical Authority (2013), food expenditures comprised 42.80 percent of the total family expenditures. However, on the average, proportion of food expenditures contracted by 1.72 percent per annum as also reflected in the decreasing food utilization for the next year. The good condition of food utilization is evident on the status of decreasing prevalence of stunting, wasting and underweight and infant mortality rate.

Based on the previous food security situation in terms of the food availability, accessibility and utilization, there is a negative or a declining pattern showing threats on food security condition of the country. However as a whole food security index measured using the principal component analysis, statistics shows an upward trending pattern condition of food security.

The identified factors that affect food utilization are dietary energy consumed in proportion to the Recommended Energy and Nutrient Intake (RENI), dietary energy supplies of cereals, roots and tubers, infant mortality rate and prevalence of stunting. In the results only the dietary energy supply of cereals, roots and tubers and infant mortality rate has significant effect to food utilization.

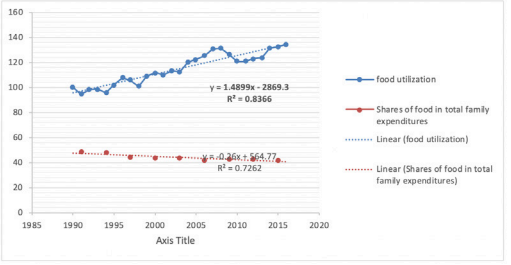

Figure 3. Food utilization index, Philippines, 1999 – 2016

The estimates have shown that dietary energy supply is found to be positively related to food utilization. On the other hand, infant mortality rate is inversely related to food utilization. The model for food utilization in the Philippines is expressed as:

$$(3)\ F_{utilization} = f(\text{Ps, Im, Sf, Desupply, DeRENI})$$
$$Fu = 22.13 + 0.08\ Des - 0.22\ Im$$

An increase in the food available for human consumption by one kilocalories will increase food utilization index by 0.08. The foods in reference are food commodities in its original/unprocessed form. The status of dietary energy supply demonstrates the agricultural performance of the country in terms of supply of raw foods available for consumption. The status of infant mortality in the country is diminishing with the proper food utilization.

Table 3. Result of OLS model for food utilization

Variables	β –coefficient	t-statistics
Constant	22.13	(8.32)**
DeRENI	0.06	(0.30)
DeSupply	0.08	(11.29)**
Im	-0.22	(-3.32)*
Ps	0.02	(0.76)

Notes: Significant at: * 5 and ** 1 percent levels, respectively; dependent variables, no. of observations= 27; R^2= 0.99 and F = 13183.88.

The Philippines is food secure taken collectively the interaction of the three dimensions. The indicators suggest that food security is a multidimensional issue that availability or supply of food alone doesn't explain the food security condition of a country. Other dimensions should be taken into consideration such as accessibility and utilization. Another factor that might have contributed was the increase of government budget for agriculture (Philippine Statistical Authority, 2013). However the declining pattern of major food items specially rice stocks might threaten food security conditions in the coming years. The condition is expected to recover because of the increase in agricultural budget as depicted by the upward trending graph of production and cereal stock index of rice. The recovery is also supported by the stability shown by the cropping intensity index, because of the government interventions such as the Five Croppings in Two Years, Early Wet Planting and Quick Turn Around Programs.

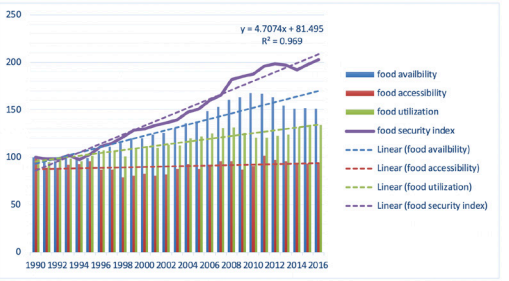

Figure 4. Food security index, Philippines, 2009 – 2016

The food security model in the Philippines is expressed as:

$$(4)\ Fsi = f(F_{availability} + F_{accessibility} + F_{utilization})$$
$$Fsi = -113.49 + 1.08\ Fav + 0.30\ Fa + 0.81\ Fu$$

All the three dimensions of food security namely: food availability, accessibility and utilization yields significant positive effect on food security. Food availability among the three posits a major influencer on the country's food security condition.

Table 4. Result of OLS model for food security

Variables	β –coefficient	t-statistics
Constant	-113.49	(-3.46)**
FAV	1.08	(6.09)**
FA	0.30	(0.92)
FU	0.81	(2.33)*

Notes: Significant at: * 5 and ** 1 percent levels, respectively; dependent variables, no. of observations= 27; R^2= 0.95 and F = 138.03

CONCLUSION AND POLICY RECOMMENDATION

This work focused on the macroeconomic dimension of food security in the Philippines. In order to explore food security in the Philippines, food security is defined in terms of its three dimensions: availability, accessibility and utilization. The model proved the claim that food security is not about food supply only but also food demand. Food availability answers only the national food security of a country which is only a part of the attainment of food security, that is enough food for Filipinos, however it does not mean that poor can obtain and make use enough of it.

The major findings of the paper are that food availability necessitates the increase food importation in the short run to meet the food gap. Likewise, increase in the production of food commodity in its original unprocessed form must be secured and taken into consideration in making a policy.

In the food accessibility dimension, the continuous increase of food prices threatened the food secure status of the country. Even though the citizens continue to buy food as prices increases it affects the consumption of food by many. The concerned government may consider giving subsidy to the people. On the other hand, it appears that the government has done its part in the decrease of child mortality rate. The improvement of the condition contributed significantly to better food utilization and ultimately food security.

The results indicate that the food security taken individually in terms of food availability, accessibility and utilization exhibit a declining pattern showing threats on food security condition. However, taken collectively, results shows that the food security condition is upward trending. Therefore, Philippines is food secure using the food security index with all of its dimensions measured collectively

References

Aker, J and Lemtouni, A. (1999). A Framework for assessing food security in face of globalization. Agroalimentaria Journal, 8, 13-26

Balisacan,A.M. and Ravago, M.V. (2003). The rice problem in the Philippines: Trends, Constraints and policy imperatives. MPRA Paper No.24865

Breisinger, C., Ecker, O., Al-Riffai P. and Yu, B. (2012). Beyond the Arab Awakening: Policies and investments for poverty reduction and food security. Food Policy Review, International Food Policy Research Institute (IFPRI). Washington DC: IFPRI.

Briones, R. (2010). Scenearios and options for productivity growth in Philippine agriculture: An Application of the AMPLE. Discussion Paper Series No 2010-05. Philippine Institute for Development Studies, NEDA. 46p.

Cabanilla, L.S. (2006) Philippine agriculture, food security and APEC. Philippine Institute for Development Studies. NEDA

Cavallo,E., S. Galiani, I.Noy and J.Pantano (2010), Catastrophic natural disasters and economic growth, IDB Working Paper Series No. IDB-WP-183, Inter-American Development Bank, 27p

David, C. , Intal, P. and Balisacan, A. (2007) Distortions to agricultural incentives in The Philippines. World Bank .

Dawe, D. (2004). Rice imports come with the territory: exporters plant more than half of their crop area to rice- importers less than half. Rice Today 3(2):37

Diaz-Bonilla, E., Thomas, M., Robinson, S. and Cattaneo, A. (2000). Food security and trade negotiations in the World Trade Organization. TMD discussion papers 59, International Food Policy Research Institute (IFPRI). Washington DC: IFPRI.

Donna Mitchell , , Darren Hudson , , Riley Post , , Patrick Bell , , Ryan B. Williams , (2015), Food Security and Conflict, in Andrew Schmitz , P. Lynn Kennedy , Troy G. Schmitz (ed.) Food Security in an Uncertain World (Frontiers of Economics and Globalization, Volume 15) Emerald Group Publishing Limited, pp.211 – 225

Ebo, J.F. (2017). Sustaining Food Security in the Philippines: A Time Series Analysis. Asian Journal of Agriculture and Food Sciences, Vol. 5 Isuue 6. pp.1-9.

FAO. (2014). World agriculture: towards 2030/2050-Interim Report. FAO. Rome

FAO. (2011). The State of food and

agriculture. 2010-2011. Women in agriculture. closing the gender gap for development.

Galero, S., Steven S., and Tiogco, M. (2014). Food security versus rice self-sufficiency: Policy Lessons from the Philippines. DLSU Research Congress.

Gandhi, V.P and Zhou, Z. (2014). Food demand and the food security challenge with rapid economic growth in the emerging economies of India and China. Food Research International Journal. Vol.63

Ghattas, H. Barbour,J.M., Nord, M., Zurayk, R. and Sahyoun N.R. (2013). Household food security is associated with agricultural livelihoods and diet quality in a marginalized community of rural bedouins in Lebanon. The Journal of Nutrition.

Habito, C.L. and Briones, R. (2005). Philippine agriculture over the years: Performance, policies and pitfalls. Paper presented at the conference entitled Policies to strengthening productivity in the Philippines", sponsored by the Asia-Europe meeting (ASEM) trust fund, Asian Institute of Management Policy Center, Foreign investment advisory service. Philippines Institute of Development Studies and the World Bank, held in Makati City, June 27,2005.

Rana Ejaz Ali Khan, Toseef Azid, Mohammad Usama Toseef, (2012) "Determinants of food security inrural areas of Pakistan", International Journal of Social Economics, Vol. 39 Issue: 12, pp.951-964, https://doi.org/10.1108/03068291211269082

Salvatore, D. and D. Reagle. (2001).Schaum's Outline of Statistics and Econometrics 5th Editon: Prentice Hall

Smith, L. and Haddad, L (2000). Explaining Child Malnutrition in Developing Countries: A Cross Country Analysis. Food Consumption and Nutrition Division Discussion Paper. International Food Policy Research Institute.

Tiogco M.M. and Francisco K.A. (2011). Philippines: Food security versus agricultural exports. Discussion Paper Series No. 2011-25. Philippine Institute for Development Studies.

United Nations Conference on Trade and Development (2011). Least Developed Countries Series