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Global Financial and Food Price Crisis: A Double Shock on ASEAN Food Security

Chayoot Wana

Department of Business Economics, Faculty of Management Science
Chandrasakem Rajabhat University, Bangkok, Thailand
Email: chayootwana84@gmail.com

Bernadette Andreosso-O'Callaghan

Department of Economics and Management
Ruhr University Bochum, Germany,
and Department of Economics, University of Limerick, Ireland
Email: Bernadette.Andreosso-O'Callaghan@rub.de

ABSTRACT

The food price crisis that occurred in the mid-2000s and the global financial crisis that transpired in 2008 had an enduring impact on developing and emerging countries where investment growth rates have declined sharply. Food insecurity has also become an important concern. Using a food security assessment model, an analysis of the medium- to long-term repercussions of the food price and global financial crises on ASEAN food security revealed that the effects of the food price crisis are expected to be more negative than those of the global financial crisis. When a financial crisis occurs in the USA and Europe, investment flows to emerging markets, suggesting that countries like Lao PDR, Singapore, Thailand, and Vietnam benefit from it. However, when a global financial crisis occurs, other ASEAN countries like Cambodia, Indonesia, Malaysia, and the Philippines are negatively affected.

Keywords: food security, ASEAN, food crisis, global financial crisis

JEL Classification: Q11, Q18

INTRODUCTION

The world economy has been threatened by upward-trending international food prices since 2006. Even though food prices dropped in 2009–2010, both the food price crisis in the mid-2000s and the US-born global financial crisis in 2008 had a long-term impact on developing countries, where the growth rates of gross fixed capital formation have declined sharply in the last seven years or so. The world continues to face economic pressures as a result of the double crisis, and food insecurity remains a concern for a large number of people, particularly those who live in developing and emerging countries.

In 2012, the leaders of the Association of Southeast Asian Nations (ASEAN) reiterated at the 21st ASEAN Summit in Phnom Penh that “food security remains a major challenge for ASEAN and the world as a whole, at a time of high commodity prices and economic uncertainty” (Desker, Caballero-Anthony, and Teng 2013). The ASEAN region, which is composed of 10 countries with varying income levels, is economically heterogeneous (World Bank 2016a). However, low-income ASEAN countries, such as Cambodia and Vietnam, produce various staple agricultural commodities; and high-income countries, such as Singapore, rely strongly on imports.

ASEAN countries were affected by both the food price hike of 2007–2008 (Wailes et al. 2012) and the global financial crisis, although the latter had a lesser impact than the 1997 Asian crisis (Leshner and Plummer 2011). The effects of both crises on food production and food security in ASEAN countries remain unclear. Understanding the effects of external shocks in times of economic uncertainty is useful in shaping policies that allow future sustainable growth. In this context, this paper analyzes the medium- to long-term repercussions of the food price crisis and global financial crisis on

ASEAN food security. It assesses the changes in nutritional energy acquired from per capita food consumption, a key food security indicator, in ASEAN countries. One of the key contributions of this paper is its focus on the effects of the crises on people who live below the poverty line (below USD 2/day) in each ASEAN country by using their nutritional energy intake as an indicator.

The Issue of Food Security

Official Definitions of Food Security

The term “food security” was initially defined at the 1974 World Food Summit: “Food security means availability at all times of adequate world food supplies of basic foodstuffs to sustain a steady expansion of food consumption and to offset fluctuations in production and prices” (United Nations 1975). It was the result of heightened awareness on problems related to world food volume and stability that occurred during that year.

In 1983, the Food and Agriculture Organization of the United Nations (FAO) expanded the definition to include “food access.” The FAO concept of food security was “ensuring that all people at all times have both physical and economic access to enough food for an active, healthy life.”

In its 1986 policy study on poverty and hunger, the World Bank highlighted food insecurity. The report showed the difference between the state of food insecurity associated with chronic problems of poverty and low income, and temporary food insecurity caused by natural disasters, market failure, or conflict (World Bank 1986).

In the mid-1990s, food security was recognized as a major concern that extended from the individual to the global level. Nevertheless, in the original FAO definition, “access” was an indicator related to conditions

that only concerned malnutrition associated with protein, which is a “major” nutrient. The definition was again expanded to include food safety issues and nutritional balance, which could reflect concerns about food ingredients and “minor” nutrient needs. However, this issue was complex and did not meet the objective of the FAO.

In 1994, the United Nations Development Program Human Development Report proposed the notion of “human security” including some perspectives on food security. This concept correlates well with human rights attitudes that influence food security. The 1996 World Food Summit added a more complex definition of food security, which led to another definition in a 2002 FAO report: “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). The international community agreed with the broad definition, goals, and responsibilities set by FAO in 2002. The operation, in fact, focused on narrower objectives and practices that were easier to perform both nationally and internationally.

The main objective of an international development policy is to reduce and eliminate poverty. For instance, the 1996 World Food Summit illustrated this policy direction through determining the main objective of international policy on food security, by reducing the incidence of food shortages or malnutrition by half by the year 2015. This paper follows the 2002 FAO definition of food security.

Trends in International Food Prices and Food Security

International food prices increased steadily in recent years. Real agricultural prices increased by more than 60 percent between

2000 and 2010 (World Bank 2016b), but their rise has been particularly dramatic since 2006; for instance, wheat prices increased by over 200 percent in 2008 (Andreosso-O’Callaghan and Zolin 2010; FAO 2013). According to the United States Department of Agriculture (USDA) (Shapouri et al. 2010), after the food price hike in 2007–2008, the number of people who were exposed to food insecurity in developing countries increased by almost 2 percent. During this period, Sub-Saharan Africa (SSA) had the lowest average calorie intake and was the most food-insecure region in the world. Asia had the largest share of hungry people (47% of the total number of people), although it was less vulnerable than the SSA.

When food prices rise, food consumption declines and a shift from higher- to lower-quality food occurs in some regions. This change in consumption structure jeopardizes people’s access to sufficient and nutritious food, lowering food security. Food insecurity becomes a concern for a large number of people, particularly those who live in the developing world (Brinkman et al. 2010; Lin and Martin 2010).

As food prices started to decline in 2009, the global financial crisis unfolded (Wong 2009). The collapse of investment banks, housing loan agencies, and insurance companies resulted in volatile stock markets. Capital was then diverted from vulnerable stock markets, and the USD depreciated vis-à-vis other international currencies like the Euro. Furthermore, bankruptcy prevented the extension of loans to both consumers and business activities. Consumer spending and gross fixed capital formation were both at an all-time low, leading to a fall in production and sluggish growth at the global level.

Since the global financial crisis erupted, agricultural and food price movements have been erratic, although their general trend has

been downward.¹ Higher levels of volatility of commodity prices, including food prices, have also been recorded (Morales and Andreosso-O'Callaghan 2012; UNCTAD 2012; Desker, Caballero-Anthony, and Teng 2013). The deteriorating financial positions and other adverse macroeconomic conditions generated by the global financial crisis strain the world economy, resulting in deteriorating food security, although food prices that have trended down in the period of the global financial crisis could help improve the situation of food importing economies. In 2009–2010, the number of food-insecure people in Asia increased by approximately 13 percent (Shapouri et al. 2010)². This is due to the many linkages between the Asian economies, mostly through trade, and the western economies where growth has been sluggish. When western economies weaken, food security in less-developed and emerging countries could be affected directly.

With market sentiment somewhat improving in recent years, food security improved slightly in most developing countries in 2012, especially in SSA where food production prospered. The number of food-insecure people in Latin America and the Caribbean was unchanged; in the Middle East, this number grew by less than 1 percent because of reduced imports caused by higher expected grain prices.

The ASEAN region was significantly affected by the double crisis. Despite being prominent agricultural exporters, some ASEAN countries have suffered from food insecurity due to food price hikes and volatility, as well as

overall adverse macroeconomic circumstances created by the global financial crisis. Desker, Caballero-Anthony, and Teng (2013) analyze the many threats to the region that are building up in the wake of the crises, such as declining productivity rates due to climate change and soil erosion; an increase in food price volatility; and a rapid transformation of the value chain from the supplier of inputs to the final consumer, given the entry of retail companies with strong market power.

A study by the Asian Development Bank (ADB) shows that ASEAN countries have been taking steps to counteract the negative impact of another food price crisis by establishing, for example, a regional emergency rice reserve as part of the new ASEAN Integrated Food Security Framework (Wailes et al. 2012). Studies at the national level highlight food security concerns during and after the crises.³ However, it is still unclear whether the food price and global financial crises affect food security (and if so, by how much) in the different economies in ASEAN in a comparative perspective.

METHODOLOGY

Data and Scenario Design

Econometric approaches and a food security assessment model were employed to project the changes in food consumption between 2015 and 2020. The impact on food security was estimated for Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines, Singapore, Thailand, and Vietnam. Brunei Darussalam and Myanmar were not included due to inadequate data. Rice, meat products, vegetable oils, and sugar were adopted as food representatives in this study

1 The World Bank forecasts a continuing fall of most agricultural commodity prices in 2016, with a small recovery in 2017 (World Bank 2016b).

2 A World Bank survey conducted in all developing regions of the world using the rather subjective indicator of self-assessed food security concludes that on average, food insecurity increased only slightly between 2005 and 2009 in Asian countries, although there are large variations around the mean (World Bank 2013).

3 See Nhat (2008) for the case of Vietnam during the food crisis.

because they are the main food commodities consumed in ASEAN countries (FAO 2013).

For the analysis models, secondary data on domestic food production, selected domestic basic food prices, selected world basic food prices, and food exports and imports from 1990 to 2013 were obtained from the USDA and the FAO Statistical Databases. Food aid data were obtained from the United Nations World Food Programme. All financial data, such as real income and real exchange rate, were obtained from the International Monetary Fund and World Bank.

Four scenarios were designed to compare the effects of the crises on food consumption and food security trends: (1) food security trends without any crises, (2) the effects on food security with a food price crisis only, (3) the effects with the global financial crisis only, and (4) the effects with both crises. As explained above, food security was measured based on nutritional energy intake per capita.

Exponential Smoothing

To compare the effects of the crises in each scenario, some variables were normalized by estimating their values in cases of effects without any crises (anti-monde or alternative scenario). These included food prices and GDP. Exponential smoothing was applied to estimate the values.

Exponential smoothing is widely used in making discrete time series data smooth to forecast future data. It is a popular method because of its simplicity, computational efficiency, and reasonable accuracy (Ostertagova and Ostertag 2011; NIST 2013). The forecast data is constructed from an exponentially weighted average of past observations, where the present observation is given the largest weight, i.e., the older the data, the lower the weight given.

The general form of exponential smoothing is shown as follows:

$$\hat{y}_{t+1} = \alpha \sum_{k=0}^{i-1} (1-\alpha)^k y_{t-k} \quad (1)$$

where:

\hat{y}_{t+1} is the forecast value Y at time t+1

α is the smoothing constant, $0 < \alpha < 1$

y_{t-k} is time series data of value Y

The Marquardt procedure, which is a non-linear optimizing method, was used to obtain stable forecast data, smooth random variation, and a minimal sum of squares of residuals. As a result, 0.1 was adopted as the α value.

Food Security Assessment Model

The International Food Security Assessment model was developed by the USDA Economic Research Service for projections of food consumption (Shapouri et al. 2010; Meade and Rosen 2013). In the model, a country's food security is assessed as the gap between projected domestic food consumption and a consumption target in line with nutritional energy requirements. The projection results provide a baseline for the food security situation in the country.

For this study, each country's model comprises four commodity groups: paddy rice, vegetable oil, meat, and sugar. Partial equilibrium recursive equations were employed to evaluate food security in ASEAN countries. The model was adjusted by changing the independent variables in the domestic production equation (Equation 5) because certain data used in the original equation were lacking, such as fertilizer use, indicators of capital use, and indicators of technology change in Cambodia and Lao PDR. Real domestic price (DRP_{fct}), real domestic price of substitutes ($SDRP_{fct}$), and

domestic substitute supply (SDQ_{fct}) were used as independent variables instead. The model is described below.

Food consumption is defined as the difference between domestic supply and non-food use, where subscripts f , c , and t stand for food commodity, country, and time, respectively.

The equation for food consumption is:

$$CON_{fct} = DQ_{fct} - NF_{fct} \quad (2)$$

where:

CON_{fct} = food consumption

DQ_{fct} = domestic supply

NF_{fct} = non-food use

In addition, non-food use can be explained as a summation of every use of commodity, including exports. Non-food use is described by the following equation:

$$NF_{fct} = SU_{fct} + FU_{fct} + EX_{fct} + OU_{fct} \quad (3)$$

where:

SU_{fct} = seed use

FU_{fct} = feed use

EX_{fct} = exports

OU_{fct} = other uses

Meanwhile, the domestic supply of a commodity in Equation 2 is defined as:

$$DQ_{fct} = PR_{fct} + IM_{fct} + CS_{fct} + FA_{fct} \quad (4)$$

where:

PR_{fct} = domestic production

IM_{fct} = commercial imports

CS_{fct} = change in stocks

FA_{fct} = food aid

On the domestic production side and in the food security assessment model, production is

determined by real domestic price, real domestic price of substitute goods, and domestic supply of substitute goods. The production equation is:

$$PR_{fct} = f(DRP_{fct}, SDRP_{fct}, SDQ_{fct}) \quad (5)$$

where:

DRP_{fct} = real domestic price

$SDRP_{fct}$ = real domestic price of substitutes

SDQ_{fct} = domestic substitute supply

The real domestic price is defined as:

$$DPR_{fct} = f(DRP_{fct-1}, DQ_{fct}, SDQ_{fct}, RY_{fct}, REX_{fct}) \quad (6)$$

where:

RY_{fct} = real income

REX_{fct} = real exchange rate

Commercial imports are assumed as a function of domestic price, world food price, and foreign exchange availability. Foreign exchange availability is a key determinant of commercial food imports, and the sum of the value of export earnings and net flow of credit. The commercial import demand function is defined as:

$$IM_{fct} = f(WRP_{fct}, SWRP_{fct}, FREX_{fct}, DRP_{fct}) \quad (7)$$

where:

WRP_{fct} = real world food price

$SWRP_{fct}$ = real world price of substitutes

$FREX_{fct}$ = real foreign exchange availability

Projections on Lower-income Groups

The Lorenz curve and income/consumption models were introduced to calculate the income distribution and consumption proportion for this income group. The Lorenz curve for each ASEAN country was constructed from income distribution data collected from the World Bank

(2013), with income distribution assumed to be constant during the projection period.

For example, the Lorenz curve equation for Thailand is $y = 0.0001x^3 - 0.0092x^2 + 0.5808x - 0.5885$, where x is the percentage of population and y is the percentage of income distribution. Since the World Bank data (2013) show that 7.8 percent of the Thai population live below the poverty line, the share of income earned by this income group can then be calculated. The same procedure was applied to each ASEAN country.

The income/consumption relationship is specified as:

$$\ln C = a + b \ln Y$$

$$C = C_0/P$$

$$P = P_1 + \dots + P_i \quad i = 1 \text{ to } 10$$

$$Y = Y_0/P$$

where:

C = average per capita food consumption

Y = per capita income

C_0 = total food consumption

P = the total population

i = income deciles

The parameter b is the estimated propensity to consume using cross-country data per capita calorie consumption and income. The percentage of food consumption derived from the model for each ASEAN country was used to calculate the per capita consumption quantity of rice, meat, vegetable oils, and sugar for the ASEAN population living below the poverty line. After obtaining per capita consumption in kilograms for each food type, nutritional energy intakes in kilocalorie (kcal) were calculated. More precisely, and according to the World Health Organization, 100 grams of rice, meat, vegetable oils, and sugar provide on average 257 kcal, 190 kcal, 884 kcal, and 385 kcal, respectively.

FINDINGS AND ANALYSIS

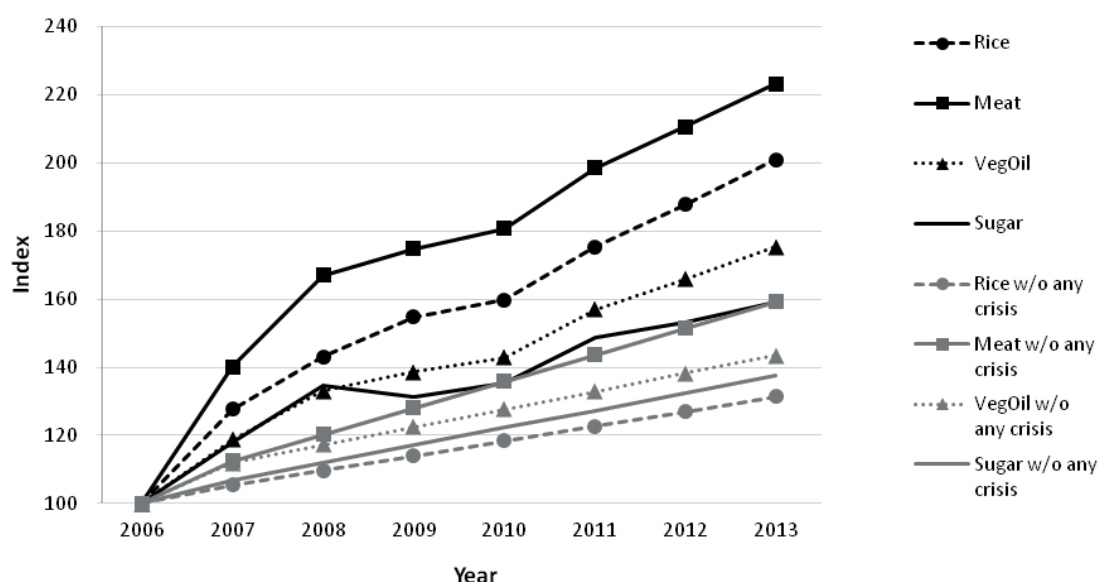
Among the four scenarios used in this study, Scenario 1 assumed the absence of any crisis; Scenario 2 considered the food price crisis only; Scenario 3 considered the global financial crisis only; and Scenario 4 considered the impact of both crises on people living below the poverty line in ASEAN countries.

Estimation of Food Prices without any Crisis

Figure 1 illustrates the estimation results of selected basic food price indices in the absence of any crisis obtained from the exponential smoothing method, and the actual food price indices with both crises. The base year for these indices is 2006.

All selected basic food price indices affected by the food price crisis increased at a higher rate than those in the case of no crisis occurring. The largest increase in prices was observed in meat products after the 2007 food crisis, soaring over 220 points compared to prices before the crisis. Prices would have increased by only 160 points without the food crisis. In addition, rice prices showed the highest spread (+70 points in 2013) between the extreme cases of food price crisis and no crisis. This suggests that rice has been the most affected commodity. By contrast, sugar prices were estimated to be the least-affected food commodity, with the smallest difference in their price indices.

Table 1 shows that average percentage changes in selected basic food prices generated by the food crisis are greater than those in the case of no crisis occurring. The gaps between food prices in both cases are relatively wide, ranging between 2 percent and 19 percent. In the case of no crisis occurring, selected domestic basic food prices in Lao PDR would have experienced the smallest change in the region, while those in Indonesia would have

Figure 1. Selected average basic food price indices in the ASEAN region**Table 1. Average changes (%) in ASEAN food prices (2007–2013)**

Country	With Food Crisis				Without Food/Global Financial Crisis			
	Rice	Meat	Vegetable Oil	Sugar	Rice	Meat	Vegetable Oil	Sugar
Cambodia	10.71	12.75	8.47	7.05	4.34	7.77	5.24	5.10
Indonesia	17.02	22.50	19.20	19.57	6.67	8.92	4.61	3.45
Lao PDR	10.11	10.39	9.87	10.07	2.33	2.03	1.44	2.34
Malaysia	9.89	11.58	18.81	21.95	2.09	1.54	3.06	2.72
Philippines	11.07	10.51	14.57	16.63	1.91	1.36	2.16	3.37
Singapore	10.04	7.80	5.92	8.35	3.93	6.02	2.46	3.42
Thailand	19.77	9.07	14.42	15.45	6.00	5.72	3.59	3.86
Vietnam	12.73	13.79	13.63	9.75	4.20	4.30	1.54	3.10

faced the greatest increase. However, the actual figures indicate that Indonesia and Malaysia have experienced the largest increase in food prices after the crisis, accounting for 10–20 percent. Among food commodities, average rice and meat prices had the largest increase of 8–20 percent in most of the ASEAN countries, while the prices of rice and meat climbed steadily by 5 percent on the average, after the 2007 food crisis.

Estimation of Real GDP Growth without the Global Financial Crisis

Exponential smoothing was also employed to estimate ASEAN's real GDP growth in the case of no global financial crisis occurring. Domestic consumption, investment, government expenditure, and net export growth were estimated under a crisis elimination scenario. Real GDP growth was then calculated.

Figure 2 illustrates the results of ASEAN's estimated real GDP growth between 2009 and 2013.

ASEAN's average real GDP growth rates affected by the 2008 global financial crisis fluctuated in a wider range than those without the crisis. When the financial crisis occurred in 2008, ASEAN's average real GDP growth plunged to lower than 2 percent despite experiencing a growth of 5–7 percent in previous years. However, growth soared to about 7 percent in 2010 and moved between 5 and 5.5 percent in the following years. Real GDP growth estimates without the crisis showed fluctuations ranging between 4.5 percent and 5.5 percent. As expected, this implies that ASEAN's real GDP growth would have been more stable without the global financial crisis.

Even though the global financial crisis generated wide fluctuations in ASEAN's average real GDP in 2009–2010, each ASEAN economy recovered in the following years. Table 2 shows that ASEAN countries have been relatively sheltered from the negative effects of the financial crisis because investors moved

their investment from the US and Europe to the ASEAN region, which is seen as an emerging market.

Overall Projected Impact on ASEAN Countries

Figure 3 illustrates that Scenario 2 will decrease the nutritional energy intake of ASEAN people who live below the poverty line. After the food price crisis, the average nutritional energy intake is projected to decline from 1,760 kcal in 2015 to 1,730 kcal in 2020. Food production is estimated to decline due to lower demand for foodstuffs, leading to lower per capita consumption. By contrast, Scenario 3 could improve per capita consumption for ASEAN people. The average nutritional energy intake of people who live below the poverty line is projected to increase from 1,790 kcal to 1,850 kcal throughout the period. In addition, ASEAN people were expected to reach the FAO minimum dietary energy requirement MDER for ASEAN, which is 1,810 kcal on average in 2016.

Figure 2. Average real GDP growth in the ASEAN region

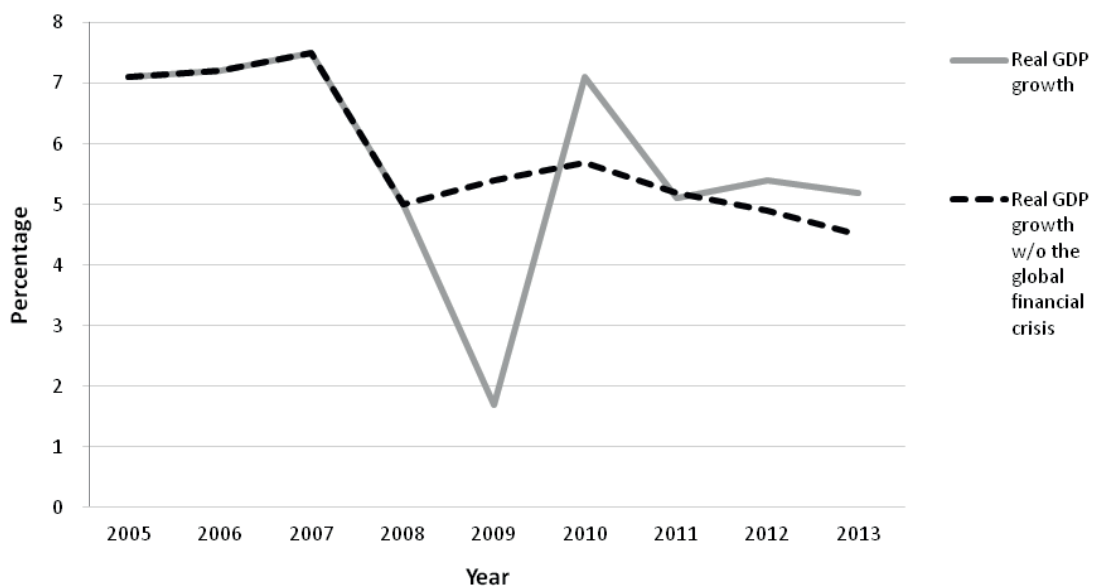


Table 2. Average changes (%) in ASEAN food prices (2007–2013)

Country	With Financial Crisis	Without Financial Crisis
Cambodia	4.9	5.1
Indonesia	5.7	6.0
Lao PDR	7.9	6.8
Malaysia	4.0	4.9
Philippines	4.5	4.6
Singapore	5.2	3.9
Thailand	5.11	4.5
Vietnam	5.7	5.3

Since ASEAN is composed of emerging markets, investments can be moved to the region when a financial crisis occurs in industrialized countries. This could significantly improve economic growth in ASEAN countries, more than in the case when no financial crisis occurs (Scenario 1). However, ASEAN's long-term economic growth generated by investment flows is estimated to rise at a slower rate because investments can be moved back to developed countries when the most detrimental effects of the financial crisis have waned and when it is eventually managed appropriately. Therefore, per capita consumption for ASEAN people in the case of no crisis occurring is projected to increase more rapidly, with a steeper slope in the long term.

Singapore is the only developed country among the ASEAN countries and no Singaporean is therefore considered living below the poverty line. Absorption of nutritional energy obtained from food consumption is at the highest level in the region, reaching the recommended dietary intake (RDI = 2,100 kcal/person/day) when no crisis occurs. In addition, Singapore is also one of the most popular destinations for investors, due to its high level of economic efficiency and to its reliable government. Therefore, the financial crisis could help improve consumption levels while the food price crisis deteriorates per capita consumption (Figure 4). Thailand is the country associated with the second highest

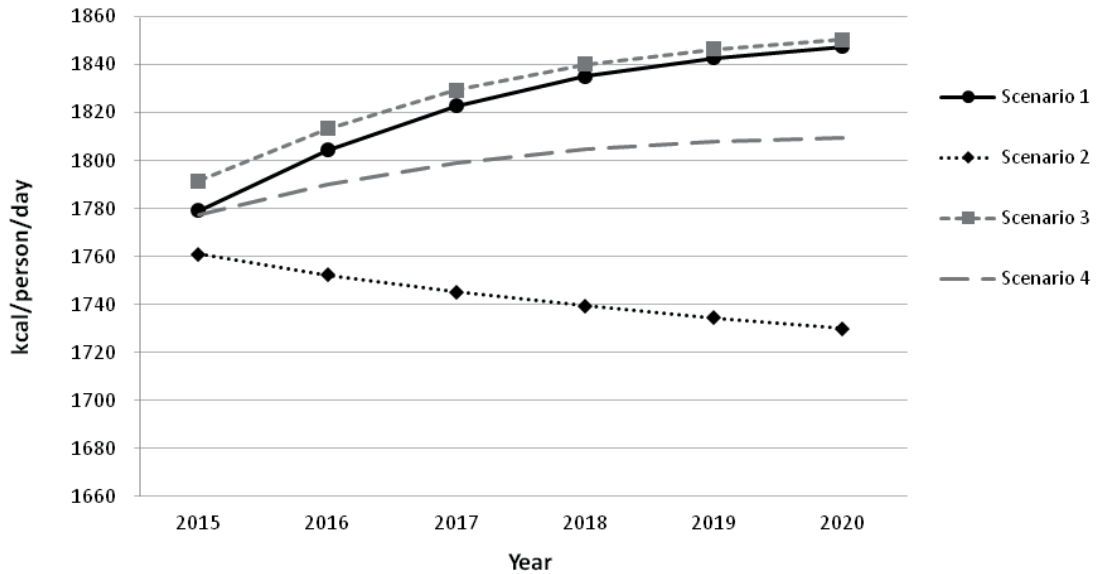
per capita consumption and with an average nutritional energy reaching the MDER (FAO's MDER for Thai people = 1,899 kcal/person/day) when the economy runs without any crises. However, Thai people cannot reach the Reference Daily Intake (RDI) despite the boost generated by foreign investment as a result of the financial crisis. In the meantime, The Philippines is estimated to be the lowest food consumption country, accounting for only 1,760 kcal/person/day. Moreover, both food price and global financial crises (Scenario 4) negatively affect the Filipino per capita consumption, pushing the nutritional energy intake down to below 1,700 kcal/person/day, at the margin of food insecurity.

ASEAN Food Security Situation by Country

Table 3 shows the estimated nutritional energy intake (kcal/person/day) of ASEAN people who live below the poverty line for 2015, 2018, and 2020, after both crises.

Cambodians who live below the poverty line are expected to obtain 1,732 kcal and 1,703 kcal of nutritional energy in 2015 and 2020, respectively. They are also expected to experience a decline in per capita food consumption due to both crises. Their nutritional energy intake is lower than the FAO MDER for Cambodia, which is 1,769 kcal/person/day. However, in the absence of a financial crisis, Cambodians could achieve the MDER in 2020.

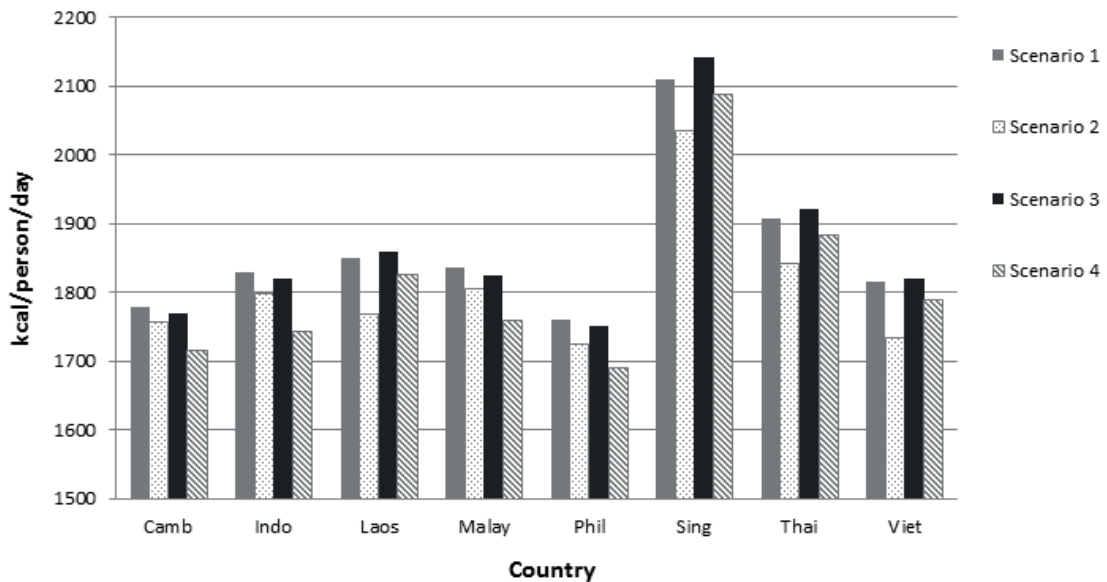
Figure 3. Trends in nutritional energy obtained by ASEAN people living below the poverty line (2015–2020)



Notes: Singapore not included

Scenario 1 assumed the absence of any crisis; Scenario 2 considered the food price crisis only; Scenario 3 considered the global financial crisis only; and Scenario 4 considered the impact of both crises on people living below the poverty line in ASEAN countries.

Figure 4. Average nutritional energy obtained by ASEAN people living below the poverty line



Note: Scenario 1 assumed the absence of any crisis; Scenario 2 considered the food price crisis only; Scenario 3 considered the global financial crisis only; and Scenario 4 considered the impact of both crises on people living below the poverty line in ASEAN countries.

They could go beyond the MDER in 2018 if food prices normalize.

Indonesians who live below the poverty line are projected to experience a decrease in nutritional energy intake from 1,761 kcal to 1,729 kcal throughout the period. They are also expected to experience a decline in per capita food consumption due to both crises. Their nutritional energy intake is lower than the FAO MDER for Indonesia, which is 1,786 kcal/person/day. However, in the absence of a financial crisis, Indonesians could achieve the MDER before 2018. Food availability will increase if food prices reach the economic equilibrium.

Laotians who live below the poverty line are expected to obtain 1,805 kcal and 1,838 kcal of nutritional energy in 2015 and 2020, respectively. They are also expected to experience an increase in per capita food consumption due to the global financial crisis. Their food consumption is projected to drop throughout the period due to the food price crisis, but the global financial crisis could elevate their consumption because of foreign investment inflows. Their nutritional energy intake is lower than the FAO MDER for Lao PDR, which is 1,843 kcal/person/day. However, in the absence of a food price crisis, Laotians could achieve the MDER in 2018.

Malaysians who live below the poverty line are expected to obtain 1,766 kcal and 1,735 kcal of nutritional energy in 2015 and 2020, respectively. They are also expected to experience a decrease in per capita food consumption due to both crises. Their nutritional energy intake is lower than the FAO MDER for Malaysia, which is 1,823 kcal/person/day. However, in the absence of a financial crisis, Malaysians could achieve the MDER before 2018 and surpass it in the following years.

Filipinos who live below the poverty line are projected to experience a decrease in

nutritional energy intake from 1,690 kcal to 1,660 kcal throughout the period. They are also expected to experience a drop in per capita food consumption due to both crises. Their nutritional energy intake is lower than the FAO MDER for the Philippines, which is 1,744 kcal/person/day. The Philippines has the lowest per capita food consumption among ASEAN countries. However, in the absence of a financial crisis, Filipinos could achieve the MDER before 2018. Food availability will increase if food prices reach the economic equilibrium.

The food price crisis is estimated to affect Singapore negatively, but the financial crisis could improve per capita consumption. However, both crises do not make Singaporeans food insecure because their nutritional energy intake is over 2,000 kcal/person/day. They can continue to achieve the RDI until 2020.

Thais who live below the poverty line are expected to obtain 1,891 kcal and 1,896 kcal of nutritional energy in 2018 and 2020, respectively. Thais are also expected to experience an increase in per capita food consumption due to the global financial crisis. Their food consumption is projected to drop throughout the period due to the food price crisis, but the global financial crisis could elevate their consumption because of foreign investment inflows. Their nutritional energy intake is lower than the FAO MDER for Thailand, which is 1,899 kcal/person/day. Thailand needs to cope with the food price crisis to achieve the MDER in 2018.

Vietnamese who live below the poverty line are expected to obtain 1,797 kcal and 1,801 kcal of nutritional energy in 2018 and 2020, respectively. They are also expected to experience an increase in per capita food consumption due to the global financial crisis. Their food consumption is projected to drop throughout the period due to the food price crisis, but the global financial crisis could elevate their

consumption because of foreign investment inflows. Their nutritional energy intake is lower than the FAO MDER for Vietnam, which

is 1,808 kcal/person/day. Vietnam needs to manage the domestic food prices appropriately to achieve the MDER in 2018.

Table 3. Projected nutritional energy intake (kcal/person/day) of ASEAN people living below the poverty line (2015–2020)

Country	Scenario	Year		
		2015	2018	2020
Cambodia	1	1,735	1,790	1,802
	2	1,736	1,764	1,769
	3	1,741	1,791	1,801
	4	1,732	1,712	1,703
Indonesia	1	1,794	1,842	1,852
	2	1,779	1,806	1,810
	3	1,781	1,837	1,849
	4	1,761	1,738	1,729
Lao PDR	1	1,807	1,864	1,876
	2	1,786	1,764	1,755
	3	1,822	1,871	1,882
	4	1,805	1,833	1,838
Malaysia	1	1,800	1,849	1,859
	2	1,785	1,812	1,817
	3	1,787	1,844	1,856
	4	1,766	1,745	1,735
Philippines	1	1,709	1,763	1,775
	2	1,705	1,731	1,735
	3	1,715	1,761	1,771
	4	1,690	1,669	1,660
Singapore	1	2,059	2,124	2,138
	2	2,035	2,010	1,999
	3	2,100	2,156	2,168
	4	2,065	2,097	2,102
Thailand	1	1,883	1,934	1,945
	2	1,841	1,818	1,808
	3	1,862	1,921	1,934
	4	1,862	1,891	1,896
Vietnam	1	1,772	1,828	1,840
	2	1,752	1,730	1,721
	3	1,784	1,832	1,842
	4	1,769	1,797	1,801

CONCLUSION

This paper analyzed the medium- to long-term impact of the food price and global financial crises on ASEAN food security. The nutritional energy intake for ASEAN people who live below the poverty line was used as an indicator. The results show that the effects of the food price crisis on ASEAN food security is expected to be more negative than those of the global financial crisis. When the financial crisis occurs in industrialized regions, investment tends to flow to emerging markets and to some of the most popular markets in the ASEAN region. This suggests that the global financial crisis could help improve ASEAN's GDP, which will then generate more food production and international trade. Therefore, some ASEAN countries, such as Lao PDR, Singapore, Thailand, and Vietnam, are expected to benefit in terms of food security. However, the global financial crisis might negatively affect others, such as Cambodia, Indonesia, Malaysia, and the Philippines. Their actual GDP is lower than that derived from the estimation in case of no crises occurring. In addition, they have been hit by the food price crisis that decreases the purchasing power of people, particularly of those who live below the poverty line. This income group will be unable to reach the minimum dietary energy requirement if the negative effects of both crises still persist. This could lead to food insecurity in the long run.

ASEAN's policy to respond to the effects of the double crises is associated with national and regional strategies (Thompson 2009; Wailes et al. 2012). The results lead to the urgency of policies geared towards the development of new agricultural production technology to increase their production yield. By investing in research and development, production technology can be enhanced, leading to greater productive capacity. When production yields are improved, food can be produced to ensure the stability of

food distribution. Furthermore, policies should aim to decrease income inequality, although raising the minimum wage may ultimately raise input prices. Hence, increasing opportunities to access quality education may be more advantageous than raising the minimum wage. Educated people have a greater chance of finding higher-income jobs, which normally leads to food-secure livelihoods. In addition, the establishment of the ASEAN Economic Community in 2015 is a milestone that should lead this regional group to collaborate with other countries, such as China, Japan, and South Korea, to strengthen the Asian macroeconomic system as a whole and to lessen the income distribution gap in the region.

REFERENCES

- Andreosso-O'Callaghan, B., and M. Zolin. 2010. "Long-term Cereal Price Changes: How Important is the Speculative Element?" *Transition Studies Review* 17 (4): 624–637.
- Brinkman, H.J., S. de Pee, I. Sanogo, L. Subran, and M.W. Bloem. 2010. "High Food Prices and the Global Financial Crisis have Reduced Access to Nutritious Food and Worsened Nutritional Status and Health." *The Journal of Nutrition* 140 (1): 153S–161S.
- Desker, B., M. Caballero-Anthony, and P. Teng. 2013. "Thought/Issues Paper on ASEAN Food Security: Towards a More Comprehensive Framework." ERIA Discussion Paper Series, ERIA-DP-2013-20. Jakarta: Economic Research Institute for ASEAN and East-Asia.
- FAO (Food and Agriculture Organization of the United Nations). 1983. "World Food Security: A Reappraisal of the Concepts and Approaches." Director General's Report. Rome: FAO.
- . 1999. "Assessment of the Impacts of the Uruguay Round on Agricultural Markets and Food Security." CCP 99/12 Rev. Rome: FAO.
- . 2002. *The State of Food Insecurity in the World 2001*. Rome, p. 7.

- FAOSTAT (FAO Statistical Databases). 2013. Annual Producer Food Price Indices Statistic Book. Rome. <http://www.fao.org/docrep/018/i3107e/i3107e.PDF>
- Leshner, M., and M.G. Plummer. 2011. "Back to Basics. Post-crisis Macroeconomic Rebalancing in ASEAN." *ASEAN Economic Bulletin* 28 (2): 160–182.
- Lin, L., and W. Martin. 2010. *The Financial Crisis and Its Impacts on Global Agriculture*. Washington DC: World Bank.
- Meade, B., and S. Rosen. 2013. "International Food Security Assessment, 2013–2023." Food Security Assessment Situation and Outlook No. (GFA-24). United States Department of Agriculture, Economic Research Service.
- Morales, L., and B. Andreosso-O'Callaghan. 2012. "The Current Global Financial Crisis: Do Asian Stock Markets Show Contagion or Interdependence Effects?" *Journal of Asian Economics* 23 (6): 616–626.
- Nhat, T.T.H. 2008. "Tackling Household Food Insecurity: The experience of Vietnam." *Asian Journal of Agriculture and Development* 5 (2): 41–55.
- NIST (National Institute of Standards and Technology). 2013. Single Exponential Smoothing. Engineering Statistics Handbook. US Commerce Department. <http://www.itl.nist.gov/div898/handbook/>
- Ostertagova, E., and O. Ostertag. 2011. "The Simple Exponential Smoothing Model." Paper presented at Modelling of Mechanical and Mechatronic Systems 2011: The 4th International Conference, Herľany, Slovak Republic, September 20–22.
- Shapouri, S., S. Rosen, M. Peters, F. Baquedano, and S. Allen. 2010. "Food Security Assessment, 2010–20." Food Security Assessment Situation and Outlook No. (GFA-21). United States Department of Agriculture, Economic Research Service.
- Thompson, B. 2009. *Impact of the Financial and Economic Crisis on Nutrition – Policy and Programme Responses*. Rome: FAO.
- UNCTAD (United Nations Conference on Trade and Development). 2012. "Excessive Commodity Price Volatility: Macroeconomic Effects on Growth and Policy Options." Contribution from the UNCTAD secretariat to the G20 Commodity Markets Working Group. Geneva: UNCTAD.
- United Nations. 1975. Report of the World Food Conference, Rome, 5–16 November 1974. New York: United Nations.
- Wailes, E., R. Clarete, R. Briones, and F. Pochara. 2012. *Food Security in Asia: The 2007–2008 Food Price Crisis*. Manila: Asian Development Bank.
- Wong, C.Y. 2009. "Global Economic Crisis and Agriculture: A Worm's Eye View." Paper presented at the 8th Asia Pacific Agriculture Policy Forum, Jeju. Korea, September 1–2.
- World Bank. 1986. *Poverty and Hunger: Issues and Options for Food Security in Developing Countries*. Washington DC: World Bank.
- . 2013. "The Impact of the Global Food Crisis on Self-Assessed Food Security." Policy Research Working Paper 6329. Washington DC: World Bank.
- . 2016a. Country Dataset. Retrieved from <http://data.worldbank.org/country>. Accessed May 9, 2016.
- . 2016b. *Commodity Markets Outlook: Resource Development in an Era of Cheap Commodities*. Washington DC: World Bank.