ERIA Discussion Paper Series

Thought/Issues Paper on ASEAN Food Security: Towards a more Comprehensive Framework

Barry DESKER

Mely CABALLERO-ANTHONY

Paul TENG

Rajaratnam School of International Studies
Nanyang Technological University

October 2013

Abstract: *Food security is fundamental to human security and sustainable development. As ASEAN moves towards an integrated community of caring societies in 2015 and beyond, we argue that food security should be an integral part of the ASEAN community building agenda and deserves more attention than it currently has been in the AEC Blueprint. More importantly, ASEAN needs to be infused with a new thinking on food security that is responsive to emerging global threats and challenges. This paper provides a new framework for ASEAN food security by focusing on a regional approach as envisioned in the AEC Jakarta Framework project.*

Keywords: Food security, regional framework, ASEAN Economic Community 2015, sustainable development, human security

JEL classification: O20

1. Food Security: Why the Need for A New Approach?

The ASEAN Community has envisioned a community of nations that is "bonded together in partnership in a just, democratic, and harmonious environment, dynamic development and ever-closer economic integration and in a community of caring societies". Toward this vision, ASEAN had adopted the ASEAN Economic Community (AEC) Blueprint in 2009 which, together with the two other blueprints on the ASEAN Political and Security Community and the ASEAN Socio-Cultural Community, set out the roadmap in achieving the goal of a region of peace, freedom and prosperity.

Against a rapidly changing global landscape and an increasingly inter-connected world, the goal of a dynamic and integrated ASEAN community is faced with a number of challenges. Among these is the challenge of food security. At the 21th ASEAN Summit held in Phnom Penh, Cambodia, in 2012, ASEAN leaders declared 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"*.

Food security is fundamental to human security and sustainable development. The global food crisis in 2007-2008 highlighted the point that food insecurity threatens peace and stability, and is a key cause of conflict and possible violence. As ASEAN moves towards an integrated community of caring societies in 2015 and beyond, we argue that food security should be an integral part of the ASEAN community building agenda and needs to be given more attention than it currently has been in the AEC Blueprint. More importantly, ASEAN needs to be infused with a new thinking on food security that is responsive to the emerging global threats and challenges.

The main objective of this paper is to provide a new framework for ASEAN food security by focusing on a regional approach as envisioned in the AEC Jakarta Framework project. The paper is organised as follows. Following the introduction, the paper identifies trends in food security in Southeast Asia, including the impact of climate change on the food security ecosystem. Against these trends, the paper sets out the conceptual dimension of food security that includes an integrated systems approach comprising the four dimensions of food security. The paper then proceeds

to provide a brief review of the current ASEAN responses and policies on food security and examines their effectiveness in addressing the four dimensions of food security. Finally, the paper concludes with thoughts on how to advance a new food security paradigm for a post-2015 ASEAN that is dynamic and competitive, but is also inclusive and equitable. A comprehensive regional policy of food security bodes well for an integrated ASEAN that prides itself of its centrality in the regional institutional architecture.

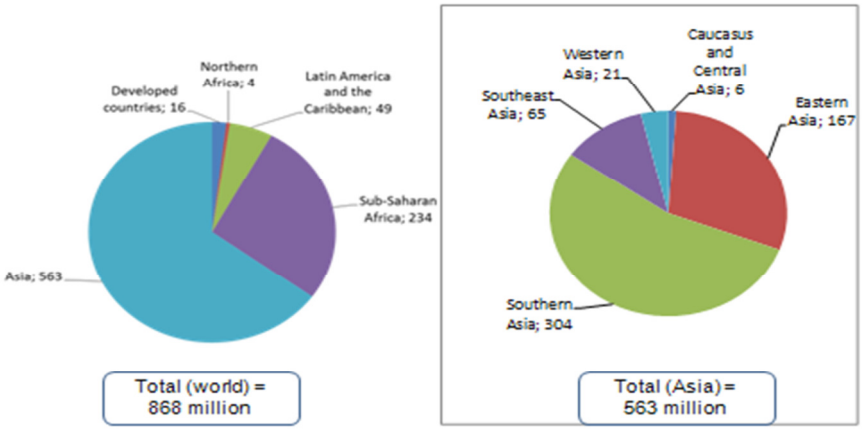
2. Trends and Issues on Food Security

At the outset, it is important to note that the food security ecosystem is complex, multidimensional and requires multiple "players" to ensure its sustainability. Currently, the food security ecosystem in Asia is under significant pressure from a number of factors which are outlined below (Fan, 2011; Teng and Escaler, 2012).

2.1. Demographic Trends

The population of the ASEAN region stands at approximately 600 million with about 21 per cent of the population living on an income of less than USD 1.25 per day (Figure 1).[1] According to estimates by the United Nations Population Division, the ASEAN region's population is expected to increase by roughly 27 per cent by 2050 to 760 million.[2] At the same time, Asia will see its urban population increase by a whopping 89 per cent, or 1.4 billion people, with China and India alone accounting for about a third of the total increase.[3] Further, Asia's share of the global GDP is projected to increase from 27 per cent in 2010 to 51 per cent in 2050, resulting in a more affluent population. These three factors alone will have a massive impact on the region's future food consumption patterns.

Figure 1: Where do the Hungry Live? 2010-2012



Source: The State of Food Insecurity in the World, FAO (2012).

Asia currently is a major importer of the world's surplus production of key food commodities (Figure 2), accounting in the trade year 2011/2012 respectively, for 78 per cent of global soybean exports, 38 per cent of global corn exports, 27 per cent of global milled rice exports, and 26 per cent of global wheat exports. Given population projections and Asia's demand for key commodities such as wheat, rice, corn and soybean in recent years, the import of these key commodities is likely to increase further in the next two decades. ASEAN itself accounted for 44.5 per cent of the Asian import of wheat, and 56.2 per cent of the Asian import of rice in 2011/12 (Figure 3). Within the ASEAN region, the top importers were Indonesia for wheat and rice, Malaysia for corn and Thailand for soybean (Figure 4).

Figure 2: Production and Imports of Key Food Commodities, Asia

Crop	Item Million MT	06/07	07/08	08/09	09/10	10/11	11/12	12/13
WHEAT	Global Production	596	612	682	684	652	696	655
	Asia Imports (% of Global Exports)	35 (30)	31 (27)	34 (24)	35 (26)	38 (28)	40 (26)	39 (27)
RICE (milled)	Global Production	421	434	448	440	449	466	468
	Asia Imports (% of Global Exports)	10 (31)	8.5 (29	6.9 (24)	8.6 (28)	11 (30)	11 (27)	10 (26)
CORN	Global Production	714	795	799	812	832	883	856
	Asia Imports (% of Global Exports)	34 (37)	35 (36)	34 (40)	37 (39)	37 (40)	40 (38)	37 (38)
SOYBEAN	Global Production	237	221	212	261	264	240	270
	Asia Imports (% of Global Exports)	39 (56)	48 (61)	51 (66)	61 (65)	65 (71)	71 (78)	73 (75)

Source: USDAFAS.

Figure 3: Imports of Key Food Commodities into ASEAN, 2011/12 TY

REGION	WHEAT		RICE		CORN		SOYBEAN	
	MT	%*	MT	%	MT	%	MT	%
E. Asia	16,865	42.0	4,125	43.0	32,339	82.1	65,449	92.0
S. Asia	5,402	13.4	790	8.2	0	0	0	0
SE. Asia	17,863	44.5	5,410	56.2	7,064	17.9	5681	8.0
Asia	40,130		9614		39,403		71130	
World	150,566		36,396		106,266		93,055	

Note: * Percent of Asia total
Source: USDAFAS.

Figure 4: Imports of Key Food Commodities into Selected ASEAN Countries, 2011/12 TY

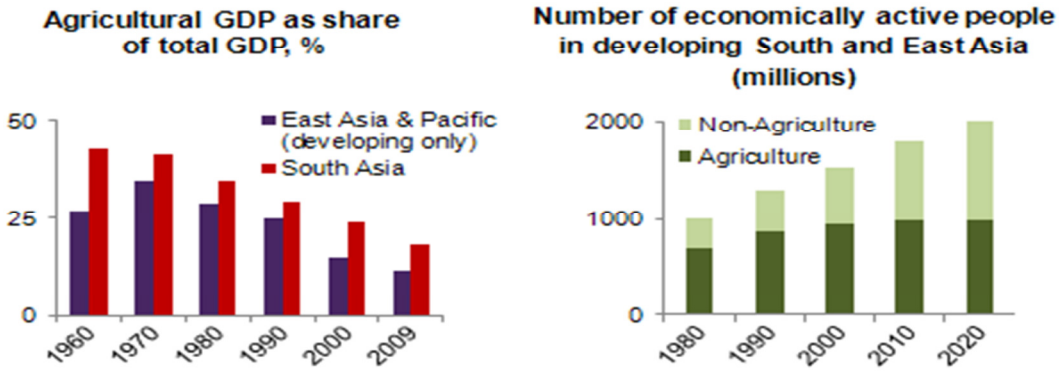
ASEAN member	WHEAT		RICE		CORN		SOYBEAN	
	MT	%*	MT	%	MT	%	MT	%
Indonesia	6,457	36.1	1,700	31.4	1,700	24.1	1,900	33.4
Malaysia	-	-	1,085	20.0	3,200	45.3	570	10.0
Philippines	4,020	22.5	1,500	27.7	-	-	60	1.1
Thailand	2,578	14.4	600	11.0	-	-	1,906	33.6
Vietnam	2,600	14.6	-	-	1,500	21.2	1,225	21.6

Note: * Percent of Asia total
Source: USDAFAS.

2.2. Transformation of Agriculture

A second trend that is adding to the concern over food security is that the agricultural sector in the region is undergoing transformation. Agriculture's share of GDP has fallen from 43 to 18 per cent between 1961 and 2009 in South Asia, for example (Fan, 2011; World Bank, 2011). There are also less and less of the rural population working in agriculture, with the number declining from 66 per cent in 1980 to 50 per cent in 2010; this number is projected to further fall to 45 per cent by 2020 (Figure 5).[4] In terms of farm size, farms are, in fact, getting even smaller as a result of population growth and inheritance-based fragmentation (Thapa and Gaiha, 2011).

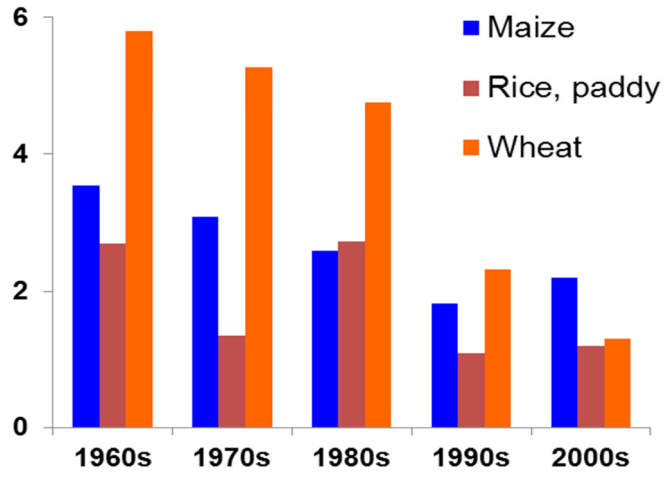
Figure 5: Decline in Agricultural GDP and Economically Active People in Agriculture



Source: Shenggen Fan, 2011.

A more worrying trend is the declining performance of agriculture. According to Trostle, the annual growth in productivity, measured in terms of average aggregate yield has slowed down over the years (Figure 6) (Trostle, 2008). Global aggregate yield growth of grains and oilseeds averaged 2 per cent per year between 1970 and 1990, but declined to 1.1 per cent between 1990 and 2007.[5] It is projected to continue to decline over the next ten years to less than 1 per cent per year. Asia's farmers are also growing older. For example, according to the Japanese Agriculture Ministry, 70 per cent of Japan's three million farmers are 60 years or older (Figure 7) (Fackler, 2009). ASEAN's agriculture labour force is made up of 73 million farmers, mostly located in Indonesia, Thailand, and the Philippines (Figure 8), and its arable land makes up just 15.6 per cent of its total land area (Figure 9).

Figure 6: Percentage Growth in Crop Yield 1960s–2000s



Source: FAO, 2011.

Figure 7: Decline in Farming Population and Ageing Farmers 1970–1998

	Farmers 65 and Older (%)		Ave. Age of Farmers		No. of Farmers (millions)		Population 65 and Older (%)	
	1970	1998	1970	1998	1970	1998	1970	1998
U.S.	17	35	51	57	1.2	1	10	13
Canada	12	19	49	51	0.3	0.3	8	12
Japan	14	43	47	60[c]	7	2.5	7	16
Korea	5	16	36	50[c]	14.4	4.9	3	6

Source: Population Reference Bureau -- **Montague Yudelman & Laura J.M. Kealy. 2000**

Figure 8: ASEAN Agriculture Labour Force, 2011

	Labour force in Agriculture (thousand) (2011)
Brunei Darussalam	NA
Cambodia	5168.9
Indonesia	39329
Lao PDR	NA
Malaysia	1451
Myanmar	NA
The Philippines	12266
Singapore	2
Thailand	14883
Viet Nam	24.4
Total	**73122.3**

Source: ADB Key Indicators for Asia and the Pacific 2012.

Figure 9: Arable Land in ASEAN, 2011

	Arable Land (1000Ha) (2011)
Brunei Darussalam	3
Cambodia	4000
Indonesia	23500
Lao PDR	1400
Malaysia	1800
Myanmar	10786
The Philippines	5400
Singapore	0.63
Thailand	15760
Viet Nam	6500
Total	**69149.63**
Arable Land/Total Land	**15.59%**

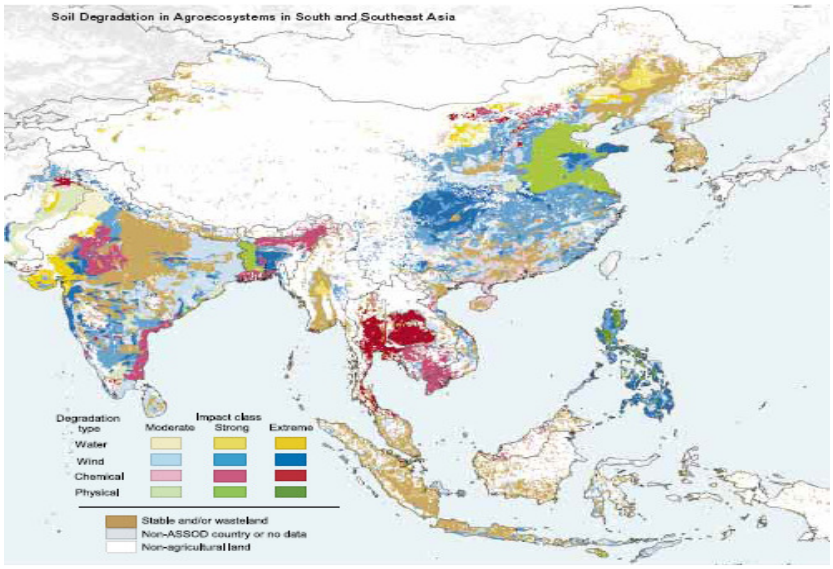
Source: FAO.

Lastly, concomitant with the changes in the age profile of farmers is the gender-relatedness of the farming community in countries like China which has seen massive rural to urban migrations. A study conducted in three South-western China provinces showed that the average age of full-time farmers was around 50 years old and women composed 78 per cent of the total agricultural labor force (Song, *et al.*, 2009).

2.3. Degradation of the Natural Resource Base for Food Production

A third trend adding to the pressure on agricultural sustainability is the fact that land and water resources in the region are already under significant duress. Out of a total land area of 4.3 billion hectares, Asia contains some 1.7 billion hectares of arid, semi-arid, and dry sub-humid land.[6] This region has the most number of people affected by desertification and drought. According to the International Soil Reference and Information Centre, water erosion is a dominant feature in degraded soils in South and Southeast Asia followed by chemical deterioration and wind erosion.[7] Water erosion covers 21 per cent of the total land area in the region (or 46 per cent of the total degraded area). It is predominant in large parts of China, India, and in the sloping parts of Indochina, the Philippines, and Indonesia (Figure 10). Water scarcity is particularly serious in Southern Asia and Northern China.

Figure 10: Soil Degradation in Southeast Asia



Source: ISRIC.

The effects of climate change will further aggravate the situation through higher and more variable temperatures, changes in precipitation patterns, and increased occurrences of extreme weather events (Nelson, *et al.*, 2010). According to recent projections by IFPRI, Asia's production of irrigated wheat and rice will be 14 and 11 per cent lower, respectively in 2050 than in 2000 due to climate change (Figure 11) (Fan, 2011).

Figure 11: Climate Change Impact on Crop Yields in Asia, 2050

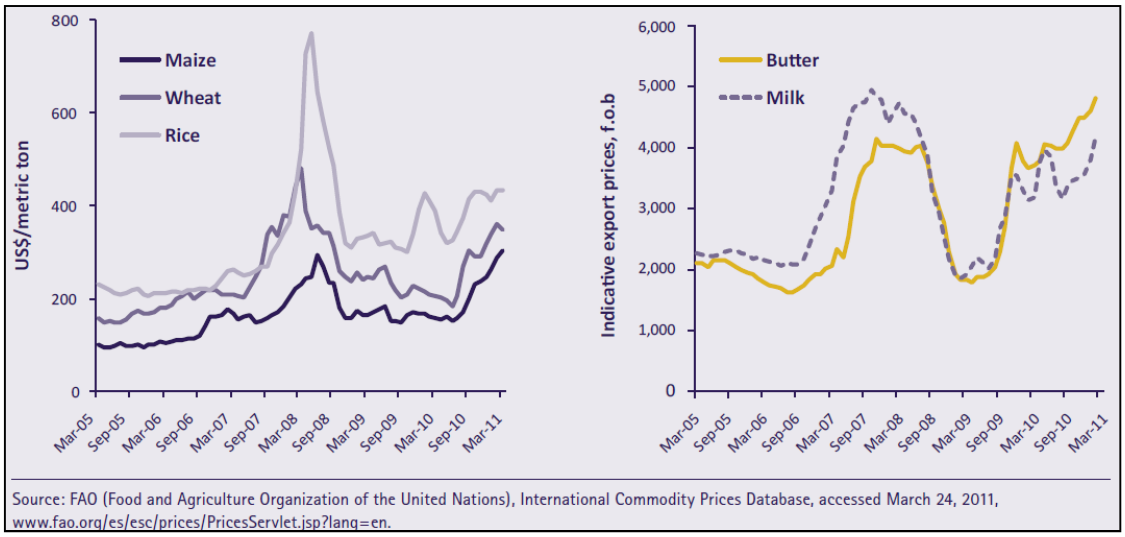
ASIA	
Crop	**Change in Production (%)**
Rice	
Irrigated	**-10.47**
Rainfed	**0.66**
Maize	
Irrigated	**-5.54**
Rainfed	**1.71**
Wheat	
Irrigated	**-13.50**
Rainfed	**-1.91**
Soybeans	
Irrigated	**-6.73**
Rainfed	**8.58**

Source: IFPRI, 2011.

2.4. Food Price Rise and Volatility

Another trend that has emerged in recent years is the rise in food prices and increased food price volatility. In just five years, international prices of major food commodities have risen sharply on two occasions, in 2008 and in 2011, a situation not seen in international food markets since the 1990s.[8] Between January 2007 and mid-2008, the FAO Food Price Index (FPI) more than doubled with nearly all food commodities experiencing significant price increases, ranging from 49 per cent for sugar and 192 per cent for oils. By the end of 2008, prices started to fall but remained higher than their pre-spike levels. In the second half of 2010, international food prices then started to rise sharply again, surpassing the peak levels of 2008. The FAO FPI increased by 41 per cent between June 2010 and February 2011, while the price of cereals jumped by 71 per cent during the same period (Figure 12).

Figure 12: Price Hikes in Food Commodity Prices 2005–2011



Source: FAO (Food and Agriculture Organization of the United Nations), Internaltional Commodity Prices Database. Available at: www.fao.org/es/esc/prices/PricesServlet.jsp?lang=en (accessed March 24, 2011).

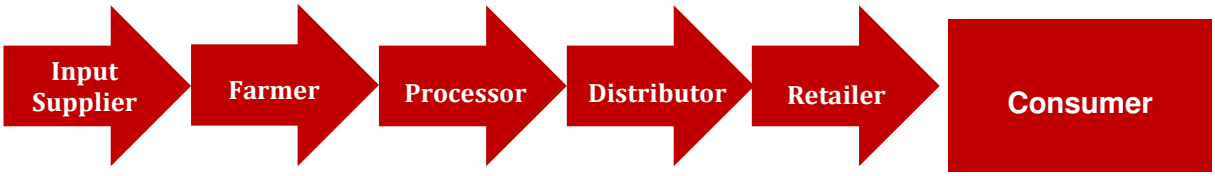
2.5. Energy Security and Biofuels

Closely linked to increasing food prices is the rising cost of fuel which has a direct impact on the price of fertilizers. In addition, higher oil prices can also negatively impact the cost of transportation and shipping thereby affecting the cost of transporting food from source to consumer. Unfortunately, the price of crude oil will continue to fluctuate in the coming decade given continued strong demand from emerging countries. An increasingly worrying trend resulting from this is the expansion of biofuel production and its competition with food crops for available land and other resources. Biofuel production based on agricultural commodities increased more than three-fold from 2000 to 2008. A number of Asian countries (e.g. India, Thailand and China) have increased their pro-biofuel policies resulting in an expansion of their biofuel industries.

2.6. Supply Chains and the Supermarket Phenomenon

Lastly, Asia has witnessed a rapid transformation of its supply chains in just two decades, mostly as a result of massive investments by the private sector (Figure 13). The way food is now being produced, processed, packaged, transported and distributed has changed dramatically over the years (Teng and Escaler, 2012).

Figure 13: Transformation of the Supply Chain



Rapid technological developments are increasing the efficiency of the processing sector. Wholesalers have become agricultural providers, operating a cluster of agricultural services. As traditional supply chains shorten, the village trader or broker role has diminished as larger companies increase direct involvement with farmers, which tends to increase the efficiency of the supply chain, and help in quality differentiation and traceability. In logistics, traders are increasingly investing in facilities and trucks at vastly different rates across the region. Investment in private logistics is increasing as specialised wholesale actors dedicated to supermarkets expand operations in parts of Asia. At the same time, the industry is also witnessing the multi-nationalisation and regional integration of logistics.

Supermarket shares in food retail have increased much to the chagrin of traditional shops and wet markets (Reardon, *et al.*, 2010). The first Asian countries to experience the "supermarket revolution" included East Asian countries like South Korea, Taiwan and the Philippines in the early to mid-1990s. They saw the average share of supermarkets in food retail go up from approximately 10 to 20 per cent in the early 1990s to 50 to 60 per cent by the early 2000s (Reardon and Gulati, 2008). They were then followed by countries such as Indonesia, Malaysia and Thailand, which saw the average share of supermarkets in food retail increase from 5 to 10 per cent in 1990 to 30 to 50 per cent by the mid-2000s. The most recent wave of countries (e.g. China, India and Vietnam) has seen supermarket shares in food retail

reaching 2 to 20 per cent of the market, thus experiencing the fastest supermarket spread in history (Reardon and Gulati, 2008). The supermarket phenomenon has obvious implications on food security, particularly for the millions of small farmers in the region. While supermarkets may provide higher quality, safer and cheaper produce for urban consumers, market participation by these small farmers is lower (Minten and Reardon, 2008).

The transformation of the supply chain therefore causes greater challenges for both farmers and small- to medium-sized suppliers, while urban consumers tend to benefit from the supermarket revolution in terms of improved economic and physical access to food.

The analysis in this section further demonstrates an underpinning feature of food security today, which is that national food security is strongly linked to regional and global food security due to the many aspects of a globalizing economy and international food supply chains, especially of the major food commodities such as wheat, corn and soybeans. Hence, any pro-active approach to managing food security in ASEAN must be cognizant of developments and the situation in other Asian countries specifically and in other world regions, generally. A food insecurity situation in one country may well precipitate supply disruptions to another country due to increased competition for the same goods.

3. Re-thinking Food Security: 4-Dimensional Approach

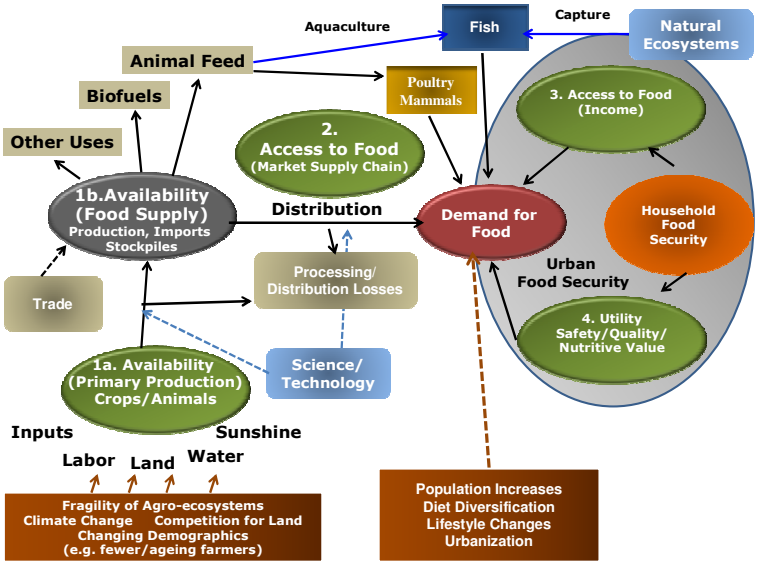
Most countries in the region have responded to the challenges of food security by strengthening existing policies and implementing new policies geared towards increasing the supply and availability of food. The types of policy instruments adopted by governments depend largely on whether a country is a net importer or exporter of food. These policies, however, are centred on pricing strategies to minimise the impact of increased prices on the population, and neglect issues that relate to the physical access to food such as poor infrastructure, inadequate logistics for food distribution and market imperfections. In addition, agricultural related policies have been targeted at increasing productivity and total production through

tax reduction, credit extension, seed and fertilizer subsidies, price subsidies and food stockpiling.[9] Trade restrictions have also been imposed in an attempt to control increased prices of agricultural commodities and to ensure sufficient supplies for domestic markets, as with rice during the 2007-2008 crisis.

The above policy responses, however, are no longer considered adequate in the face of growing complexities in food security ecosystems. The experience of the past 50 years has demonstrated that food security is not simply about increasing the physical supply and availability of food. It is also about improving an individual's ability to access and secure good quality and nutritious food. This realization led to the recognition of the multi-dimensional nature of food security.

In 1996, the Food and Agricultural Organization (FAO) moved away from the initial focus of food availability and redefined food security as a condition "when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".[10] This definition may be interpreted to suggest that food security can only be achieved if the following four basic dimensions are simultaneously met: 'availability', 'physical access', 'economic access' and 'utilization' (Teng and Escaler, 2010). The FAO often adds a fifth dimension, 'stability', to emphasise the importance of the stability of the four dimensions over time. While each dimension is necessary for overall food security, they may weigh in differently in a rural setting as compared with an urban setting and even across countries with different incomes and net food trade balances (Teng and Escaler, 2010). Pictorially, this has been represented as a conceptual model in which the components of food security are considered as four dimensions to illustrate the complex interplay of factors that influence each dimension (Figure 14).

Figure 14: Conceptual Model of Food Security



The first dimension of food security, is food availability (left hand side, Figure 14), which addresses the food supply side, whether through primary production of crops and animals, or reserve stocks levels, or food imports. Raising agricultural productivity is the primary need of this dimension, particularly for countries that are more dependent on agriculture. On the other hand, imports and reserves play a larger role in net-food importing countries that are predominantly urban such as Singapore and Hong Kong. Food availability may also be influenced by alternative uses of agricultural products, such as for biofuel production or for animal feed, especially for the fast growing aquaculture industry due to the decline in captured fish from wild fish stocks (top, Figure 14).

A number of forces impact on food availability and include, but are not limited to, the state of agro-ecosystems, climate change, competition for land, changing demographics and various socio-economic and cultural factors that determine where and how farmers perform in response to market conditions. National planning efforts by governments to ensure food availability should take into consideration these forces as well as potential external shocks from major trading partners. While food availability is necessary, and often the focus of much of the discussions, it is not sufficient on its own to ensure food security at the household level.

The second dimension of food security is the physical access to food. Consumers and in particular, vulnerable households must be able to physically reach food supplies, whether through their own production or through the marketplace. Factors that can impact on this dimension include war and conflict, poor infrastructure, inadequate logistics for food distribution and market imperfections. These problems are more likely to exist in more isolated rural areas. For urban populations, market supply chains are the main distribution channels for food, so in cities, raising the efficiency of market supply chains to deliver food to consumers is a primary concern. Currently, 50-57 per cent of the cost of food is attributed to post farm gate expenses in the supply chain, such as processing and logistics (Reardon, 2011).

Given that the dynamic changes in the food supply chains discussed in Section 2 are creating both challenges and opportunities for Asia, it is important that governments recognise the shifting environment. At present, the private sector tends to move too fast for many governments to keep up, hence policies should be created to maximise the advantages brought about by the changing environment, as well as minimise the marginalisation of vulnerable groups. The on-going regional efforts towards economic integration in ASEAN may provide an opportunity to rethink the concept of the supply chain, and consider a "Meta-national" approach that builds upon competitive regional advantage and is based on a single commodity. Section 5 of this paper will provide elaboration on this approach.

The level of science and technology in a country can heavily influence the 'Availability' and 'Physical Access' dimensions of food security. Countries that have invested more in agricultural research and development, whether through better seeds and inputs or better post-harvest and processing technologies or better infrastructure, generally have higher agricultural productivity levels and incur lower losses in food production and distribution.

Economic access to food or the ability of a household to buy the food it requires is the third dimension in the model (Figure 14) and is a critical component of food security. This is a concern for both developed as well as less developed countries and weighs in more heavily in an urban setting where poorer consumers can spend a significant proportion of their household budget on food. Factors that influence this

dimension include employment and income security, macro-economic policies and of course, market prices. Governments must manage this dimension carefully to ensure access to affordable food since any small increase in price can result in fewer meals a day for the more vulnerable sectors of society and become a catalyst for civil disobedience.

The last dimension in the model is food utilization which is typically reflected in the nutritional status of an individual. A household may have the capacity to purchase all the food it needs but it may not always have the ability to utilise that capacity to the fullest (Reardon, 2011). Factors that can influence this dimension include the quantity and quality of food, general child care and feeding practices, food preparation, food storage and an individual's health status (Riely, *et al.*, 1999). It is not sufficient to have enough food if it cannot be consumed properly due to poor health or if food safety is wanting. Many of the urban poor live in sub-optimal living conditions and are often more prone to falling ill. As the distance between consumers and the source of food increases in urban areas, there is a greater need to ensure the freshness and safety of foods as they are transported over longer distances.

The interplay of a range of interconnected factors operating at various levels strongly suggests that different sets of policies, services and interventions will be required to help countries develop comprehensive solutions to food security. In addition, it is equally important that they do not conflict with one another or with other development objectives. Interconnected policy-making is just as critical (Foresight, 2011).

When viewing food security in this multi-dimensional representation, a time element further needs to be imposed. This is the distinction between acute and chronic food insecurity. Acute food insecurity is caused by factors such as unexpected severe weather events, natural calamities and pest or disease outbreaks, all of which are common in some ASEAN member countries. Chronic food insecurity is insidious and exemplified by the low level of nutrition and prevailing hunger that exists among the poorer echelons of society.

4. Food Security in ASEAN: Frameworks and Responses

As countries in Southeast Asia grapple with the realities of these new trends and challenges, ASEAN's record of responding to food security is rather mixed. So far, ASEAN's efforts in achieving food security is focused largely on the first dimension of food security approach—food availability through primary production and supply of food, including through trade and building food reserves. Most of the efforts have also been directed at meeting acute food insecurity.

Within the AEC framework, one observes that ASEAN cooperation in food security is currently more focused on sustaining agricultural production, while enhancing the competitiveness of the region's food, agricultural and forestry products. Building upon the experience of certain member states and existing international standards, the priorities being addressed are the harmonisation of quality and standards, assurance of food safety, and standardisation of trade certification.

Efforts at enhancing ASEAN competitiveness is indeed important given that at the global level, Indonesia, Thailand, Vietnam, Malaysia, the Philippines and Myanmar rank among the world's top three agricultural exporters of palm oil, cloves, cinnamon, coconuts, rice, shrimp, rubber, pineapple and eggs, cashew pepper, coffee, pigeon peas, cowpeas and sesame (Figure 15).

Figure 15: ASEAN Countries as Global Agri-food Players

Country	Major Ag Commodities Produced	World Ranking (2011)
Brunei	rice, vegetables, fruits; chickens, eggs	
Burma	rice, vegetables, beans, fruits, groundnuts, sugarcane	2- pigeon peas, beans; 3- mustard seed
Cambodia	rice, cassava, maize, vegetables, sugar cane	
Indonesia	rice, cassava (tapioca), sugar cane, palm oil, maize, coconuts, bananas, fruits, rubber	1- palm oil, cloves, cinnamon, coconuts; 2 – rubber, nutmeg; 3 – rice, coffee, cassava
Laos	rice, vegetables, sugar cane, maize, cassava, sweet potatoes	
Malaysia	palm oil, rice, chicken meat, rubber, sugar cane, coconuts	2 – palm oil; 3 - rubber
Philippines	sugarcane, rice, coconuts, bananas, maize, vegetables, fruits	2 – coconuts, pineapple; 3 - bananas
Singapore	eggs, vegetables	
Thailand	sugar cane, rice, cassava, maize, rubber, fruits	1 –rubber, pineapple; 2- eggs; 3 – palm oil
Vietnam **Source: FAOSTAT**	Rice, sugar cane, cassava vegetables, maize, pigmeat, fruits	1- cashew pepper; 2 - coffee; 3 –

There is also the realisation that efforts must be stepped up to increase intra-ASEAN agricultural trade. In 2010, intra-ASEAN agriculture trade (agro-based, rubber-based and fisheries) amounted to US$78 billion in 2010. This translates to a 1.7 per cent increase from 2003 and makes up 7.3 per cent of total ASEAN exports (Figure 16). The limited growth in intra-ASEAN agriculture trade may be in part attributed to little product specialization in the agro-based and fisheries sectors of ASEAN and each economy producing a wide range of products, which does not encourage intra-regional trade. Moving forward, the aim to increase intra-regional agricultural trade under the AEC would depend on the willingness of member states to cooperate and implement coordinated policies in the agro-based and fisheries sectors. This will also determine the development and growth of the regional agriculture and fisheries sectors.

Figure 16: ASEAN Exports of Priority Integration Sectors' Products

Products	2003 (US$ billion)	2010 (US$ billion)
Agro-based	11.7 (2.6)	38.9 (3.6)
Rubber-based	6.8 (1.5)	25.7 (2.4)
Fisheries	6.8 (1.5)	13.6 (1.3)
Wood-based	10.1 (2.2)	11.0 (1.0)
Textiles and apparel	21.9 (4.8)	39.1 (3.7)
Electronics	194 (42.8)	195 (18.2)
Automotive	11.4 (2.5)	45.8 (4.3)
Total	263 (58.0)	369.4 (34.5)

Note: the numbers in the brackets are share (%) to total ASEAN exports.
Source: ASEAN Community in Figures, 2011, ASEAN Secretariat; calculation by Sanchita Basu Das.

Improvements in trade facilitation measures outlined in the AEC framework are also aimed at enhancing food security in ASEAN. In this regard, ASEAN has added logistics as its 12th priority sector and adopted the Master Plan of ASEAN Connectivity (MPAC), which outlines regional initiatives to promote physical, institutional and people-to-people connectivity. These measures relate to the speed, frequency and ease of transport; border clearance and transit services; along with the expenses of wholesale and retail distribution. The MPAC is expected to address the region's problems of inadequate and inefficient logistical services, which have led to excessive spoilage of perishable products.

Despite ongoing efforts to improve food availability through the promotion of trade, it has also been observed that agriculture trade in ASEAN suffers from protectionism, with countries often imposing high non-tariff barriers in the form of additional charges and taxes or quota restrictions (Dios, 2007). As the region enters a transitory phase towards the AEC, countries may rely on non-tariff barriers to counter domestic pressures. Such measures will have an impact on the four dimensions of food security: a) availability (with two aspects - primary production and supply of food, including building food reserves and trade); b) access (market

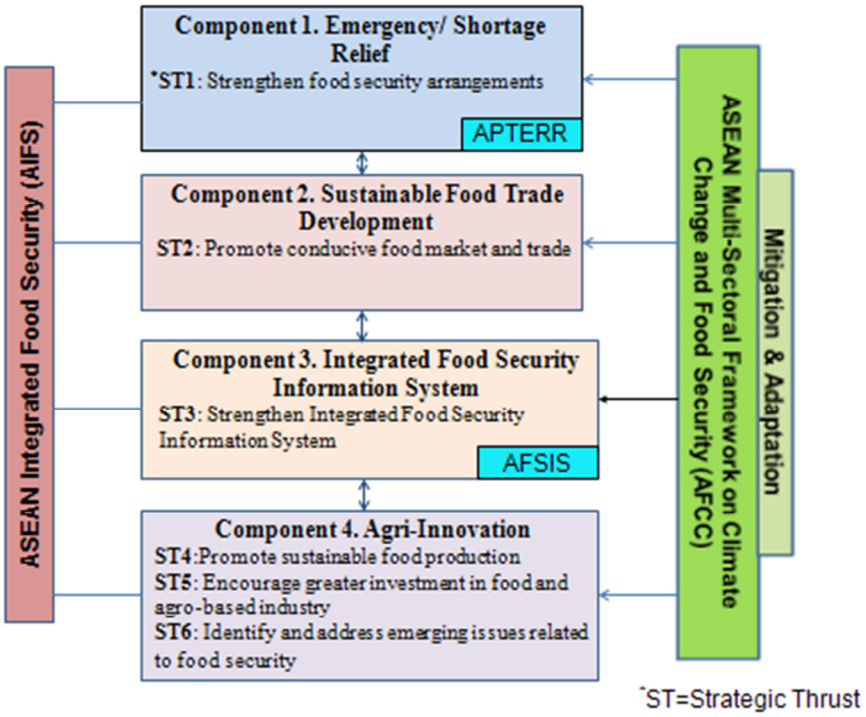
supply chain/ distribution); c) access to food (affordability/ income); d) utilization (safety and quality or nutritive value). As non-tariff barriers may negate the positive effects from the elimination of tariffs, it should not be assumed that the AEC will bring about greater benefits for food security. In the worst case scenario, prices could be pushed up higher than originally and lead to food price crises and civil disobedience.

The ASEAN experience with the food crisis in 2007-2008 has compelled the grouping to build and strengthen existing regional mechanisms to address the challenges posed by food insecurity. Some of these mechanisms are highlighted below:

a) **Crafting Food Security Blueprint:** ***ASEAN Integrated Food Security (AIFS) Framework and the Strategic Plan of Action on Food Security (SPA-FS)***

In 2009, ASEAN adopted the ASEAN Integrated Food Security (AIFS) Framework to advance cooperation on food security among member states and work towards long-term food security.[11] The AIFS Framework is supported by the Strategic Plan of Action on Food Security (SPA-FS). The initial priority commodities for ASEAN are rice, maize, soybean, sugar and cassava.

Figure 17: Schematic Representation of the Key ASEAN Initiatives on Food Security



The AIFS Framework comprises of four components (Figure 17). The first component Food Security and Emergency/Shortage Relief is to be realised through the strengthening of regional food security arrangements. The second component on Sustainable Food Trade Development looks at promoting a conducive environment for food markets and trade. The third component on a regional Integrated Food Security Information System is to be attained by enhancing ASEAN's Integrated Food Security Information Systems (AFSIS) that aims to forecast and monitor supplies and the utilisation of basic food commodities. The fourth component of the AIFS Framework on Agricultural Innovation is focused on the promotion of sustainable food production. This component aims to encourage investment in food and agro industries and enhance food security by identifying and addressing emerging trends and issues.

To achieve the goal of ensuring long-term food security and to improve the livelihoods of farmers in the ASEAN region, the SPA-FS aims to increase food production; reduce postharvest losses; promote conducive market and trade for agriculture commodities and inputs; ensure food stability; promote availability and accessibility to agriculture inputs; and operationalise regional food emergency relief arrangements.

b) Building Mechanisms for Emergency Food Reserve: ASEAN Plus Three Emergency Rice Reserve (APTERR)

Launched in July 2012 by ASEAN and its Plus Three members, Japan, China and South Korea, the primary impetus for the APTERR was the 2007-2008 food price crisis, which caused great uncertainty in the regional rice market and led to export bans and extreme import orders.[12] The APTERR aims to make rice available during emergencies, stabilise the price of rice, and improve farmers' income and welfare, (Aprichart, 2012) and ultimately improve food security without distorting the international rice market.

The APTERR comprises earmarked pledges (commitments from national reserves) and physical pledges (rice exclusively allocated to the APTERR). Earmarked pledges form the major part of the commitments, a total of 787,000 tons. The Plus Three countries account for 700,000 tons; while the ASEAN member countries have pledged a total of 87,000 tons (Figure 18).

Figure 18: ASEAN Plus Three Emergency Rice Reserve

Countries	Earmarked quantity (tons)
Brunei Darussalam	3,000
Cambodia	3,000
Indonesia	12,000
Lao PDR	3,000
Malaysia	6,000
Myanmar	14,000
Philippines	5,000
Singapore	5,000
Thailand	15,000
Viet Nam	14,000
ASEAN	***87,000***

Source: ASEAN Plus Three Emergency Rice Reserve Agreement, 7 October 2011.

To put these commitments into perspective, Southeast Asia and East Asia combined consume 542,000 tons per day, meaning that the reserves total less than two days of regional consumption.[13] The contribution of each ASEAN country is roughly its domestic consumption of rice for one day. This is low considering that national rice reserve strategies likely endeavour to provide

for at least one or two weeks of domestic consumption. Considering that some countries in Southeast Asia are among the world's largest rice producers and consumers, there is significant scope to increase ASEAN pledges. Under the APTERR, rice will be made available through a three-tier system involving special commercial contracts; emergency grants and loans; and delivery of donated rice in times of acute emergency.

To successfully and cohesively move forward with the APTERR, ASEAN Plus Three countries need to be consistent in their strategic engagement in the rice sector (Trethewie, 2013). While the Plus Three countries have shown a significant level of commitment, ASEAN member states appear to be persisting with their historically lukewarm support for regional emergency rice reserves by again committing to minimal rice pledges, despite some of them being among the world's biggest producers, exporters and stockpilers of rice. Furthermore, there is scope for some ASEAN members to increase their financial commitment to the APTERR Fund to boost operational capacity and potentially enhance Tier Three rice procurement. Member countries must pay attention to such challenges, and continue to work to boost the level of commitment.

Given that inefficient request and delivery processes were a key factor behind the non-utilisation of past reserves, the APTERR should implement a straightforward, practical system for emergency releases of rice. The development of processes and other institutional issues could be the most cumbersome of the challenges faced by the APTERR. Developing complementary laws and policies on rice reserves and rice trade will not be easy. Countries in the region also vary in their capacity to implement their APTERR responsibilities. Information on the quantity of rice in national reserves is also scarce and few Asian countries have formalised their national policies on rice reserves. All these factors could undermine the effectiveness of the scheme. Other key issues include financial sustainability and the challenge of balancing the goal of food security with the cost of storage. Member countries will need to provide strong financial support for the operation of the scheme. The depth of the commitment of the ASEAN Plus Three members to the scheme, both in terms of financial support and earmarked rice pledges, will be vital.

c) Building Capacity: ASEAN Food Security Information System (AFSIS)

The ASEAN Food Security Information System (AFSIS) project was set up by ASEAN and its Plus Three members, Japan, China and South Korea in October 2002 due to growing concern over food security in East and Southeast Asia. The project was carried out between 2003 and 2012, and was led and coordinated by Thailand's Ministry of Agriculture and

Cooperatives with funding from Japan through the ASEAN Trust Funds. Its overall objective is to strengthen food security in the region through the systematic collection, analysis and dissemination of food security related information.

The implementation of AFSIS was focused on human resource development through knowledge sharing and mutual technical cooperation among ASEAN member states to enable member states to provide accurate, reliable and timely information required for the construction of regional food security information, and the development of an early warning and commodity outlook information to facilitate the management of food security policies and programmes. It was envisioned to enable the assessment of food security situations in the region and help identify areas where food insecurity is likely to occur.

While the AFSIS project saw remarkable progress in terms of operationalisation, the quality of data and their reliability has remained a concern.[14] Data quality could be improved through periodic analysis and the monitoring of food situations such as supply and demand balances, trade and prices. Technology transfer would also be essential to help countries with limited technical capacity improve their data collection methodology. Information dissemination could be improved further by establishing links and synergising efforts among governments, non-governmental organisations (NGOs), the private sector and farmers.

5. Pathways for ASEAN Food Security Beyond 2015

The ASEAN initiatives described in the previous section are certainly steps forward to strengthen efforts in addressing the challenges of food security. Nonetheless, one can argue that given the multi-dimensional nature of food security, more can be done to enhance current efforts to build a more coherent and targeted approach to ASEAN food security, as informed by the 4-dimensional framework outlined in Section 3.

In this regard, ASEAN needs to pay more attention to four sets of factors in crafting a more robust policy toward food security. These are farm-level factors, policy and trade, demand and price and environmental factors, which need to be balanced if countries aim to have a more robust approach in withstanding food security threats. Our analysis suggests that two major overlapping pathways may be

followed to achieve a comprehensive food security framework. Pathway 1 is crafting an integrated approach to food security, and Pathway 2 is ensuring that an integrated approach is aligned with the goals of AEC 2015 and beyond.

Pathway 1: Moving towards an integrated approach to food security

In order to have a more integrated approach to food security, policy makers need to be cognizant of the inter-relatedness of the 4-dimensions of food security: availability, physical and economic access to food, as well as its utilization. The recent initiative called the "Rice Bowl Index" (www.ricebowlindex.com) provides interesting analyses on the dynamic relationship of the following factors which are instructive in crafting a more integrated approach on food security (Syngenta, 2012). The study establishes that:

a) In countries where agriculture contributes substantially to GDP, **Farm-level Factors** have the greatest impact when considering how robust the food security system might be. This reflects a larger segment of the population being directly dependent on the production off the farm or the income generated from it. Given that farm-level Factors fluctuate more than other factors irrespective of the overall stability and robustness of the food security system, there is therefore a need to improve the overall contribution of Farm-level Factors to food security robustness while recognizing that year to year fluctuation is inevitable. Agricultural R&D and extension services, whether public or private, have an important role to ensure farmers have access to the latest technologies and adequate inputs to produce more output.

b) Periods of greater price volatility result in **Demand and Price** having more impact on the robustness of a country's food security system. Stability of price and production is very important in considering food security and the capacity of a country to achieve it. Population growth and urbanization present direct and indirect challenges to a country's capacity to address food security challenges as it also impacts the demand for food and the price of food. Price volatility may be reduced if export policies are not restrictive in conditions of acute food security and regional commitments should be fostered to commit to this.

c) The **Policy and Trade** environment within a country has a longer-term impact on the overall stability of a country's food security system. A more stable and predictable policy environment, supported by free and open markets improves the overall robustness of the food security system. With the increasingly globalized food supply chain, policy which facilitates unhindered trade between ASEAN member countries and other trading partners, will assure that there is continued physical access to food.

d) **Environmental Factors** impact system robustness over an extended period and although change is generally gradual, extreme weather shocks can have immediate impact. It is important to avoid policy myopia on Environmental Factors because the opportunity for improving performance is substantial, while any intervention is likely to require significant time to manifest in positive change. It is essential that available resources are used in a sustainable manner.

Overall, the study points out that a country's capacity to address food security challenges is likely to be more robust where there is more balance between the four rubrics. This suggests that an ASEAN regional approach which targets all of the contributing components is necessary to achieve a stable and robust food system. This approach would also necessarily subsume the four food security dimensions (availability, physical access, economic access, utilization) and help ASEAN have an integrated approach towards food security as outlined in the first pathway. This would also incorporate the 4 components outlined in the AIFS framework mentioned earlier – Emergency/Shortage Relief; Sustainable Food Trade Development; Integrated Food Security Information System; and Agricultural Innovation.

An integrated food security approach can further be advanced if ASEAN could also re-think the value of adopting a 'Meta-national' approach to supply-chain which aims to transcend boundaries in order to build upon the region's comparative advantage. The "Meta-national" concept of a single supply chain is developed based on commodity and not country. This would arise from the principle of "comparative advantage", in which the location of any part of the supply chain is determined by the efficiency at that location. Corporations may leverage on resources around the region or globally to build competitive advantage and harness advantages beyond their own firms or home countries. It is also conceivable that harmonised food production, processing and quality standards become an accepted part of the

comprehensive system, to result in quality equivalency and transportability of foods across countries.

This approach will enable ASEAN to act as a single trade block when dealing with extra-ASEAN exporters and importers. As a global supplier of key commodities, trade outflows would be better coordinated. Further, as a globally important importer of key commodities, supply stability and price setting could be much better coordinated across ASEAN member countries for corn and soybeans, in particular, and if synchronized with the Plus Three countries.

Aside from the above, ASEAN may also consider the utility of the commodity futures markets and how it could play a role in reducing price volatility given its ability to enable price discovery and price stabilisation. A key benefit of a commodity futures market is the ability of market participants to shift the future price risks that they take on themselves to a central clearing house. Outsiders, however, participate in futures market purely for speculative investment. Well-functioning agricultural futures markets are therefore important for both consumers and producers as it allows hedging against price fluctuations and offers useful indicators about expectations of future price developments.[15] Concerns of excessive speculation in derivative markets may be reined in with appropriate financial supervision such as transparency regulations and through reporting requirements for acquired positions and upper limits to regulate market power. This task to achieve greater transparency and appropriate regulation of the international commodity markets has been set by the G20 leaders, and ASEAN could play an important role as six ASEAN countries are among the world's top agricultural producers.

Pathway 2: Moving towards aligning food security to AEC2015 goals and anticipated changes in ASEAN.

An integrated food security approach for ASEAN would necessarily be aligned to the AEC 2015 goals of establishing a dynamic and competitive, but also an inclusive and equitable ASEAN community. In this regard, we highlight key issues that must be taken on board to advance an integrated food security approach.

1. Food Security and social protection

Aside from the 4-dimensions of food security cited in Section 3, there is also a need to re-think policies that address the issues of individual access to food through policies such as those on social safety nets. These are needed to meet one of the stated goals of the AEC to have an equitable economic development and narrow the development gap.

Some countries in Southeast Asia still have a very high incidence of extreme poverty; more than 40 per cent of the population in Cambodia, Lao PDR and Timor-Leste and more than 20 per cent of the population of Indonesia, the Philippines and Vietnam live on less than USD 1.25 a day. Currently, social protection exist mostly in the form of safety nets, which are non-contributory transfer programmes targeted at the poor and vulnerable (Grosh, *et al*., 2008), who would be more exposed to risks of food insecurity than other segments of the population. The main objective of food-based safety net programmes is therefore to provide adequate food and help poor consumers achieve and maintain better nutritional status. In the absence of such intervention, the poor would likely decrease their food consumption, which may result in problems such as malnutrition, disease and possibly death. Countries in Southeast Asia already have a number of food-based safety net programmes including supplementary feeding programmes, food-for-work programmes, food stamps, vouchers, coupons and food price subsidies. However, most of these programmes are poorly targeted resulting in a high rate of leakage to non-poor households.[16]

Policy initiatives which have been used in other regions to increase economic access to food include:

- Reduced taxes, customs duties
- Food assistance, distribution
- Food price subsidies
- Imposition of safety nets
- Conditional cash transfers
- Price controls, and
- Release of stocks.

Some of these are relevant to ASEAN but may have to be selectively adopted to meet local situations. The use of social safety nets to address the food security of the poor or near poor can be undermined by protectionist trade policies. In the case of Indonesia, an import ban on rice was introduced in 2004 to stabilise domestic prices after the end of the Asian Financial Crisis. While social protection measures ensured that poor households were entitled to purchase 25 per cent of their monthly rice consumption at

subsidised prices, the prevalent availability of subsidised rice, the low price elasticity of rice demand and the import ban on rice led to higher domestic prices (Sudarno and Bazzi, 2011). As a result, poor households had to purchase the remaining 75 per cent of their monthly rice consumption at higher prices, which challenged the government's rationale behind its social protection policy. The ban on imports also led to a 1.8 per cent increase in poverty incidence between 2005 and 2006 as many households were unable to cope with the rising prices of rice (Sudarno and Bazzi, 2011).

2. Investing in R&D for food production (agriculture, aquaculture)

To continue economic growth and development, and poverty and hunger reduction, food security through sustainable agriculture is imperative. During the "Green Revolution" of the late 1960s, smallholder farmers, who adopted new innovations such as improved seeds, inputs, and farming practices, increased their productivity, and contributed to increased food security and higher income for people in the region. The same, if not more, needs to be done for smallholder farmers today, particularly for women farmers who make up a large share of the agricultural workforce in a number of ASEAN countries. Increased investments and institutional innovations should strengthen the access of farmers to input and output markets, financial and extension services, education, and rural infrastructure, including irrigation and rural road networks (Fan, 2011). However, unlike farmers in the past decades, smallholder farmers today have to overcome new challenges such as climate change, a more globalised trading system, a more consumer demand-driven market, increased competition and more sophisticated food supply chains and distribution channels which require regulatory scrutiny.

Having played a critical role during the Green Revolution, a sustained investment in science and technology will continue to improve the agricultural system today and in the future. Decades of neglect by governments and the international community were one of the contributing factors to the food price crisis in 2007-2008. There still remains a lot of room to increase yields of smaller and less efficient farms with current technologies and practices. Moreover, reducing food losses due to inadequate post-harvest technologies, storage or inefficient processing could significantly boost food supply but is an often neglected strategy.

Looking to the future, agricultural research should focus on new technologies that are greener, more adaptable, more affordable and more suitable for smallholders, and also on innovations that will help both large and small farmers adapt to future challenges of climate change and dwindling natural resources. These should also include better technologies in livestock production and fisheries, given the fact that rising income and urbanisation

have led to the increasing diversification of diets. Part of the new pathway towards achieving the AEC goals would require that within ASEAN, transboundary flows of investments and technologies be facilitated through supportive policies and regulations.

R&D partnerships within ASEAN and with international research organizations should be considered as food availability depends heavily on scientific research capacity to generate new technologies. Thailand and Vietnam are particularly well known for their rice breeding for new varieties and for aquaculture research. International research organizations such as the International Rice Research Institute (IRRI) in the Philippines, and the WorldFish Centre in Malaysia, in spite of their global mandates have provided much benefit to the region. The private sector likewise has a prominent presence in ASEAN to provide new production technologies in crops such as corn and various vegetables, especially in improved seeds.

Farmer-oriented policies which support increasing food availability include reduced producer taxes, producer credit and financial support services; production input subsidies, producer price subsidies; marketing and product purchases; increased incentives for investment in R&D; and building of reserves and stockpiles.

3. Incorporating health and nutrition into food security strategies

As adequate nutrition is essential and key to sustainable economic growth, a mere increase in food availability is insufficient. Thus, food security approaches must result in better health and nutritional outcomes, particularly for the poor. The poor must have more opportunities to diversify their diets; improved access to safe water, sanitation and healthcare services; better education (particularly women's education) regarding nutrition and general childcare and feeding practices; and targeted distribution of supplements in situations of acute micro-nutrient deficiencies. At the other extreme, the problem of over-nourishment, as manifested in the rising incidence of overweight and obesity is becoming more apparent in ASEAN countries and warrants closer attention. Moving forward towards a comprehensive food security framework requires that policies be put in place to explicitly incorporate health and nutrition aspects.

4. Reducing food wastage

There has been evidence to suggest that consumer waste is increasing in industrialising cities such as China and Brazil, and in similar urban environments in Southeast Asia. In developing countries, most food wastage occurs at the early stages of the supply chain such as harvesting, storage and

transport, with relatively little waste occurring at the consumer level. In industrialised countries, consumer behaviour and government interventions that promote surplus production of particular food commodities are the major causes.

Reducing food wastes from the supply chain is necessary because early-stage losses account for a majority of the food wastage in Asia. There are potentially large benefits to prioritising interventions in this area as the adoption of modern technologies in the early stages of supply chains (harvest, storage, transport) in Southeast Asia is relatively low. Measures aimed at the early stages of supply chains are particularly important, such as production planning (so as to align with market requirements); resource-efficient production and processing practices; modern preservation and packaging technologies (which will enhance food availability, safety and shelf life); and transportation and logistics.[17] Further, as Southeast Asia urbanises, food wastage issues are likely to become more salient, and interventions targeting the retail and hospitality sector, and consumer behaviour and attitudes, would need to be increasingly emphasised.

Where food wastage is unavoidable, opportunities to create value from food waste should be explored. Potential areas include redistribution of edible food to those who suffer from a lack of economic and physical access to food and leveraging on available industrial technology to create value from food waste. Examples include conversion of food waste to biogas as a source of electricity for food production, and reprocessing food waste (typically unsold processed food) to produce food for human consumption with added nutritional value.

5. Acknowledging the urban dimensions of food security

With already 45 per cent of all Asians living in cities and with the number steadily increasing, policy makers must acknowledge the urban dimensions of food security. This is of particular relevance given the fact that more and more of the poor and undernourished in Asia are residing in cities. Therefore, urban food security will play an increasingly important role in maintaining peace and stability since a majority of the urban poor in the region spend as much as 50 to 70 per cent of their household budget on food. As the world witnessed in 2007-2008 and in 2011, the sharp increase in food prices resulted in food riots and protests in many cities across the world. Policies and investments to grow an urban agriculture sector will contribute to more comprehensive food security and complement other major sources of agricultural production. There is much room for developing countries to grow in peri-urban agriculture. The success of peri-urban agriculture in cities such as Hanoi, Shanghai, Beijing, Mexico City, Dakar or Accra has shown

how urban farming can contribute to poverty reduction, food security, improvements in nutrition, increased income, environmental protection and increased awareness of the importance of agriculture through on-site education (Teng, *et al.*,2010). In all cases, political will and the appropriate support mechanisms have been the key drivers of success.

6. Toward an Integrated and Harmonised ASEAN Food Security Ecosystem

While the pathways toward an enhanced integrated ASEAN food security framework outlined in this paper would certainly require a lot of work, time and investment, it is important that "ASEAN 2015 and beyond" is seen as taking the lead in setting the agenda of an integrated food security framework for East Asia and beyond.

The recommendations put forth in this section could serve to explicate the Jakarta Framework for an Integrated Food Security component of AEC 2015 and beyond which aims to establish a post-2015 ASEAN that is dynamic and competitive, but is also inclusive and equitable.

1. To achieve sustainable agricultural production and food trade for the region, a strategic approach towards enhancing transboundary flows of agricultural investments, research and technologies should be mapped out and coordinated at the regional level. While doing so, it is important to keep in mind the "Meta-national" concept of food supply chains which transcends countries and allows ASEAN to capitalise on the comparative advantage of member states, hence ultimately building up its competitiveness vis-à-vis the rest of the world.

2. To advance a new food security paradigm, national-level action would be necessary. Governments should be aware that protectionist trade policies have the ability to negate or counter the efforts of social protection, thus coordinated policies among the national agencies of trade, agriculture and social welfare would help to ensure social protection policies benefit the targeted recipients while minimising unintended effects on other segments of the population.

3. To tackle the problem of undernourishment and over-nourishment in the less developed and developed member states, health and nutritional aspects of food security should be incorporated into national food security strategies. As food wastage at the consumer-level is likely to increase with increasing urbanisation, consumer education and strategies to make effective use of food waste or direct avoidable wastage to vulnerable populations should be set in place. These efforts may be promoted by the government and undertaken in partnership with the private sector and local NGOs.

4. To sustain agricultural production in the long term may necessitate agricultural production in urban areas so as to maximise the use of space. While peri-urban agriculture is no substitute for other major sources of agricultural production, the region faces the challenge of limited arable land and diminishing natural resources.

5. To further advance a comprehensive strategy for food security, more effort must be done to strengthen partnership with other regional and international organisations to promote collaborative research and development, and technology transfer in food security and bioenergy.

Within the framework of the East Asia Summit (EAS) and the Asia Pacific Economic Cooperation (APEC), ASEAN can use these bigger platforms to initiate cooperative programmes on food security by engaging with major food-producing countries such as the United States, India and Australia, and build on the existing areas of cooperation in the ASEAN Plus Three. With all the strategic frameworks and plans of actions that have been developed, what is needed urgently is a mapping of the existing frameworks and a recalibration of policies in order to make them more attuned to the new realities of food security challenges.

References

Apichart, J. (2012), 'Current operations of ASEAN Plus Three Emergency Rice Reserve (APTERR)', Presentation delivered at the APEC Food Emergency *Response Mechanism Working Meeting*, Taipei, 10–11 April. Available at (http://apecfsf.tier.org.tw/docs.asp)

Dios, L. C. (2007), 'Non-tariff Barriers to Trade in the ASEAN Priority Goods Sectors', in Hew, D. (ed.), *Brick by Brick: The Building of an ASEAN Economic Community*. Singapore: ISEAS.

Fackler, M. (2009), *Japan's Rice Farmers Fear Their Future is Shrinking*. New York Times. Published on 28 March. Available at: http://www.nytimes.com/2009/03/29/world/asia/29japan.html?pagewanted=all&_r=1& .

Fan, S. (2011), 'Asian food security in a global context.' Paper presented at the *International Conference on Asian Food security* (ICAFS), Singapore 10-12 August. Available at: http://www.rsis.edu.sg/nts/events/docs/ICAFS-Fan_Shenggen.pdf

Foresight (2011), 'The Future of Food and Farming: Challenges and Choices for Global Sustainability', Final Project Report, London: The Government Office for Science. Available at (http://www.bis.gov.uk/foresight/ourwork/ projects/currentprojects/ globalfoodandfarmingfutures/ reportsandpublications)

Grosh, M., C. del Ninno, E. Tesliuc and A. Ouerghi (2008), *For Protection and Promotion: The Design and Implementation of Effective Safety Nets*. Washington, D. C.: World Bank.

Minten, B. and T. Reardon (2008), 'Food Prices, Quality and Quality's Pricing in Supermarkets Versus Traditional Markets in Developing Countries', *Review of Agricultural Economics* 30, pp.480–490.

Nelson, G., M. Rosegrant, A. Palazzo, I. Gray, C. Ingersoll, R. Robertson, S. Tokgoz, T. Zhu, T. Sulser, C. Ringler, S. Msangi, and L. You (2010), *Food Security, Farming, and Climate Change to 2050: Scenarios, Results, Policy Options*. Washington D.C.: IFPRI.

Reardon, T. (2011), *Revolution in Asian Food Supply Chains: Implications for Farmers and Consumers*. IFPRI/MSU Joint Program on Markets in Asia.

Reardon, T. and A. Gulati (2008), 'The Supermarket Revolution in Developing Countries: Policies for "Competitiveness with Inclusiveness"', *IFPRI Policy Brief* 2. June. Washington, D. C.: International Food Policy Research Institute.

Reardon, T., C. P. Timmer, and B. Minten (2010), 'Supermarket Revolution in Asia and Emerging Development Strategies to Include Small Farmers', Proceeding of the National Academy of Sciences. Available at: www.pnas.org/cgi/doi/10.1073/pnas.1003160108

Riely, F., N. Mock, B. Cogill, L. Bailey, and E. Kenfick (1999), *Food Security Indicators and Framework for Use in the Monitoring and Evaluation of Food Aid Programs*, Washington, D. C. : Food and Nutrition Technical Assistance, Academy for Educational Development. Available at: http://www.pronutrition.org/files/Food%20Security%20Indicators%20and%20Framework.PDF

Song, Y., L. Zhang, D. Sun, Q. Sun, and J. Jiggins (2009), 'Feminization of Agriculture in Rapid Changing Rural China: Policy Implication and Alternatives for an Equitable Growth and Sustainable Development', Paper presented at the FAO-IFAD-ILO Workshop on *Gaps, trends and current research in gender dimensions of agricultural and rural employment: differentiated pathways out of poverty*, Rome, 31 March - 2 April.

Sudarno, S and S. Bazzi (2011), 'Social Protection in Indonesia: Past Experiences and Lessons for the Future', Paper presented at the *Annual Bank Conference on Development Opportunities (ABCDE)* jointly organized by the World Bank and OECD, 30 May-1 June. Paris.

Syngenta. (2012), *Rice Bowl Index White Paper: Translating Complexity into an Opportunity for Action*. Available at: http://www.ricebowlindex.com/SiteCollectionDocuments/ricebowl-whitepaper.pdf

Teng, P. S. and M. Escaler (2010), 'The Case for Urban Food Security: A Singapore Perspective', NTS Perspectives, No. 4, Singapore. RSIS Centre for Non-Traditional Security (NTS) Studies.

Teng, P. S. and M. Escaler (2012), *Regional Security Outlook*. Council for Security Cooperation in the Asia Pacific (CSCAP).

Teng, P. S., *et al*. (2010), 'Ensuring Urban Food Security in ASEAN', *NTS Policy Brief*, No. 4, RSIS Centre for Non-Traditional Security (NTS) Studies, Singapore.

Thapa, G. and R. Gaiha (2011), 'Smallholder Farming in Asia and the Pacific: Challenges and Opportunities', Paper presented at the *IFAD Conference on New Directions for Smallholder Agriculture*, Rome.

Trethewie, S. (2013), 'The ASEAN Plus Three Emergency Rice Reserve (APTERR): Cooperation, Commitment and Contradictions', NTS Working Paper no. 8, Singapore: RSIS Centre for Non-Traditional Security (NTS) Studies.

Trostle, R. (2008), 'Global Agricultural Supply and Demand: Factors Contributing to the Recent Increase in Food Commodity Prices', *Economic Research Service*, USDA. Available at: http://www.ers.usda.gov/Publications/WRS0801/WRS0801.pdf

World Bank (2011), *World Development Indicators*. Washington, D.C. Available at: http://data.worldbank.org/news/WDI-2011-database-and-publication-available

ENDNOTES

[1] Statistical Yearbook for Asia and the Pacific (2012). UNESCAP, 6 November. Available at (http://www.unescap.org/stat/data/syb2011/region-fingertips/subreg-SEA.pdf)

[2] United Nations (2010). World population prospects: The 2010 Revision. Department of Economic and Social Affairs/Population Division. New York.

[3] United Nations (2012). World urbanization prospects: The 2011 revision. Department of Economic and Social Affairs/Population Division. New York.

[4] Food and Agricultural Organisation (FAO). FAOSTAT database. Available at (http://faostat.fao.org/)

[5] APEC PSU. (2012). Food security policies in APEC. Available at http://publications.apec.org/publication-detail.php?pub_id=1326

[6] United Nations Convention to Combat Desertification (UNCDD). (2007). Regional assessment of progress combating desertification and mitigating land degradation in Asia and the Pacific region. Available at (http://www.unescap.org/esd/rim/16/documents/Presentations/UNCCD.pdf)

[7] International Soil Reference and Information Centre (ISRIC). (1997). The assessment of the status of human-induced soil degradation in South and Southeast Asia. Available at (http://www.isric.org/sites/default/files/ASSODEndReport.pdf)

[8] APEC PSU. (2012). Food security policies in APEC. Available at (http://publications.apec.org/publication-detail.php?pub_id=1326)

[9] APEC PSU. (2012). Food security policies in APEC. Available at (http://publications.apec.org/publication-detail.php?pub_id=1326)

[10] Food and Agricultural Organisation (FAO). (1996). Rome Declaration on World Food Security and World Food Summit Plan of Action. World Food Summit 13-17 November 1996. Rome.

[11] ASEAN Secretariat. (2011). ASEAN Integrated Food Security (AIFS) Framework and the Strategic Plan of Action on Food Security (SPA-FS) in the ASEAN region 2009-2013. Available at (http://aseanfoodsecurity.asean.org/wp-content/uploads/2011/08/aifs.pdf)

[12] ASEAN Plus Three Emergency Rice Reserve Agreement (2011). Jakarta, Indonesia, 7 October. Available at (http://www.scribd.com/doc/97411992/APTERR-Agreement)

[13] US Department of Agriculture. (2013). Grain: World markets and trade, Foreign Agricultural Service Circular Series FG 01-13, January. Available at (http://usda01.library.cornell.edu/usda/fas/grain-market//2010s/2013/grain-market-01-11-2013.pdf)

[14] RSIS Centre for Non-Traditional Security (NTS) Studies. (2010). Report on Food Security Expert Group Meeting 'Food First: Ensuring Food and Nutrition for Urbanites'. 4–5 August. Singapore.

[15] Federal Ministry of Food, Agriculture and Consumer Protection (2013). Price fluctuations (volatility) of agricultural commodities, Speech, Berlin, Germany.

[16] Hangzo, PK. (2010). Comprehensive food security: An approach to sustainably address food insecurity. NTS Perspectives no. 3, Singapore: RSIS Centre for Non-Traditional Security (NTS) Studies. Available at (http://www.rsis.edu.sg/nts/HTML-Newsletter/Perspective/PDF/NTS_Perspectives_3.pdf)

[17] RSIS Centre for Non-Traditional Security (NTS) Studies (2013), Expert Working Group Meeting on Food Wastage in Southeast Asia (23–24 August 2012), Report, Singapore.

ERIA Discussion Paper Series

No.	Author(s)	Title	Year
2013-20	Barry DESKER, Mely CABALLERO-ANTHONY, Paul TENG	Thought/Issues Paper on ASEAN Food Security: Towards a more Comprehensive Framework	Oct 2013
2013-19	Toshihiro KUDO, Satoru KUMAGAI, So UMEZAKI	Making Myanmar the Star Growth Performer in ASEAN in the Next Decade: A Proposal of Five Growth Strategies	Sep 2013
2013-18	Ruperto MAJUCA	Managing Economic Shocks and Macroeconomic Coordination in an Integrated Region: ASEAN Beyond 2015	Sep 2013
2013-17	Cassy LEE and Yoshifumi FUKUNAGA	Competition Policy Challenges of Single Market and Production Base	Sep 2013
2013-16	Simon TAY	Growing an ASEAN Voice? : A Common Platform in Global and Regional Governance	Sep 2013
2013-15	Danilo C. ISRAEL and Roehlano M. BRIONES	Impacts of Natural Disasters on Agriculture, Food Security, and Natural Resources and Environment in the Philippines	Aug 2013
2013-14	Allen Yu-Hung LAI and Seck L. TAN	Impact of Disasters and Disaster Risk Management in Singapore: A Case Study of Singapore's Experience in Fighting the SARS Epidemic	Aug 2013
2013-13	Brent LAYTON	Impact of Natural Disasters on Production Networks and Urbanization in New Zealand	Aug 2013
2013-12	Mitsuyo ANDO	Impact of Recent Crises and Disasters on Regional Production/Distribution Networks and Trade in Japan	Aug 2013
2013-11	Le Dang TRUNG	Economic and Welfare Impacts of Disasters in East Asia and Policy Responses: The Case of Vietnam	Aug 2013
2013-10	Sann VATHANA, Sothea OUM, Ponhrith KAN, Colas CHERVIER	Impact of Disasters and Role of Social Protection in Natural Disaster Risk Management in Cambodia	Aug 2013
2013-09	Sommarat CHANTARAT, Krirk PANNANGPETCH, Nattapong PUTTANAPONG, Preesan	Index-Based Risk Financing and Development of Natural Disaster Insurance Programs in Developing Asian Countries	Aug 2013

No.	Author(s)	Title	Year
	RAKWATIN, and Thanasin TANOMPONGPHANDH		
2013-08	Ikumo ISONO and Satoru KUMAGAI	Long-run Economic Impacts of Thai Flooding: Geographical Simulation Analysis	July 2013
2013-07	Yoshifumi FUKUNAGA and Hikaru ISHIDO	Assessing the Progress of Services Liberalization in the ASEAN-China Free Trade Area (ACFTA)	May 2013
2013-06	Ken ITAKURA, Yoshifumi FUKUNAGA, and Ikumo ISONO	A CGE Study of Economic Impact of Accession of Hong Kong to ASEAN-China Free Trade Agreement	May 2013
2013-05	Misa OKABE and Shujiro URATA	The Impact of AFTA on Intra-AFTA Trade	May 2013
2013-04	Kohei SHIINO	How Far Will Hong Kong's Accession to ACFTA will Impact on Trade in Goods?	May 2013
2013-03	Cassey LEE and Yoshifumi FUKUNAGA	ASEAN Regional Cooperation on Competition Policy	Apr 2013
2013-02	Yoshifumi FUKUNAGA and Ikumo ISONO	Taking ASEAN+1 FTAs towards the RCEP: A Mapping Study	Jan 2013
2013-01	Ken ITAKURA	Impact of Liberalization and Improved Connectivity and Facilitation in ASEAN for the ASEAN Economic Community	Jan 2013
2012-17	Sun XUEGONG, Guo LIYAN, Zeng ZHENG	Market Entry Barriers for FDI and Private Investors: Lessons from China's Electricity Market	Aug 2012
2012-16	Yanrui WU	Electricity Market Integration: Global Trends and Implications for the EAS Region	Aug 2012
2012-15	Youngho CHANG, Yanfei LI	Power Generation and Cross-border Grid Planning for the Integrated ASEAN Electricity Market: A Dynamic Linear Programming Model	Aug 2012
2012-14	Yanrui WU, Xunpeng SHI	Economic Development, Energy Market Integration and Energy Demand: Implications for East Asia	Aug 2012
2012-13	Joshua AIZENMAN, Minsoo LEE, and Donghyun PARK	The Relationship between Structural Change and Inequality: A Conceptual Overview with Special Reference to Developing Asia	July 2012
2012-12	Hyun-Hoon LEE, Minsoo LEE, and Donghyun PARK	Growth Policy and Inequality in Developing Asia: Lessons from Korea	July 2012

No.	Author(s)	Title	Year
2012-11	Cassey LEE	Knowledge Flows, Organization and Innovation: Firm-Level Evidence from Malaysia	June 2012
2012-10	Jacques MAIRESSE, Pierre MOHNEN, Yayun ZHAO, and Feng ZHEN	Globalization, Innovation and Productivity in Manufacturing Firms: A Study of Four Sectors of China	June 2012
2012-09	Ari KUNCORO	Globalization and Innovation in Indonesia: Evidence from Micro-Data on Medium and Large Manufacturing Establishments	June 2012
2012-08	Alfons PALANGKARAYA	The Link between Innovation and Export: Evidence from Australia's Small and Medium Enterprises	June 2012
2012-07	Chin Hee HAHN and Chang-Gyun PARK	Direction of Causality in Innovation-Exporting Linkage: Evidence on Korean Manufacturing	June 2012
2012-06	Keiko ITO	Source of Learning-by-Exporting Effects: Does Exporting Promote Innovation?	June 2012
2012-05	Rafaelita M. ALDABA	Trade Reforms, Competition, and Innovation in the Philippines	June 2012
2012-04	Toshiyuki MATSUURA and Kazunobu HAYAKAWA	The Role of Trade Costs in FDI Strategy of Heterogeneous Firms: Evidence from Japanese Firm-level Data	June 2012
2012-03	Kazunobu HAYAKAWA, Fukunari KIMURA, and Hyun-Hoon LEE	How Does Country Risk Matter for Foreign Direct Investment?	Feb 2012
2012-02	Ikumo ISONO, Satoru KUMAGAI, Fukunari KIMURA	Agglomeration and Dispersion in China and ASEAN: A Geographical Simulation Analysis	Jan 2012
2012-01	Mitsuyo ANDO and Fukunari KIMURA	How Did the Japanese Exports Respond to Two Crises in the International Production Network?: The Global Financial Crisis and the East Japan Earthquake	Jan 2012
2011-10	Tomohiro MACHIKITA and Yasushi UEKI	Interactive Learning-driven Innovation in Upstream-Downstream Relations: Evidence from Mutual Exchanges of Engineers in Developing Economies	Dec 2011
2011-09	Joseph D. ALBA, Wai-Mun CHIA, and Donghyun	Foreign Output Shocks and Monetary Policy Regimes in Small Open Economies: A DSGE Evaluation of East	Dec 2011

No.	Author(s)	Title	Year
	PARK	Asia	
2011-08	Tomohiro MACHIKITA and Yasushi UEKI	Impacts of Incoming Knowledge on Product Innovation: Econometric Case Studies of Technology Transfer of Auto-related Industries in Developing Economies	Nov 2011
2011-07	Yanrui WU	Gas Market Integration: Global Trends and Implications for the EAS Region	Nov 2011
2011-06	Philip Andrews-SPEED	Energy Market Integration in East Asia: A Regional Public Goods Approach	Nov 2011
2011-05	Yu SHENG, Xunpeng SHI	Energy Market Integration and Economic Convergence: Implications for East Asia	Oct 2011
2011-04	Sang-Hyop LEE, Andrew MASON, and Donghyun PARK	Why Does Population Aging Matter So Much for Asia? Population Aging, Economic Security and Economic Growth in Asia	Aug 2011
2011-03	Xunpeng SHI, Shinichi GOTO	Harmonizing Biodiesel Fuel Standards in East Asia: Current Status, Challenges and the Way Forward	May 2011
2011-02	Hikari ISHIDO	Liberalization of Trade in Services under ASEAN+n : A Mapping Exercise	May 2011
2011-01	Kuo-I CHANG, Kazunobu HAYAKAWA Toshiyuki MATSUURA	Location Choice of Multinational Enterprises in China: Comparison between Japan and Taiwan	Mar 2011
2010-11	Charles HARVIE, Dionisius NARJOKO, Sothea OUM	Firm Characteristic Determinants of SME Participation in Production Networks	Oct 2010
2010-10	Mitsuyo ANDO	Machinery Trade in East Asia, and the Global Financial Crisis	Oct 2010
2010-09	Fukunari KIMURA Ayako OBASHI	International Production Networks in Machinery Industries: Structure and Its Evolution	Sep 2010
2010-08	Tomohiro MACHIKITA, Shoichi MIYAHARA, Masatsugu TSUJI, and Yasushi UEKI	Detecting Effective Knowledge Sources in Product Innovation: Evidence from Local Firms and MNCs/JVs in Southeast Asia	Aug 2010

No.	Author(s)	Title	Year
2010-07	Tomohiro MACHIKITA, Masatsugu TSUJI, and Yasushi UEKI	How ICTs Raise Manufacturing Performance: Firm-level Evidence in Southeast Asia	Aug 2010
2010-06	Xunpeng SHI	Carbon Footprint Labeling Activities in the East Asia Summit Region: Spillover Effects to Less Developed Countries	July 2010
2010-05	Kazunobu HAYAKAWA, Fukunari KIMURA, and Tomohiro MACHIKITA	Firm-level Analysis of Globalization: A Survey of the Eight Literatures	Mar 2010
2010-04	Tomohiro MACHIKITA and Yasushi UEKI	The Impacts of Face-to-face and Frequent Interactions on Innovation: Upstream-Downstream Relations	Feb 2010
2010-03	Tomohiro MACHIKITA and Yasushi UEKI	Innovation in Linked and Non-linked Firms: Effects of Variety of Linkages in East Asia	Feb 2010
2010-02	Tomohiro MACHIKITA and Yasushi UEKI	Search-theoretic Approach to Securing New Suppliers: Impacts of Geographic Proximity for Importer and Non-importer	Feb 2010
2010-01	Tomohiro MACHIKITA and Yasushi UEKI	Spatial Architecture of the Production Networks in Southeast Asia: Empirical Evidence from Firm-level Data	Feb 2010
2009-23	Dionisius NARJOKO	Foreign Presence Spillovers and Firms' Export Response: Evidence from the Indonesian Manufacturing	Nov 2009
2009-22	Kazunobu HAYAKAWA, Daisuke HIRATSUKA, Kohei SHIINO, and Seiya SUKEGAWA	Who Uses Free Trade Agreements?	Nov 2009
2009-21	Ayako OBASHI	Resiliency of Production Networks in Asia: Evidence from the Asian Crisis	Oct 2009
2009-20	Mitsuyo ANDO and Fukunari KIMURA	Fragmentation in East Asia: Further Evidence	Oct 2009
2009-19	Xunpeng SHI	The Prospects for Coal: Global Experience and Implications for Energy Policy	Sept 2009

No.	Author(s)	Title	Year
2009-18	Sothea OUM	Income Distribution and Poverty in a CGE Framework: A Proposed Methodology	Jun 2009
2009-17	Erlinda M. MEDALLA and Jenny BALBOA	ASEAN Rules of Origin: Lessons and Recommendations for the Best Practice	Jun 2009
2009-16	Masami ISHIDA	Special Economic Zones and Economic Corridors	Jun 2009
2009-15	Toshihiro KUDO	Border Area Development in the GMS: Turning the Periphery into the Center of Growth	May 2009
2009-14	Claire HOLLWEG and Marn-Heong WONG	Measuring Regulatory Restrictions in Logistics Services	Apr 2009
2009-13	Loreli C. De DIOS	Business View on Trade Facilitation	Apr 2009
2009-12	Patricia SOURDIN and Richard POMFRET	Monitoring Trade Costs in Southeast Asia	Apr 2009
2009-11	Philippa DEE and Huong DINH	Barriers to Trade in Health and Financial Services in ASEAN	Apr 2009
2009-10	Sayuri SHIRAI	The Impact of the US Subprime Mortgage Crisis on the World and East Asia: Through Analyses of Cross-border Capital Movements	Apr 2009
2009-09	Mitsuyo ANDO and Akie IRIYAMA	International Production Networks and Export/Import Responsiveness to Exchange Rates: The Case of Japanese Manufacturing Firms	Mar 2009
2009-08	Archanun KOHPAIBOON	Vertical and Horizontal FDI Technology Spillovers:Evidence from Thai Manufacturing	Mar 2009
2009-07	Kazunobu HAYAKAWA, Fukunari KIMURA, and Toshiyuki MATSUURA	Gains from Fragmentation at the Firm Level: Evidence from Japanese Multinationals in East Asia	Mar 2009
2009-06	Dionisius A. NARJOKO	Plant Entry in a More LiberalisedIndustrialisationProcess: An Experience of Indonesian Manufacturing during the 1990s	Mar 2009
2009-05	Kazunobu HAYAKAWA, Fukunari KIMURA, and Tomohiro MACHIKITA	Firm-level Analysis of Globalization: A Survey	Mar 2009

No.	Author(s)	Title	Year
2009-04	Chin Hee HAHN and Chang-Gyun PARK	Learning-by-exporting in Korean Manufacturing: A Plant-level Analysis	Mar 2009
2009-03	Ayako OBASHI	Stability of Production Networks in East Asia: Duration and Survival of Trade	Mar 2009
2009-02	Fukunari KIMURA	The Spatial Structure of Production/Distribution Networks and Its Implication for Technology Transfers and Spillovers	Mar 2009
2009-01	Fukunari KIMURA and Ayako OBASHI	International Production Networks: Comparison between China and ASEAN	Jan 2009
2008-03	Kazunobu HAYAKAWA and Fukunari KIMURA	The Effect of Exchange Rate Volatility on International Trade in East Asia	Dec 2008
2008-02	Satoru KUMAGAI, Toshitaka GOKAN, Ikumo ISONO, and Souknilanh KEOLA	Predicting Long-Term Effects of Infrastructure Development Projects in Continental South East Asia: IDE Geographical Simulation Model	Dec 2008
2008-01	Kazunobu HAYAKAWA, Fukunari KIMURA, and Tomohiro MACHIKITA	Firm-level Analysis of Globalization: A Survey	Dec 2008