



EU-ASIA DIALOGUE

*Shaping a Common Future for Europe and Asia –
Sharing Policy Innovation and Best Practices in Addressing Common Challenges*

Food Security

**The Role of Asia and Europe
in Production, Trade and
Regionalism**



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The Role of Asia and Europe in
Production, Trade and Regionalism



Centre in Singapore

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Preface

Although the fight against hunger is part of the Millennium Development Goals and improvements can be seen, millions of people are still suffering from hunger and malnutrition. In fact, 2009 saw a historically high number of 1.02 billion people suffering from chronic hunger. This was, among other factors, primarily the result of an increase in global food prices by 83 per cent between 2005 and 2008. Despite an improvement in 2010 due to a more favourable economic environment, international organizations such as the Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization (FAO) have forecasted that the prices of principle foods will increase considerably over the next ten years. This may provoke new crises with consequences beyond issues of food production, food supply and food distribution. This is, in particular, the case for Asia, where a combination of various factors results in food insecurity.

Food security, broadly defined, refers to the state of food supply when all people at all times have adequate access to food that is affordable, safe and healthy, culturally acceptable and meets their specific dietary needs. Food security means different things to different countries, depending on their natural resource endowment and their stages of economic as well as social development.

For historical, cultural and economic reasons, different peoples have different preferences for a specific staple food, be it rice, wheat or corn. The staple food item may be historically and culturally determined, but economic development and affluence can subsequently change the supply and demand conditions of this staple food item. A change in tastes and preferences can lead to the substitution of different food items. To satisfy their security needs, different countries aim to achieve different levels of food self-sufficiency, mainly based on political and economic considerations. For strategic reasons (e.g., war contingency or external shocks), some governments strive for a stringent level of food self-sufficiency in order to feel secure.

Large countries (e.g., China and India) with big populations will have to achieve a high level of domestic food production as their huge food demands cannot be easily satisfied by imports. They cannot and should not depend on international trade to achieve food security, simply because their potentially large imports can de-stabilize the international food markets.

For poor countries, food security is mainly about how to cope with the fundamental problem of satisfying basic food needs and how to stave off hunger and famine. For countries that have achieved successful economic development and a rising middle class, their concept of food security will change. They will shift their emphasis and priority from quantity to quality; from a few staple items to greater food diversity. Amidst growing affluence, the focus of food security will further move from basic food needs to a concern for food safety (i.e.,

food with less chemical addictiveness and less contamination) and the need for more healthy foods (e.g., organic foods or diets with less fat content).

With a total of 642 million people suffering from hunger, the Asia Pacific region accounts for 63 per cent of all affected people. Domestic factors which influence food production are governance structures and distribution of food. In this context, corruption and land grabbing have significant consequences. Lack of infrastructure makes transport and access to markets more difficult. This also results in a high percentage of subsistence agriculture, which is more vulnerable to endogenous and exogenous shocks. In addition, many Asian countries suffering from severe malnutrition are characterized by rapid population growths, such as India, Bangladesh, Indonesia and the Philippines, which therefore increases the demand for food even more. These countries have to take steps to achieve a high level of self sufficiency as this will have a positive impact on the local market structures. They cannot rely fully on international trade as this will impact their local food production and de-stabilize the international market due to their huge demand. Food security cannot be seen as only the secured availability of food, as other dimensions such as physical, economic, social and ecological factors impact the distribution and vulnerability as well. Thus, fighting against hunger must be seen in close connection to other policy areas. Environmental disasters can affect agriculture not only in developing countries as they destroy much of the agricultural land and products. Thus, food security is also concerned with the stability of supply and not just the amount of food produced. Extreme weather events also appear to be increasing in number, frequency and intensity as a result of climate change. Another strong influence on food production is the growing urbanization in Asia, which reduces the availability of farmland and makes more transport from the rural areas into the cities necessary.

While the situation in Europe is certainly not as bad as in Asia, European policies have an influence on food security abroad. Most European countries have no domestic problems with food security as food production is high, technology is advanced and inter-European trade is working smoothly. The Common Agricultural Policy of the EU and various subsidies have even create a massive over-supply. The food from this over-supply is being exported and can negatively impact the establishment of local market structures abroad. A second influence from Europe on Asia is the demand for non-food crops such as palm oil. These agricultural products often command higher prices on the markets and are more profitable than food products. Thus, it is a rational choice for farmers to change their seeding. In addition, agricultural land may be acquired by multinational corporations to produce these crops. This commercialization poses a serious threat to food security in the Asian developing countries.

Due to this close connection between Europe and Asia concerning food security, stronger collaboration is desirable. A key issue to ensuring food safety in Asia is sustainable and locally adapted agriculture. The EU has long-standing experience in the promotion of sustainable agriculture and can provide suggestions on the policies, governance and social structures which are needed to achieve this goal. While it is important to not ignore local methods and traditional agriculture, technology transfer can help to increase food production in Asia. In order to use the technology, capacity building has to take place. Close cooperation can also be established on the research side.

Such bi-regional cooperation can address topics which are of importance to the European countries as well. With an increasing amount of food products imported from Asia, food safety should be treated bi-regionally. This will ensure that new products meet the high standards of the European Union. A second topic of concern is food wastage. A number of European countries, such as Germany, have realized that a tremendous amount of food is being wasted and have taken policy measures. In several highly developed Asian countries, much food is wasted as well, but comparatively, this aspect has not received much attention yet. Finally, urban agriculture can be a way to ease the food security situation in Asia. This topic can be considered in connection with sustainable urban management and should be addressed jointly.

In order to contribute to the understanding of current challenges and implemented solutions, this publication includes papers with perspectives from Europe and Asia. What are the food policies as well as present challenges in the countries? What can they learn from each other? How do they try to ensure a stable food supply? What impacts do trade, regional initiatives and technology transfer have on food security? These and other questions will be addressed by this publication.

Paul P S Teng and **Margarita Escaler** provide an analysis of the current state of food security in Asia. Their paper portrays the development over the past decades and explains the multi-dimensionality of food security. Future trends and how those can be addressed through policies are discussed. Finally, the authors take a look at how the EU influences the situation in Asia and what are the possible opportunities for cooperation.

Jun Yang and **Xuetao Huang** look at food security and policies in the People's Republic of China. Being the most populated country in the world and characterized by huge development differences, China faces many challenges in ensuring a stable food supply. These challenges and their consequences for food security are analyzed. As fast-growing urbanization has an impact on food production, the authors also look into the role of urban agriculture.

Food security in Indonesia is addressed by **Purwanto** by providing an overview on the policy changes in the country over the years. Specific attention is given to the role of food security in national development planning as it is an integral part of the strategy. It is argued that the strategy has to involve all stakeholders and the three subsystems of food security – availability, distribution and consumption.

Ritika Sehjpal, **Aparna Vashisht**, **Shailly Kedia** and **Supriya Francis** discuss the linkages between green growth and food security in India. The country has a chronic problem of hunger. Food security and policy initiatives are analyzed in the context of the agricultural sector's performance and development challenges.

A.N.M. Muniruzzaman addresses food security in Bangladesh. Being one of the most densely populated countries with a high level of poverty and exposed to severe environmental changes, Bangladesh is highly vulnerable to food insecurity. The author analyzes the various threats to food security and its socio-economic impacts by putting it in the regional context and discussing government initiatives.

J. Jackson Ewing and **Sandra Silfvast** provide a profound analysis of regional initiatives in food security in the European Union and the Association of Southeast Asian Nations

(ASEAN). By discussing the situation in two key agricultural countries, France and Thailand respectively, the authors illustrate the connection between the domestic level and the regional level and the challenges arising from this.

Current megatrends in agricultural production are the focus of **Rudy Rabbinge** and **Prem Bindraban's** analysis. Of particular interest is the role of public and private actors in addressing these trends as they direct many developments.

Jerome R. Hassler and **Dr. Vilailuk Tiranutti** discuss the linkages between fair trade and food security. They argue that fair trade can support sustainable production and consumption chains. However, there are a number of pitfalls and thus, the current system requires certain modifications.

Gouranga Gopal Das analyzes the possibilities for cooperation between Europe and Asia via technology transfer. The paper shows how technology transfer has to go hand in hand with capacity building and entitlement.

This book is part of the "EU-Asia Dialogue" project, which is co-funded by the European Union and Konrad-Adenauer Stiftung Germany. In the context of this project, the implementing consortium will publish seven books. More information on the "EU-Asia Dialogue" can be found on the website www.eu-asia.eu.



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Food Security in Asia

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INTRODUCTION

Asia, home to over 60 per cent of the world's population, with half of the population living in urban areas and also where some of the fastest-growing economies are, has only 34 per cent of the world's arable land and 36 per cent of the world's water resources. Needless to say, Asia faces formidable challenges in food security. While it has had remarkable success in reducing poverty and hunger over the years, Asia still suffers from high levels of food insecurity and malnutrition. According to the most recent estimate by the Food and Agriculture Organization (FAO), over 60 per cent of all the undernourished in the world, or 563 million out of 868 million people, live in Asia.³

No less daunting is what lies ahead for the region's agricultural sector. Emerging trends taking place regionally and globally are transforming the food security landscape in Asia and further threatening its ability to feed its people. While Asia's farming sector has the potential to improve food security in the region, many hurdles exist for hundreds of millions of small farmers, the majority of whom are food-insecure. Governments, together with the private sector, civil society and international partners, must embark on a multifaceted and integrated strategy, one that is broader in scope and adapted to these dynamic challenges.

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³ Food and Agriculture Organization (FAO). (2012 a) *State of Food Insecurity in the World: 2012*. (Rome: FAO, 2012a) (Rome: FAO, 2012).

THE LAST 50 YEARS OF PROGRESS

While the absolute number of undernourished in the world remains high and is indeed disconcerting and shocking on a grand scale, this should not alter the fact that the present situation actually reflects the remarkable success in the region's pursuit of food security.⁴ The proportion of the world's population that has remained undernourished has actually declined dramatically over the last 50 years. In the mid-1960s, when the global population was about 3.3 billion, only about two billion people, roughly 60 per cent, were getting enough to eat. Today, with a global population of around seven billion, slightly more than six billion people, or over 85 per cent, now have enough to eat to live a healthy and productive life. The progress made during this period in Asia, in particular, has been spectacular. China and India, once on the brink of mass famine, have experienced agricultural booms; China has slashed the number of starving people from 303 million in the 1979-1981 period to 122 million in the 2003-2005 period, and India from 262 million to 231 million over the same periods.⁵ How did they achieve such success and what lessons have been learnt in the process?

A study conducted by the International Food and Policy Research Institute (IFPRI) identified and examined successes in agricultural development in developing countries over the last 50 years and found that while the pathways to success were extremely varied, the convergence of science, policy, and leadership was a common thread running through many of the case studies.⁶ Some demonstrated how an improved crop variety or cultivation practice contributed to increasing crop output per hectare of land, lowering production costs, or reducing crop losses. Other cases showed how incentives and changes in public policies encouraged farmers to produce more food, pursue more sustainable cultivation practices, and participate more actively in the marketplace. Below are some examples described in the study by IFPRI.

One of the first major successes during the last 50 years came from a global effort to fight wheat rust, an age-old fungal disease that can rapidly destroy wheat as it matures in the field. The late Nobel laureate Norman Borlaug, with the support of policymakers, scientists, and donor agencies spearheaded this effort by introducing rust-resistant wheat varieties in Mexico with the help of innovative research tools. This helped protect about 117 million hectares of land under wheat cultivation from the fungal disease, directly ensuring the food security of 60 to 120 million rural households and many more millions of consumers.⁷

The success with wheat rust eventually led to a series of similar achievements that began in the 1960s and came to be known as the Green Revolution. In Asia, the breeding and introduction of improved rice and wheat varieties, combined with the expanded use of fertilisers and other chemical inputs, irrigation, strong and supportive public policies and increased

⁴ David J Spielman and Rajul Pandya-Lorch, *Millions Fed: Proven Successes in Agricultural Development* (Washington, DC: International Food Policy Research Institute, 2009).

⁵ Food and Agriculture Organization, *The State of Food Insecurity in the World: 2008* (Rome: FAO, 2008).

⁶ Spielman and Pandya-Lorch, op. cit.

⁷ Ibid.

investments in agricultural research and development, led to dramatic yield increases. Cereal output and yields doubled between 1965 and 1990 and an estimated one billion people benefited in terms of either improved access to food, or increased earnings from agriculture, or both.

While the Green Revolution staved off mass famine in many parts of Asia, concerns emerged about the equity and environmental implications of rapid agricultural development. The longer-term sustainability of agriculture came to the forefront of development discussions and subsequently led to new policies, programmes, investments and more sustainable technologies and farming practices. This was a move away from a narrow food supply-increasing perspective to a more holistic view of agriculture and rural development.

In addition to the above successes, IFPRI also noted that policy reforms to expand the role of markets also played a critical role in improving food security throughout the region. In Bangladesh, the easing of restrictions on the importation and sale of irrigation equipment, which was a result of government efforts to liberalise the agricultural input markets in the 1980s, stimulated the rapid growth of irrigated dry-season rice farming. This subsequently grew to account for 90 per cent of the increase in rice production in Bangladesh between 1988 and 2007. In China, policy reforms that promoted private investment in agriculture, along with scientific breakthroughs in rice research, encouraged the growth of a vibrant seed industry for hybrid rice. Between 1978 and 2008, hybrid rice had grown to account for 63 per cent of all land under rice cultivation from which the yield advantages helped to feed an additional 60 million people per year during this period. In India, similar policy reforms and scientific advances in the mid-1990s encouraged the growth of private investment in the marketing of improved seeds for pearl millet and sorghum, two crops that are essential sources of sustenance and income for around 14 million poor households in India.

The emphasis on markets also opened up new opportunities for cultivating and marketing non-staple crops such as legumes, fruits, and vegetables as well as dairy, livestock, and fish as a means of increasing farm incomes and improving food security among the poor. In many Asian countries, this was exemplified by the diffusion of improved mungbean. An international research programme and active farmer participation in the research process led to the release of improved mungbean varieties in the mid-1980s which contributed to yield gains of 28 to 55 per cent among an estimated 1.5 million farmers. In India, Operation Flood (also known as the White Revolution), a national programme that ran from 1970 to 1996, helped create a national dairy industry that integrated small-scale farmers with village-level dairy cooperatives, commercial dairy processors and distributors, and new technologies to modernise the industry. Between 1970 and 2001, India went from being a net importer of dairy products to a major player in the global dairy market. In the Philippines, the Genetic Improvement of Farmed Tilapia (GIFT) project that ran from 1988 to 1997 played an important role in enhancing the role of fish as a source of income and protein for many farmers and consumers.

Economic policy reforms in recent decades also contributed significantly to changing traditional urban biases that discriminated against rural households. China provides the most dramatic case in point. Between 1978 and 1984, China undertook a series of policy reforms

that reintroduced household farming after more than 30 years of collective agriculture. By returning more than 95 per cent of farmland to some 160 million farm households, the reforms directly contributed to an increase in rural incomes by 137 per cent, a reduction in rural poverty by 22 per cent, and an increase in grain production by 34 per cent. Similar land reforms in Vietnam between 1987 and 1993 had much the same effect albeit on a smaller scale. The country shifted from being a net food-importing country to becoming the world's third-largest rice exporter in 1989 and the reforms contributed substantially to poverty reduction and to both economic growth and industrialisation.

MULTI-DIMENSIONAL NATURE OF FOOD SECURITY

The pathways to success described above were not simply about increasing the physical supply of food. What the experience of the past 50 years has demonstrated is also about improving an individual's ability to access and secure good quality and nutritious food. This realisation led to the recognition of the multi-dimensional nature of food security. In 1996, the 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".⁸ 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 "utilisation".⁹ 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 differently in a rural setting as compared with an urban setting and even across countries with different incomes and net food trade balances.¹⁰ 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 1).

The first dimension of food security is food availability (Figure 1), which addresses the food supply side, whether through primary production of crops and animals, or reserve stock, or food imports. An imperative of this dimension is raising agricultural productivity, 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. A number of forces impact on food availability, including, 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. Food availability may also

⁸ Food and Agriculture Organization, "The Rome Declaration on World Food Security and World Food Summit Plan of Action", World Food Summit, 13-17 November 1996 (Rome: FAO, 1996).

⁹ Paul P S Teng and Margarita Escaler, "The Case for Urban Food Security: A Singapore Perspective", NTS Perspectives, no. 4 (Singapore: RSIS Centre for Non-Traditional Security (NTS) Studies, 2010).

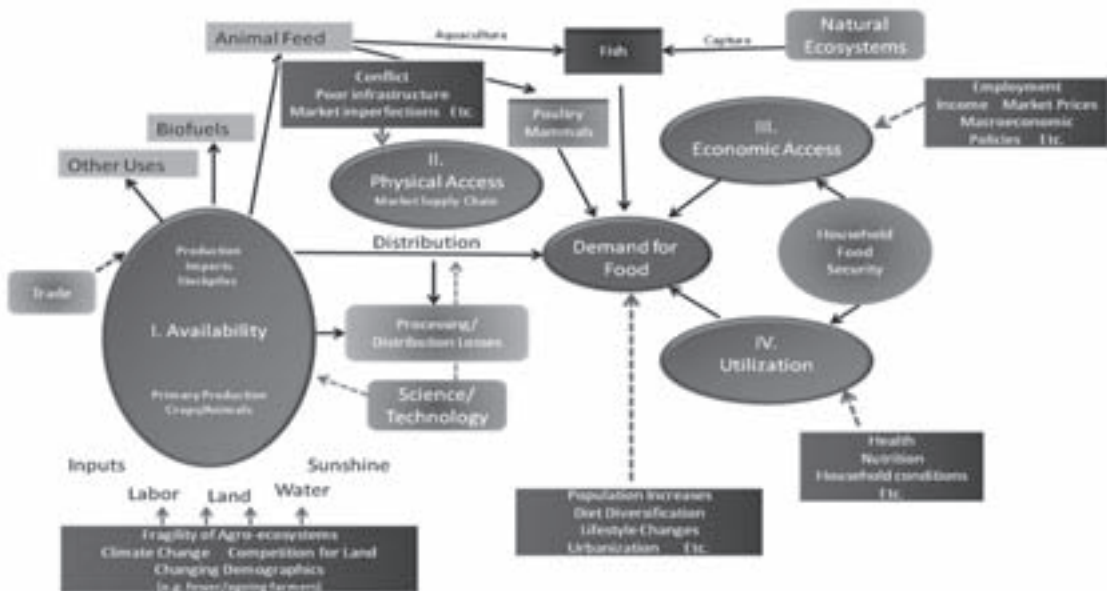
¹⁰ Ibid.

be influenced by alternative uses of agricultural products for biofuel production or for animal feed, especially in the fast-growing aquaculture industry due to the decline in captured fish from wild fish stocks (Figure 1). While food availability is necessary, and often the focus in most discussions, it is not sufficient on its own to ensure food security at the household level.

The second dimension of food security is 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.

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 1) and also a critical component of food security. This is a concern for both developed as well as less-developed countries and weighs more heavily in an urban setting where poorer consumers can spend a significant proportion of their household budgets on food. Factors that influence this dimension include employment and income security, macroeconomic policies and of course, market prices. Managing this dimension is key to assuring people’s 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.

Figure 1 Conceptual Model of Food Security

Source: Paul P S Teng and Margarita Escaler, "The Case for Urban Food Security: A Singapore Perspective", NTS Perspectives, no. 4 (Singapore: RSIS Centre for Non-Traditional Security (NTS) Studies, 2010).

The fourth dimension in the model is food utilisation, 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.¹¹ Factors that can influence this dimension include the quantity and quality of food, general childcare and feeding practices, food preparation, food storage and the health status of individuals.¹² Having enough food does not suffice if it cannot be consumed properly due to poor health or if food safety is wanting. Many of the urban poor live in suboptimal 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

¹¹ Ibid.

¹² Frank Riely, Nancy Mock, Bruce Cogill, Laura Bailey and Eric Kenfick, *Food Security Indicators and Framework for Use in the Monitoring and Evaluation of Food Aid Programs* (Washington, DC: Food and Nutrition Technical Assistance, Academy for Educational Development, 1999). Available at <http://pdf.usaid.gov/pdf_docs/PNACG170.pdf> (accessed 20 September 2010).

that they do not conflict with one another and other development objectives. Interconnected policy-making is just as critical.¹³

CURRENT STATE OF FOOD SECURITY IN ASIA

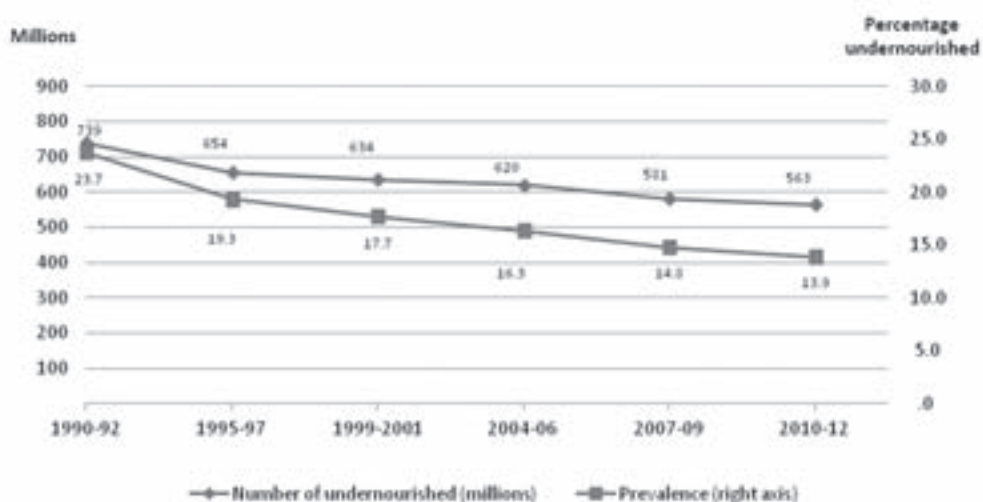
Food security in Asia must be viewed from the perspectives of the four dimensions described in the preceding section (Figure 1) as adequacy in one dimension is insufficient to guarantee overall food security in a stable manner. As Asia increasingly urbanises, the relative importance of these dimensions will change since cities are not capable of making substantive amounts of food available through production and have to rely on supply chains for imports, and on reserves in times of shortages.

By and large, the region has made significant progress in terms of feeding the population over the last few decades. The number of undernourished in Asia fell from 739 million people in the period 1990-1992 to 563 million in the period 2010-2012 (Figure 2).¹⁴ More impressive was the reduction in the proportion of undernourished in the region while the total population increased from 3.1 billion to 4.1 billion during the same period. The prevalence of undernourishment fell from 23.7 per cent in the period 1990-1992 to 13.9 per cent in the period 2010-2012. Despite this remarkable progress and recent declines in the region's poverty incidence, pervasive hunger, however, remains a problem in Asia and the FAO revealed that the rate of decline has slowed down since 2007.

With respect to the rate of progress in the reduction of undernourishment, considerable differences exist among Asia's sub-regions (Table 1). South-eastern Asia has shown the most rapid reduction (from 29.6 to 10.9 per cent), followed by eastern Asia while western Asia has seen an increase in the prevalence of undernourishment over the period. These differences in the rates of progress have led to significant changes in the distribution of the undernourished in the world between 1990-1992 and 2010-2012. The share of the world's undernourished people has declined most rapidly in south-eastern Asia and eastern Asia (from 13.4 to 7.5 per cent and from 26.1 to 19.2 per cent, respectively). Meanwhile, the share has increased from 32.7 to 35 per cent in southern Asia and from 1.3 to 2.9 per cent in western Asia.

¹³ Foresight 2011, *The Future of Food and Farming: Challenges and Choices for Global Sustainability, Final Project Report* (London: The Government Office for Science, 2011). Available at <<http://www.bis.gov.uk/assets/foresight/docs/food-and-farming/11-547-future-of-food-and-farming-summary.pdf>> (accessed 25 January 2011).

¹⁴ Food and Agriculture Organization, *State of Food Insecurity in the World: 2012* (Rome: FAO, 2012a).

Figure 2 Undernourishment in Developing Asia, 1990-1992 to 2010-2012

Source: Food and Agriculture Organization (FAO), *State of Food Insecurity in the World: 2012* (Rome: FAO, 2012a).

Table 1 Undernourishment in Developing Asia, by Sub-region, 1990-1992 to 2010-2012

	Number (millions) and prevalence (%) of undernourishment					
	1990-92	1995-97	1999-2001	2004-06	2007-09	2010-12
Asia	739 23.7%	654 19.3%	634 17.7%	620 16.3%	581 14.8%	563 13.9%
Western Asia	8 6.6%	12 8.3%	13 8.0%	16 8.8%	18 9.4%	21 10.1%
Southern Asia	327 26.8%	323 23.8%	309 21.2%	323 20.4%	311 18.8%	304 17.6%
Caucasus and Central Asia	9 12.8%	9 13.4%	11 15.8%	7 9.9%	7 9.2%	6 7.4%
Eastern Asia	261 20.8%	202 15.3%	197 14.4%	186 13.2%	169 11.8%	167 11.5%
South-Eastern Asia	134 29.6%	108 22.0%	104 20.0%	88 15.8%	76 13.2%	65 10.9%
World	1000 18.6%	931 16.1%	919 15.0%	898 13.8%	867 12.9%	868 12.5%

Source: Food and Agriculture Organization (FAO), *State of Food Insecurity in the World: 2012* (Rome: FAO, 2012a).

According to Fan,¹⁵ Asia's undernutrition is heavily concentrated in the middle-income countries, suggesting that despite strong economic gains in recent years, middle-income countries constitute an overwhelming share (86 per cent) of the region's undernourished.

Southern Asia continues to be a "hotspot" for food insecurity with the sub-region's undernourished accounting for over half of all undernourished people in Asia, that is 304 million out of 563 million. Southern Asia also has, by far, the largest number of undernourished children in the world.¹⁶ Based on IFPRI's Global Hunger Index (GHI), southern Asia is also the region with the highest GHI score in 2012 with alarming levels of hunger.¹⁷ The GHI aggregates three equally weighted indicators: the proportion of people who are undernourished; the proportion of children under five years old who are underweight; and the mortality rate of children under five years of age.

India, in particular, remains one of the most undernourished countries in the world despite its economic gains.¹⁸ Due to poor nutrition, around 44 per cent of Indian children under the age of five were underweight in 2006, while 48 per cent were stunted and 20 per cent were wasted.¹⁹

The above findings imply that reduction of hunger and malnutrition does not necessarily follow from economic growth. While there is no doubt that hunger and poverty are closely linked and that economic growth contributes to reducing the number of undernourished, growth alone, while necessary, is not sufficient to ensure food security particularly for the most vulnerable populations.²⁰

¹⁵ Fan Shenggen, "Asian Food Security in a Global Context", paper presented at the International Conference on Asian Food security (ICAFS), 10-12 August 2011, at <http://www.rsis.edu.sg/nts/events/docs/ICAFS-Fan_Shenggen.pdf> (accessed 12 December 2012).

¹⁶ Food and Agriculture Organization (FAO), *State of Food Insecurity in the World: 2012* (Rome: FAO, 2012a).

¹⁷ International Food Policy Research Institute, *Global Hunger Index 2011*, at <<http://www.ifpri.org/publication/2011-global-hunger-index>> (accessed 19 November 2012).

¹⁸ Asian Development Bank, *Food Security and Poverty in Asia and the Pacific: Key Challenges and Policy Issues* (Mandaluyong City, Philippines: Asian Development Bank, 2012).

¹⁹ Food and Agriculture Organization (FAO), *State of Food Insecurity in the World: 2012* (Rome: FAO, 2012a).

²⁰ Ibid.

CHANGES IN FOOD DEMAND AND DIET DIVERSIFICATION

Food Demand

With a rising population, strong income growth and an expanding middle class, Asia plays a dominant role in the growing global demand for food. During the 1980-2010 period, the real gross domestic product (GDP) of developing Asia grew by 7.3 per cent annually on average, more than double the world average of 2.9 per cent.²¹ If this growth trajectory continues, by 2050 developing Asia will provide just over half of global GDP and an additional three billion people in the region will be affluent by current standards.²² Unsurprisingly, the annual increase of per capita income in the region has resulted in an increased demand for dietary energy as measured by the per capita amount of energy (kilocalories) per day, in food available for human consumption. Between 1990 and 2010, Asia had the largest absolute increase in dietary energy consumption from 260 to 270 kcal per person a day.²³

Despite the fact that Asia is home to some of the world's top producers and exporters of agricultural commodities (Table 2), the region, as a whole, remains a net food importer, particularly for the four commodities important to Asia: corn, rice, soybean, and wheat (Table 3).

While Asia produces enough rice to satisfy domestic consumption, it, ironically, remains a net rice importer. This is due to the fact that most rice is consumed where it is grown and the global market for trade is very thin, with only 6 to 7 per cent of annual milled rice output available for trade, concentrating in a few countries. Thus, the situation is a fragile one. Any natural disaster or any change in trade policy can dramatically disrupt availability and result in higher rice prices with detrimental effects on the poor. Some countries in the region are persistently net rice importers, either by design or by need.²⁴

²¹ Asian Development Bank, *Food Security and Poverty in Asia and the Pacific: Key Challenges and Policy Issues* (Mandaluyong city, Philippines: Asian Development Bank, 2012).

²² Asia Development Bank, *Asia 2050: Revitalizing the Asian Century* (Mandaluyong city, Philippines: Asian Development Bank, 2011).

²³ Food and Agriculture Organization, FAOSTAT Database, at <<http://faostat.fao.org/>> (accessed 12 December 2012).

²⁴ Paul T S Teng, *Bioscience Entrepreneurship in Asia: Creating Value with Biology* (Singapore: World Scientific Publishing, 2008).

Table 2 Asia's Top Agricultural Producers and Exporters, by Commodity

Commodity	Top producers (world ranking, 2011)	Top exporters (world ranking, 2011)
Rice (milled)	China (1); India (2); Indonesia (3)	India (1); Vietnam (2); Thailand (3)
Corn	China (2)	—
Dairy (milk)	India (2); China (4)	China (4)
Coconut oil	Philippines (1); Indonesia (2); India (3)	Philippines (1); Indonesia (2); Malaysia (3)
Palm oil	Indonesia (1); Malaysia (2); Thailand (3)	Indonesia (1); Malaysia (2)
Poultry (meat, broiler)	China (2)	Thailand (4); China (5)
Wheat	China (2); India (3)	—
Millet	India (1); China (4)	d.n.a.
Sugar	India (2); China (4); Thailand (5)	Thailand (2); India (3)
Cotton	China (1); India (2); Pakistan (4)	India (2)
Potatoes*	China (1); India (2)	—
Rubber*	Thailand (1); Indonesia (2); Malaysia (3); India (4)	Indonesia (1); Thailand (2); Malaysia (3)
Coffee (green)	Vietnam (2); Indonesia (3)	Vietnam (2); Indonesia (3)

—: not in the top five; d.n.a.: data not available; FAO 2010

Sources: United States Department of Agriculture, Production, Supply and Demand (PS&D) Database, at <<http://www.fas.usda.gov/psdonline/psdquery.aspx>> (accessed 12 December 2012); Food and Agriculture Organization, FAOSTAT Database, at <<http://faostat.fao.org/>> (accessed 12 December 2012).

Asia imported a significant amount of the surplus export corn from 2006 to 2010, averaging 41 to 48 per cent of global exports (Table 3). Japan is the world's largest corn importer, importing just over 16 million tons in 2010. As the amount of corn available for export is only 12 to 13 per cent of global production, it is projected that the market for corn will become tighter due to competing uses such as bioethanol production.²⁵ Asia remains heavily dependent on the international market to satisfy its demand for soybeans. During the same period, Asia imported a majority of all soybean exports, averaging 62 to 75 per cent of global exports. China remains the largest soybean importer in the world, importing around 57 million tons in 2010, up from 45 million tons in 2009.²⁶ As for wheat, the region imported, on average, 34 to 38 per cent of all global wheat exports from 2006 to 2010. Japan and Indonesia are among the world's top five importers of wheat.

²⁵ Ibid.

²⁶ Food and Agriculture Organization, FAOSTAT Database, at <<http://faostat.fao.org/>> (accessed 12 December 2012).

Table 3 Production and Trade of Corn, Rice, Soybean and Wheat, 2006 to 2010

Crop	Item	2006	2007	2008	2009	2010
Corn (Maize)	Global Production Million M T (million tons)	706.8	789.5	826.8	819.2	840.3
	Global Exports Million M T (million tons) (% of global production)	95.4 (13%)	110.0 (14%)	102.1 (12%)	100.7 (12%)	107.9 (13%)
	Asian Imports Million M T (% of global exports)	45.4 (48%)	44.8 (41%)	43.7 (43%)	45.3 (45%)	52 (43%)
Rice (Milled)	Global Production Million M T (million tons)	420.3	433.6	448.1	440.3	451.5
	Global Exports Million M T (million tons) (% of global production)	31.9 (7%)	29.7 (7%)	29.2 (6%)	31.3 (7%)	30.2 (7%)
	Asian Imports Million M T (% of global exports)	9.2 (28%)	8.5 (29%)	7.6 (26%)	8.0 (26%)	8.6 (28%)
Soybean	Global Production Million M T (million tons)	222.0	219.7	231.2	223.3	265.0
	Global Exports Million M T (million tons) (% of global production)	67.9 (31%)	74.4 (34%)	79.0 (34%)	81.5 (36%)	93.4 (35%)
	Asian Imports Million M T (% of global exports)	42.4 (62%)	47.0 (63%)	51.9 (66%)	56.0 (69%)	70.5 (75%)
Wheat	Global Production Million M T (million tons)	602.9	612.6	683.2	686.6	653.7
	Global Exports Million M T (million tons) (% of global production)	126.4 (21%)	124.6 (20%)	131.2 (19%)	147.0 (21%)	145.2 (22%)
	Asian Imports Million M T (% of global exports)	46.7 (37%)	42.8 (34%)	46.4 (35%)	56.0 (38%)	49.2 (34%)

Sources: Food and Agriculture Organization, FAOSTAT Database, at <<http://faostat.fao.org/>> (accessed 12 December 2012); United States Department of Agriculture, Production, Supply and Demand (PS&D) Database, at <<http://www.fas.usda.gov/psdonline/psdquery.aspx>> (accessed 12 December 2012).

Diet Diversification

Inevitably, the rise in food consumption per person has been accompanied by changes in the composition of diets.²⁷ While cereals continue to dominate Asian diets, providing 56 per cent of all calories in the period 2005-2007, the per capita dietary energy from cereals has declined significantly in all regions since the early 1990s (Table 4). This is despite an increase in the total per capita dietary energy availability. This phenomenon is largely due to the changing diets in Asia, where countries, particularly in the rapidly growing East

²⁷ Food and Agriculture Organization, *State of Food Insecurity in the World: 2012* (Rome: FAO, 2012a).

Asian region, are moving away from predominantly rice-based diets.²⁸ At the same time, consumption of animal-source products (i.e., meat, fish, dairy, eggs) and fruit and vegetables has increased noticeably. Again, East Asia leads the changes, recording the largest increase in the consumption of animal-source products during this period.

Household consumption surveys have shown a positive correlation between total household income and dietary diversity. A recent study conducted by the FAO in 47 developing countries confirmed that diets in higher-income groups are more diversified, irrespective of the region.²⁹ As incomes rise, the contribution of cereals and starchy roots to per capita dietary energy supply decreases whereas the contributions of animal-source products and fruit and vegetables increase significantly.

The shifts in diet composition with rising income are also having profound effects on the nutritional status of individuals, both negatively and positively. On the one hand, the increase in the share of dietary energy supply from animal-source products, fats and oils, fruit and vegetables, is generally beneficial as they provide proteins and micronutrients which are essential for improving nutrition. However, for individuals who already have higher levels of protein, fats, or sugars in their diets, a further increase may be detrimental to their health. Such diets, together with a more sedentary lifestyle, a feature of more urbanised areas, increase the risk of chronic diseases, including diabetes and obesity. According to the World Health Organization (WHO), overweight and obesity, once considered a high-income country problem, are now on the rise in low- and middle-income countries, particularly in urban settings. Close to 35 million overweight children are living in developing countries and eight million in developed countries.³⁰ In China, 3.4 per cent of women and 2.4 per cent of men above 15 years of age were obese, while 9.2 per cent of children under five years old were overweight for their age in 2002.

Table 4 Changes in Dietary Composition, 1990-1992 to 2005-2007

	Contribution in diets by commodity													
	cereals		meat & fish		dairy & eggs		fruit & vegetables		sugar		starchy roots		pulses	
	%	%	%	%	%	%	%	%	%	%	%	%	%	%
	1990-92	2005-07	1990-92	2005-07	1990-92	2005-07	1990-92	2005-07	1990-92	2005-07	1990-92	2005-07	1990-92	2005-07
Asia	63	56	8	12	3	4	3	4	6	6	6	5	5	5
Central Asia	59	54	7	7	9	10	2	4	5	6	4	6		
East Asia	63	53	9	14	1	2	3	5	4	4	7	5	3	6
South Asia	65	60	2	4	4	5	2	3	9	8	2	3	5	5
West Asia	51	49	5	6	6	6	9	7	9	10	3	3	4	3

Source: Food and Agriculture Organization, *FAO Statistical Yearbook: World Food and Agriculture 2012* (Rome: FAO, 2012b).

Increasing food demand and changing dietary patterns not only have an impact on health and nutrition but also on trade. The increase in the region's demand for food products,

²⁸ Food and Agriculture Organization, *FAO Statistical Yearbook: World Food and Agriculture 2012* (Rome: FAO, 2012b).

²⁹ Food and Agriculture Organization, *State of Food Insecurity in the World: 2012* (Rome: FAO, 2012a).

³⁰ World Health Organization, "Obesity and Overweight", Fact Sheet no. 311, 2012, at <<http://www.who.int/mediacentre/factsheets/fs311/en/>> (accessed 12 December 2012).

including meat, fish, fruits, vegetables, edible oil, and oil seeds, has resulted in significantly higher food import bills over the last decade for many Asian countries. As a region, Asia saw its import bills increase from USD71,479 million in 2000 to USD245,986 million in 2010, driven mainly by a combination of higher international prices and greater trade. In relatively advanced (and urbanised) countries such as the Republic of Korea, Taiwan, Singapore and Japan, indirect consumption of grains has increased as demand for meat grew.³¹ Similarly, Asia's fast-growing economies, such as China, India, Indonesia, Malaysia, Philippines and Vietnam, have also seen their imports of meat, fish, vegetable oil, and oil seeds grow rapidly since 2000. Many of these countries' food import bills grew by more than 10 per cent per annum during the 2000–2010 period. Should population growth, rising income and rapid urbanisation in these countries continue, the changes in their food consumption patterns will clearly have a major impact on global food trade.³²

Given the contrasting picture depicting Asia's food security situation, a key challenge facing the region is how to continue to address the needs of a significant proportion of the population that remains hungry and undernourished and at the same time, meet the evolving demand for more resource-intensive food products as more and more people become richer and more nutrition-conscious. Without a doubt, it is a formidable task especially given the fact that emerging trends taking place regionally and globally are transforming the food security landscape in Asia and threatening further its ability to feed the population.

TRENDS AFFECTING FOOD SECURITY IN ASIA

Food security in Asia is under significant pressure from a variety of factors.³³ First, the region's population is expected to increase by roughly 20 per cent by 2050. 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.³⁴ Further, Asia's share of 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.

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.³⁵ There are also less and

³¹ Asian Development Bank, *Food Security and Poverty in Asia and the Pacific: Key Challenges and Policy Issues* (Mandaluyong City, Philippines: Asian Development Bank, 2012).

³² Ibid.

³³ Fan, op. cit.; Paul P S Teng and Margarita Escaler, *Regional Security Outlook*, Council for Security Cooperation in the Asia Pacific (CSCAP), 2012.

³⁴ United Nations, *World Urbanization Prospects: The 2011 Revision*, Department of Economic and Social Affairs/Population Division (New York: United Nations, 2012).

³⁵ Fan, op. cit.; World Bank, *World Development Indicators 2011* (Washington, DC: World Bank, 2011), at <<http://data.worldbank.org/news/WDI-2011-database-and-publication-available>> (accessed 12 December 2012).

less of the 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 2020.³⁶ In terms of farm size, farms are, in fact, getting even smaller as a result of population growth and inheritance-based fragmentation.³⁷ A more worrying trend is the declining performance of agriculture. According to Trostle,³⁸ the annual growth in productivity, measured in terms of average aggregate yield, has slowed down over the years. 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 2007.³⁹ It is projected to continue to decline over the next 10 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.⁴⁰ 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 active farmers was around 50 years old and that women composed 78 per cent of the total agricultural labour force.⁴¹

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 is made up of some 1.7 billion hectares of arid, semi-arid, and dry sub-humid land.⁴² 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.⁴³ Water erosion covers 21 per cent of the total land

³⁶ Food and Agriculture Organization, *FAO Statistical Yearbook: World Food and Agriculture 2012* (Rome: FAO, 2012).

³⁷ Ganesh Thapa and Raghav Gaiha, "Smallholder Farming in Asia and the Pacific: Challenges and opportunities", paper presented at the IFAD Conference on New Directions for Smallholder Agriculture, Rome, 2011.

³⁸ Ronald Trostle, "Global Agricultural Supply and Demand: Factors Contributing to the Recent Increase in Food Commodity Prices", Economic Research Service, United States Department of Agriculture, 2008, at <<http://www.ers.usda.gov/Publications/WRS0801/WRS0801.pdf>> (accessed 7 September 2011).

³⁹ APEC Policy Support Unit, *Food Security Policies in APEC, 2012*, at <http://publications.apec.org/publication-detail.php?pub_id=1326> (accessed 13 September 2012).

⁴⁰ Martin Fackler, "Japan's Rice Farmers Fear Their Future is Shrinking", *The New York Times*, 28 March 2009, at <http://www.nytimes.com/2009/03/29/world/asia/29japan.html?pagewanted=all&_r=1> (accessed 31 March 2011).

⁴¹ Song Yiching, Zhang Linxiu, Sun Dajiang, Sun Qiu and Janice Jiggins, "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", 31 March-2 April 2009, Rome.

⁴² United Nations Convention to Combat Desertification (UNCCD), "Regional Assessment of Progress Combating Desertification and Mitigating Land Degradation in Asia and the Pacific Region", 2007, at <<http://www.unescap.org/esd/rim/16/documents/Presentations/UNCCD.pdf>> (accessed 12 December 2012).

⁴³ International Soil Reference and Information Centre (ISRIC), "The Assessment of the Status of Human-induced Soil Degradation in South and Southeast Asia", 1997, at <<http://www.isric.org/sites/default/files/ASSODEndReport.pdf>> (accessed 7 April 2010).

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. Water scarcity is particularly serious in southern Asia and northern China. 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.⁴⁴ 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.⁴⁵

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.⁴⁶ 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 to 192 per cent for oils. At 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.

Closely linked to increasing food prices is the rising cost of fuel which has a direct impact on the price of fertilisers. In addition, higher oil prices can also negatively impact the cost of transportation and shipping, thereby affecting the cost to transport 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 threefold 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.

Lastly, Asia has witnessed a rapid transformation of supply chains in just two decades. The way food is now being produced, processed, packaged, transported and distributed has dramatically changed over the years.⁴⁷ Supermarkets' share in food retail has increased, much to the chagrin of traditional shops and wet markets.⁴⁸ The first Asian countries to experience the "supermarket revolution" included East Asian countries like South Korea, Taiwan and

⁴⁴ G Nelson, M Rosegrant, A Palazzo, I Gray, C Ingersoll, R Robertson, S Tokgoz, Zhu T, T Sulser, C Ringler, S Msangi and You L, *Food Security, Farming, and Climate Change to 2050: Scenarios, Results, Policy Options* (Washington DC: IFPRI, 2010).

⁴⁵ Fan, *op. cit.*

⁴⁶ APEC Policy Support Unit, *op. cit.*

⁴⁷ Paul P S Teng and Margarita Escaler, *Regional Security Outlook, Council for Security Cooperation in the Asia Pacific (CSCAP)*, 2012.

⁴⁸ Thomas Reardon, C Peter Timmer and Bart Minten, "Supermarket Revolution in Asia and Emerging Development Strategies to include Small Farmers", *Proceedings of the National Academy of Sciences*, 2010, at <<http://www.pnas.org/cgi/doi/10.1073/pnas.1003160108>> (accessed 12 December 2012).

the Philippines in the early to mid-1990s. They saw the average share of supermarkets in food retail go up from approximately 10-20 per cent in the early 1990s to 50-60 per cent by the early 2000s.⁴⁹ They were then followed by countries such as Indonesia, Malaysia and Thailand, which saw the average share of supermarkets in food retail increase from 5-10 per cent in 1990 to 30-50 per cent by the mid-2000s. The most recent wave of countries that has seen supermarkets' share in food retail reaching 2 to 20 per cent of the market include China, India and Vietnam, thus resulting in the fastest supermarket spread in history.⁵⁰ 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 the small farmers is lower.⁵¹

POTENTIAL POLICY INTERVENTIONS

Feeding and nourishing a larger, more urban and increasingly affluent Asian population amid increasing uncertainty and unpredictability will be an enormous challenge. Not only must the lessons learned in the last 50 years of progress be brought to bear but a paradigm shift is also needed to address the new realities of today's food and agricultural system. Policymakers need to take a much broader perspective and approach in relation to food security. Recent policy measures by some Asian governments in response to rising food prices and increased food price volatility have demonstrated a bias towards easy, fast-acting, and protectionist measures.⁵² While entirely understandable that governments need to act promptly to cushion the blow of higher prices on their vulnerable populations, such short-term thinking may come at the expense of medium- and long-term objectives of increased agricultural productivity and sustained economic growth for all.

One of the aims of this paper was to underscore the multidimensional nature and complexity of food security. As illustrated in the model in Figure 1, there are many social, economic, environmental, physical and political factors that are interconnected and operating at different levels. Therefore, Asian policymakers must think beyond the notion that increasing food availability is ample. It is critical for them to tackle the four dimensions of food security simultaneously and ensure that food security at the household level, and not at the aggregate level, remains an overarching long-term objective. Below is a list of some policy interventions that are needed to move the region in the right direction. It is, by no means, an exhaustive one.

⁴⁹ Thomas Reardon and Ashok Gulati, "The Supermarket Revolution in Developing Countries: Policies for 'Competitiveness with Inclusiveness'", IFPRI Policy Brief 2 (Washington DC: International Food Policy Research Institute, June 2008).

⁵⁰ Ibid.

⁵¹ Bart Minten and Thomas Reardon, "Food Prices, Quality and Quality's Pricing in Supermarkets versus Traditional Markets in Developing Countries", *Review of Agricultural Economics* 30, no. 3 (2008):480-90.

⁵² APEC Policy Support Unit, op. cit.

1. Enhance agricultural productivity, particularly of smallholder farmers

To continue to play a role in economic growth, development, and poverty and hunger reduction, growth in agriculture is imperative. Following the Green Revolution practice, 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 Asian countries. Increased investments and institutional innovations should strengthen their access to input and output markets, financial and extension services, education, and rural infrastructure, including irrigation and rural road networks.⁵³ 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.

2. Increase investment in agricultural science and technology

Having played a critical role during the Green Revolution, sustained investments 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 was one of the contributing factors to the food price crisis in 2007-2008. There still remains a lot of room to increase the 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.

3. Provide and/or scale up social protection programmes, especially social safety nets

Social protection programmes can help bridge the gap between short- and longer-term food security interventions and protect the most vulnerable during emergency situations. For countries lacking established safety nets, i.e., social assistance/transfers targeted at the poor, governments must begin programme development immediately. Where they are already in place, governments should ensure that scaling up existing safety net programmes is a viable option by either adding new beneficiaries and/or by increasing transfers made to

⁵³ Fan, op. cit.

beneficiaries.⁵⁴ The availability of government resources, as well as proper targeting, design and implementation are essential in making these programmes effective.⁵⁵ Governments should draw on experiences and best practices from other countries for south-south learning.

4. Ensure economic growth is inclusive, encompassing the poor

Strong economic gains in the region must translate to enhanced nutrition for the most vulnerable.⁵⁶ While economic growth in recent decades has provided considerable scope for reducing hunger and malnutrition, millions still remain undernourished, particularly in southern Asia. Thus, governments need to ensure that growth and benefits reach and involve the poor by providing better social protection programmes, public goods and services, increased employment and income-earning opportunities. The poor, on their part, need to use their additional income for improving the quantity and quality of their diet, water and sanitation facilities as well as on improved health services. Women, in particular, play a critical role in making this happen.

5. Recognise health and nutrition as being closely associated with food security

Making more food available is not enough. Adequate nutrition is essential and key to sustainable economic growth. Thus, food security approaches must result in better health and nutritional outcomes, particularly for the poor.⁵⁷ They must be given more opportunities to diversify their diets, gain improved access to safe water, sanitation and healthcare services, acquire better education (particularly women's education) regarding nutrition and general childcare and feeding practices, as well as have access to targeted distribution of supplements in situations of acute micronutrient 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 emerging Asian countries and thus warrants closer attention.

6. Acknowledge the urban dimensions of food security

With already 45 per cent, and steadily increasing percentage, of Asians living in cities, policymakers 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 the majority of the urban poor in the region spend a large proportion (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.

⁵⁴ APEC Policy Support Unit, op. cit.

⁵⁵ Fan Shenggen, Maximo Torero and Derek Headey, "Urgent Actions Needed to Prevent Recurring Food Crises". IFPRI Policy Brief 16, (Washington DC: International Food Policy Research Institute, 2011).

⁵⁶ Food and Agriculture Organization, *State of Food Insecurity in the World: 2012* (Rome: FAO, 2012a).

⁵⁷ Ibid.

EU'S ROLE IN ASIA'S FOOD SECURITY

The European Union (EU) plays an important role in Asia's food security in several ways. First, the 27-member bloc is an important trading partner for the region. In 2006, it captured 16 per cent of all Asian exports, worth approximately USD457 billion.⁵⁸ The EU is China's largest trading partner, and the Association of Southeast Asian Nations' (ASEAN) second-largest, and it is also Japan's and South Korea's third and fourth trading partner, respectively.⁵⁹ Second, the EU has been an important contributor to some of these countries' export-led growth in recent years. It is the largest foreign investor in China, accounting for 20 per cent of all foreign direct investment (FDI) into the country, and similarly, in the Republic of Korea and the ASEAN countries.

Third, the EU has contributed not only to the economic growth of the region, but is also one of the world's leading contributors to global food security with agriculture at the heart of its international development programme.⁶⁰ In 2008, it set up a one-billion euro food facility fund as a rapid response to soaring food prices in developing countries. The food facility fund helps protect vulnerable populations from food price volatility by increasing food supplies, investing in agricultural capacity and improving agricultural governance.⁶¹ It pledged a further 2.7 billion euro in 2009 at the G8 meeting to help increase global food security. More specifically, the EU has recently invested 22 million euro in a four-year regional programme, entitled "Technology Transfer for Food Security in Asia" (TTFSA), which focuses on facilitating the adoption of productive and environmentally green technologies to raise agricultural productivity and improve farmers' access to markets.⁶² Seven projects are currently underway in countries with the highest food insecurity in Asia based on IFPRI's GHI: Afghanistan, Bangladesh, Myanmar, Cambodia, Laos, Nepal, Pakistan and India. The EU has also maintained its ongoing geographical and thematic development programmes that focus on poverty reduction and enhanced nutrition with their development partners in the region.

Lastly, the EU is one of the largest partners of the FAO and the World Food Programme (WFP), working alongside them to improve food security and promote rural development in many developing countries.

⁵⁸ Michael G Plummer, "EU-Asia Free Trade Areas? Economic and Policy Considerations", ADBI Working Paper 255, at <<http://www.adbi.org/working-paper/2010/12/03/4232.eu.asia.free.trade.areas/>> (accessed 12 December 2012) (Tokyo: Asian Development Bank Institute, 2010).

⁵⁹ Anne Pollet-Fort and Yeo Lay Hwee, "EU-Asia Trade Relations: Getting Through the Crisis", FRIDE Policy Brief no. 2, 2012, at <<http://www.friderg.org/publication/974/eu-asia-trade-relations:-getting-through-the-crisis>> (accessed 12 December 2012).

⁶⁰ European Commission at <http://ec.europa.eu/europeaid/what/development-policies/intervention-areas/ruraldev/food_intro_en.htm> (accessed 27 March 2013)(accessed 12 December 2012).

⁶¹ Ibid.

⁶² European Commission, Food Security — Asia, 2012, at <http://ec.europa.eu/europeaid/where/asia/regional-cooperation/food_security/index_en.htm> (accessed 12 December 2012).

For the reasons cited above, the current financial crisis in the EU is a cause for concern for the region's food security. The crisis has already impacted on some East Asian economies through decreased trade and a slowdown in investments. Further economic uncertainty in the 27-member bloc could also jeopardise existing food security programmes in the region.

OPPORTUNITIES FOR CLOSER COOPERATION BETWEEN EUROPE AND ASIA

The challenges facing Asia's quest to be food secure, and several areas for policy interventions were identified in the preceding sections. However, policy initiatives alone are not sufficient and more substantive results are needed to produce the desired changes. Food security requires a multi-sectoral, integrated effort drawing from multiple sources of capacity, and therefore, closer cooperation between Europe and Asia has the potential to generate significant benefits to both regions. Below are examples of opportunities for closer cooperation.

- Increasing farm-level productivity through investments in currently used technologies
 - Farm-level crop, animal and fish yields in Europe are among the highest in the world and many European farmers utilise the latest technologies on their farms. As mentioned in the preceding section, the EU's recently launched Technology Transfer for Food Security in Asia programme aims to transfer agricultural technologies to many of Asia's poorest and smallest farmers who are often excluded due to poverty, gender, ethnicity and remote location. The goal is to adapt these technologies for the use of smallholder farmers to increase their productivity. Further, European multinational companies like Syngenta and Bayer CropScience have significant interests in Asia and contribute to technology-sharing of inputs like seeds and management systems. Similarly, public sector R&D has led to the introduction of new technologies to European farmers, such as precision farming systems from the Wageningen Agricultural University in the Netherlands. A drop in FDI in Asia has meant that, until recently, technology transfer from Europe to Asia has not kept pace with the need to increase the agricultural productivity of Asia's over-400 million small farms.
- Increasing R&D cooperation in science to generate "breakthrough" technologies for crops, animals and fish
 - Increasing yields and productivity of key food crops and animals through strategic collaborative research between centres of excellence in Europe and Asia
 - Science-based fish breeding and improvement (e.g., the pioneering work on the genetic improvement of a tropical food finfish, Tilapia, was done by Norwegian scientists and the technology has since led to commercial farming in Malaysia through a joint venture called Trapia)

- Techniques to assess and reduce food losses in the region (e.g., the UK's Waste and Resources Action Programme, WRAP, has extensive experience in conducting quantitative research on household and commercial food wastage, thus aiding the implementation of more effective plans to reduce food loss along the supply chain)
- Sharing experiences in ensuring economic access to food
 - The EU has some of the world's best social safety nets to buffer its poorer citizens against poverty-induced hunger and malnutrition. Asia is woefully lacking in the experience of institutionalised safety nets. Family-based safety nets have broken down, especially with family dislocations between rural and urban areas, as the continent modernises. Research and experience-sharing on effective policies, policy instruments and financial arrangements to assure economic access to food will greatly benefit the poor in many Asian countries.
- Investments in improving the logistics of food supply chains to improve physical access to safe food
 - The EU generally has modern food supply chains, oftentimes accompanied by traceability and identity preservation systems. Traditional supply chains predominate in the region and are often characterised by being more production-oriented, consisting of fragmented production units, made up of multilayered channels, and there is limited use of post-harvest technologies. Inefficiencies in these types of supply chains often result in large losses in the quantity and quality of food.
- Development and implementation of food safety standards
 - The EU today has some of the strictest food safety regulations in the world based on clearly defined standards and a transparent monitoring system. The many incidents which have occurred in exporting countries have led not only to food fears within those countries but also in the countries to which food have been exported. As the EU is a major trading partner of Asia, both regions can greatly benefit from the sharing of technologies and experience, and from joint investments to improve food safety.
- Developing urban farming systems from shared experiences and R&D on urban agricultural science and technology
 - Two of the premier entities championing urban agriculture — the RUAFA (Resource Centres on Urban Agriculture and Food Security) Foundation and the United Nations' FAO — are based in Europe. Concomitantly, urban farming is a part of urban living in several European countries, as demonstrated by the many community gardens and local organic vegetable farms that exist throughout the region. Asia is now beginning to recognise the role urban farming can play in food security and how it can allay some of the dependency on the countryside for produce like vegetables, fish and eggs.

The Netherlands has pioneered high-tech greenhouse farms for vegetables, while countries like Singapore and Korea are only starting to make serious investments in these areas now. The sharing of experiences and joint R&D between Europe and Asia will accelerate the development of new technologies appropriate for Asia's growing cities and spur investment in the area.

- Promoting and organising regular forums for joint sharing of new developments in all dimensions of food security
 - Bi-regional dialogue forums and meetings such as the ASEM (Asia-Europe Meeting) High-Level Conference on Food Security, the EU-Asia Dialogue project and academic conferences such as the 2011 International Conference on Asian Food Security aim to foster cooperation between the two regions in the area of food security and therefore must be encouraged and strengthened.

CONCLUSION

While many challenges remain, it is important to remember that Asia has already achieved remarkable success in terms of feeding the majority of its population over the last 50 years. In just two decades, Asia managed to slash the proportion of undernourished from 23.7 per cent in the period 1990-1992 to 13.9 per cent in the period 2010-2012. However, the prevalence of hunger and malnutrition in many parts of the region in an environment of plentiful food demands more successes in agricultural development. Moreover, emerging trends and changing realities of the current food and agricultural systems require new and innovative approaches to tackle food security. A “business-as-usual” approach will simply be inadequate. The added value from cooperation between Asia and other regions of the world such as the EU is high as it will help reduce the time and resources required to develop solutions.

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Food Security in China and its Policies

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EXECUTIVE SUMMARY

China has attained great achievements in improving its food security by depending mainly on its own agricultural production; a miracle, considering that it meets the needs of one-fifth of the world's population with less than one-tenth of the arable land. However, China's agricultural production and food supply-demand balance confront many challenges in the new era, such as the greater demand for better quality food. Thirty years ago, when China initiated its economic reform, one in three Chinese citizens was undernourished. Since then, the national average per capita food intake calculated by calorie, fat and protein has risen continuously and is now close to the level of many developed countries.

China's food demand is expected to keep rising in the next few decades while its agricultural production is facing even more severe constraints. Arable land has become scarcer because it is more profitable for land to be used for residential or industrial purposes. Water supply has also come under great pressure with increased demand, reduced supply and heavier pollution. High levels of inputs and diminishing marginal returns indicate that increasing inputs will not provide as large increases in output as before and may even have negative effects on production. Meanwhile, trade liberalisation and environment-development tensions will further challenge China's agricultural and rural economy. How to strengthen agricultural production and the sector's competitiveness is a tough issue for China after more than 30 years of high economic growth.

The Chinese government has recognized the magnitude of the challenges it faces. A series of policies have been adopted to protect agricultural land, increase research and development (R&D) investments, subsidize agriculture, and enhance rural infrastructure and water management. It has also set production targets for several key commodities to secure domestic supply. While the challenges confronting China's agriculture are complicated and dynamic, the emphasis on agriculture by the Chinese government and society, the pragmatic policies

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implemented and the rising purchasing power of consumers will contribute to agricultural production and rural development, and further to food security sustainability.

This paper examines the policies that China has adopted to develop its agricultural economy, reduce poverty and improve food security. Section 2 presents the challenges faced by China in developing its agricultural sector. Section 3 discusses the socio-economic impacts these challenges have on the country. Section 4 lays out the policies that were implemented to support agricultural development and ensure sufficient food supply. Section 5 evaluates the opportunities for closer cooperation between Europe and China. Section 6 briefly discusses the function of urban agriculture in food supply. Conclusions and policy implications are discussed in the final section.

FOOD SECURITY CHALLENGES

China faces severe challenges to achieving food self-sufficiency to meet rising demand. Food availability in China is important because it affects not only the livelihoods of a large proportion of the world's population, but also industrialization and urbanization, income growth, as well as consumption pattern. However, agricultural production is constrained by water and land, environmental issues and drastic competition from non-agricultural sectors. To understand the challenges to China's food security, seven main aspects are discussed.

Land

There has been a slow but steady loss of arable land since the late 1980s. Cultivable land decreased from 144 million hectares (ha) in the late 1980s to 127 million ha in 2001 and further down to 122 million ha in 2008, narrowly hitting the "red line" of 120 million ha set by the central government³. During the economic reform era, population pressure, urbanization and rising prosperity had resulted in the loss of some of China's best farmland. The loss of output is even greater than this contraction since the process of net land contraction conceals the loss of disproportionately large plots of land in the most fertile regions of coastal China where economic growth and structural change have been the most prominent. Meanwhile, land degradation has also become another major problem.

Land fragmentation further aggravates the problem. According to the World Bank, China's 0.08 ha of cultivable land per person in 2008 was comparatively low compared to the world average of 0.2 ha, made worse by the possibility that land plots owned by single households are scattered. This kind of land distribution prevents farmers from adopting modern technology and increasing agricultural production due to lack of labour and other inputs.

Water

China ranks sixth in the world in terms of water resources volume. However, in per capita terms, it is only one-fourth of the world average. As agricultural land in the developed region

³ Ministry of Land and Resources of the People's Republic of China (MLR). 2008. *Arable Land Reserves Continue to Decline*. Beijing, China.

of southeast China has to give way to industrialisation and urbanization, agricultural production now takes place chiefly in the north which has only 16.8% of the nation's water resources, 70% of the arable land and 46% of the country's population⁴. The North China Plain, where 70% of wheat and 60% of maize are produced, is known to be severely deficient in water.

Underground aquifers and surface water have also been over-pumped. A recent report issued by the Earth Policy Institute in Washington, DC estimates that some 130 million people in China are fed with grain that is produced by over-pumping underground water⁵. When underground aquifers are exhausted, irrigation in these basins will have to rely on rainfall, which will severely impact on crop yields. As water becomes scarcer, grain production losses are exacerbated.

Labour

Increase in wages significantly affects agricultural production costs. The agricultural sector has been facing labour shortage as a result of rural labour migration to industrial and service sectors, slowing population growth and ageing. The number of rural dwellers is expected to decline from 900 million in 2010 to 400 million by 2040⁶. In recent years the real wage of labour is increasing at a rate of 8%. The rising opportunity cost of rural labour will change the cost structure of agricultural products; if labour is not substituted by machinery or improved technology, the increased cost will reduce agricultural production, and severely dampen the competitiveness of China's agricultural products in the global market.

Investment in Agricultural Technology

Technological change has been the primary engine of agricultural growth. Between 2001 and 2008, public R&D funding doubled, while private R&D funding increased to 16% of the total in 2006. Despite large funding increases, China's agricultural research intensity ratio – the ratio of total public spending on agricultural R&D to national agricultural output – of 0.5 in 2008 is quite low compared to that of developed countries, which typically have a ratio of about 2.5. Another major challenge is the incentive design of agricultural research. Currently, China's agricultural research is dominated by the public sector, which does not always respond to demands for new technologies, and funding was previously allocated in ways that did not always reward excellence.⁷

⁴ Huang, J., Yang, J., Qiu, H. 2012. "Reconsideration of the strategy and policy on national grain security". *Issues in Agriculture Economy* (3): 4-8.

⁵ Swiss Federal Institute of Technology Zurich (ETH). 2011. *Feeding Billions: Food Security in China*. Zurich, Switzerland.

⁶ Boulter, J. 2013. *Food and Water Security China's Most Significant National Challenge*. Independent Strategic Analysis of Australia's Global Interests.

⁷ Huang, J., Liu, Y., Martin, W., Rozelle, S. 2010. "Agricultural Trade Reform and Rural Prosperity: Lessons from China". NBER Chapters in *China's Growing Role in World Trade*, 397-423. National Bureau of Economic Research, Inc.

Climate Change

There is no definitive answer to what climate change can do to food production in China. Current research results based on CO₂ fertilisation and utilisation of irrigation vary remarkably depending on the region. In general, the existing results indicate that rain-fed farmland is expected to suffer more adverse consequences than irrigated areas. Increased CO₂ fertilisation may increase crop yields. Higher temperatures may increase rainfall in some areas and reduce it in others. Although the impacts of climate change on China's agricultural production are highly uncertain in the long run, there is consensus that extreme weather events are likely to become more frequent and the adverse effects of climate change on crop yields may potentially threaten food security in the short term.

Consumption Patterns

With rapid industrialization, urbanization and higher living standards, China's food demand will keep rising and its consumption pattern will continue to change notably, posing increasing pressure on food production. China's middle class presently numbers around 300 million and is expected to increase to 600 million by 2020. Increased food consumption will inevitably follow; daily per capita kilojoules consumption rose from 10,800 in the early 1990s to 12,400 in 2005-07⁸. There is still room for growth in food consumption when compared to a daily per capita kilojoules consumption of 15,800 in the US in 2005-2007.

Not only is there an increase in the quantity of food consumed, the consumption patterns are also changing. The Chinese diet is expected to change from one that is mainly dependent on vegetables and grains to one that is more meat-dependent. As Chinese consumption of meat continues to grow, the import of livestock feed is also likely to rise remarkably. Therefore food security in China takes the form of not only grain security but feed security⁹.

FOOD SECURITY CONSEQUENCES

China's agricultural sector has three objectives: (i) match the rapidly changing demand for food from a larger and more affluent population to its supply; (ii) ensure that the poor in the country do not go hungry; and (iii) implement measures that are environmentally and socially sustainable.

Equity and Differentiated Food Demand

Three decades of economic reforms have lifted hundreds of millions of Chinese people out of poverty. China is one of the very few countries in the world that will fulfil the Millennium

⁸ Boulter, J. 2013. *Food and Water Security China's Most Significant National Challenge*. Independent Strategic Analysis of Australia's Global Interests.

⁹ Huang, J., Liu, Y., Martin, W., Rozelle, S. 2010. "Agricultural Trade Reform and Rural Prosperity: Lessons from China". NBER Chapters in *China's Growing Role in World Trade*, 397-423. National Bureau of Economic Research, Inc.

Development Goal of cutting its hunger incidence by half in 2015¹⁰. Even so, the Food and Agriculture Organization's report on *The State of Food Insecurity in the World* shows that in 2005-2007, undernourishment still affected 130 million people or about 10% of the population in China, mostly in the countryside in the central and western regions.

On the other hand, there is a growing need to meet the dietary aspirations of a population that is becoming more affluent and more demanding. In this respect, profound changes have already taken place. In the early 1980s, domestic food output met little more than subsistence needs. But since the 1990s, rising income has accompanied major improvements in diet, with most Chinese enjoying significant increases in the consumption of non-staple foods, including meat, fish, fruits, eggs and dairy products. These changes have been most pronounced in cities and are now widely felt even in the countryside. As income continues to rise, especially among rural residents, the demand for non-staples will intensify, adding to China's food security challenge.

Natural Resources and the Environment

Trends in environmental degradation have aggravated the scarcity of natural resources. First, there is considerable stress on the agricultural land base. Inappropriate use of technologies such as excessive application of fertilizers and pesticides or imbalances in the combination of inputs can result in serious environmental problems and food safety concerns. There is growing concern regarding farm produce contamination, agro-ecosystem damage and human health risks as China has become the world's largest consumer of chemical fertilizers and pesticides. Environmental stresses are evident in terms of soil erosion, salination, arable land loss and declining land quality¹¹. Deng et al.¹² show that as a result of industrial development and urban expansion, the average potential productivity of cultivated land – or bioproductivity – declined by 2.2% from the late 1980s. The pressure on the environment will undermine past progress in food production. Policies must take into consideration current and future food productions.

Meanwhile, the other concerns are highly correlated to agriculture. For example, water shortages and increasing competition from industry constrain the use of irrigation and related output increase¹³. Poorly educated farmers may not have the means or incentives to make farming decisions that contribute to long-term sustainable development.

¹⁰ Swiss Federal Institute of Technology Zurich (ETH). 2011. *Feeding Billions: Food Security in China*. Zurich, Switzerland.

¹¹ Huang, J., Rozelle, S. 1995. "Environmental Stress and Grain Yields in China". *American Journal of Agricultural Economics* 77: 853-864.

¹² Deng, X., Huang, J., Rozelle, S., Uchida, E. 2006. "Cultivated Land Conversion and Potential Agricultural Productivity in China". *Land Use Policy* 23: 372-384.

¹³ Lohmar, B., Wang, J., Rozelle, S., Huang J., Dawe, D. 2003. *China's Agricultural Water Policy Reforms: Increasing Investment, Resolving Conflicts and Revising Incentives*. Agriculture Information Bulletin No. 782. Washington DC, United States Department of Agriculture Economic Research Service.

FOOD SECURITY POLICIES

The promotion of agricultural production and food security is always among the top priorities of the Chinese government. Furthermore, the Chinese government has recognized the rising challenges during the process of China's economic transition. Many policies have been implemented and planned to enhance the capacity of agricultural production and ensure national food security in the future.

Land Policies

China's rural reform starts with land reform and the income rights that provided incentives for farmers to increase their output and to benefit from it. In 1979, the Household Responsibility System (HRS) reform dismantled agricultural collectives and contracted agricultural land to households, mainly based on family size and number of workers in each household. The land reform started the country's economic reform and significantly promoted agricultural production.

During the 1980s and 1990s the concerns were about the long-term sustainability of the reforms. The renewal of land-use contracts has been extended from 15 years to 30 years. By 2000, 98% of villages had amended their contracts with farmers to reflect these long-term rights¹⁴. The secured land rights enhanced land productivity.

With the issue of use rights resolved, the government is seeking a mechanism to allocate additional arable land to the remaining full-time farmers to increase their income and competitiveness. A major new policy, established by the Rural Land Contract Law (RLCL), allows farmers to enter into contractual agreements with the collectives to obtain rights other than land ownership, such as the rights of transfer and exchange of land, as they would have under a private property system. The law also allows family members to inherit land during the contract period.

Even with the enactment of RLCL, village authorities in some parts of China have continued to interfere with the conferred rights¹⁵. There is a perception that despite RLCL, tenure security is still weak, and as a result, farm size and quality of investments in land are limited. Without securing tenure, rural residents do not have the assets to access finance that permits them to invest in land. The debate in China is now whether the rural economy is ready for indefinite land security. Fully secured tenure will probably not occur immediately, but with the continued effort of reformers it may become a reality.

Agricultural Research Policies

The Chinese government emphasizes the importance of yield improvements in promoting agricultural production. To establish a more efficient incentive system, nationwide reform of

¹⁴ Ministry of Agriculture. *China Agricultural Development Report, 2000 and 2002*. Beijing, China Agricultural Press.

¹⁵ Rozelle, S. 1996. "Stagnation Without Equity: Patterns of Growth and Inequality in China's Rural Economy". *China Journal* 35(1): 63-96.

research was launched in the mid-1980s to increase research productivity by shifting funding from institutional support to competitive grants, supporting research useful for economic development and encouraging commercialization of new technology¹⁶. In the late 1980s and early 1990s, new horticultural seeds, improved breeding livestock¹⁷ and new dairy technologies were imported¹⁸.

After a decline from the early 1980s to the mid-1990s¹⁹, investment in R&D began to rise in China. Funding for plant biotechnology had been increased, but to date only *Bacillus thuringiensis* (Bt) cotton has been commercialized in a major way^{20, 21}. China is one of the global leaders in agricultural biotechnology. In the late 1990s, China's investment in agricultural biotechnology research surpassed those of other developing countries combined, and its public spending on agricultural biotechnology was second only to the United States²². Investment in government-sponsored R&D increased by 5.5% annually between 1995 and 2000 and by 15% per year after 2000²³. During the past decade, the increase in rural R&D investments in China has been the most rapid among large nations.

The investment in R&D has paid off. In China's early reform period, major food crops yields rose steadily. During the 1980s and early 1990s, China's agricultural total factor productivity (TFP) rose at a healthy rate of 2% per year²⁴. Meanwhile, agricultural TFP in poorer areas rose as quickly²⁵. Poor farmers are just as likely to adopt new technologies as wealthier farmers when the technologies are introduced²⁶.

¹⁶ Pray, C., Rozelle, S., Huang, J. 1997. *Can China's Agricultural Research System Feed China?* Working paper. New Brunswick, NJ, USA, Rutgers University Department of Agricultural Economics.

¹⁷ Rae, A.N., Ma, H., Huang, J., Rozelle, S. 2006. "Livestock in China: Commodity-specific Total Factor Productivity Decomposition Using New Panel Data". *American Journal of Agricultural Economics* 88(3): 680-695.

¹⁸ Ma, H., Rae, A.N., Huang, J., Rozelle, S. 2006. *Enhancing Productivity on Suburban Dairy Farms in China*. Working paper. Palo Alto, CA, USA, Stanford University Freeman Spogli Institute for International Studies.

¹⁹ See footnote 14.

²⁰ Huang, J., Rozelle, S., Pray, C., Wang, Q. 2002. "Plant Biotechnology in China". *Science* 295: 674-677.

²¹ Huang, J., Hu, R., Rozelle, S. 2003. *Agricultural Research Investment in China: Challenges and Prospects*. China Finance and Economy Press, Beijing.

²² Huang, J., Liu, Y., Martin, W., Rozelle, S. 2010. "Agricultural Trade Reform and Rural Prosperity: Lessons from China". NBER Chapters in *China's Growing Role in World Trade*, 397-423 National Bureau of Economic Research, Inc.

²³ Hu, R., Shi, K., Cui, Y., Huang, J. 2007. "China's Agricultural Research Investment and International Comparison". *China's Soft Science* 2: 53-65.

²⁴ Fan, S. 1997. "Production and Productivity Growth in Chinese Agriculture: New Measurement and Evidence". *Food Policy* 22(3): 213-228.

²⁵ Jin, S., Huang, J., Hu, R., Rozelle, S. 2002. "The Creation and Spread of Technology and Total Factor Productivity in China's Agriculture". *American Journal of Agricultural Economics* 84(4): 916-939.

²⁶ Huang, J., Rozelle, S., Pray, C. 2002. "Enhancing the Crops to Feed the Poor". *Nature* 418(8): 678-684.

Market Policies

Price and market reforms have been important components in China's transition from a centrally planned economy to a market-oriented one. As markets began to emerge, the state government refrained from interfering, allowing markets to function with minimum distortions. The distinct roles of private and public sectors led to increased productivity and efficiency²⁷. In a liberalized market, farmers can adjust production to commodities with rising prices and mitigate the downside effects of price change²⁸.

One of the market interventions that the government announced in recent year is the "minimum agricultural pricing policy" in 2004. A minimum price for early indica rice and japonica rice was first announced in 2004; in 2005 the coverage was extended to include middle and late indica rice, and in 2006 the coverage was further extended to include wheat. China has increased the minimum prices by about 5-10% annually. State grain reserves were established and managers of the reserves were authorized to purchase crops when market prices hit a minimum. The grains were then placed in storage. This ensures stability in agricultural prices and prevents a downward slide of income for rural workers.

Farm Taxes and Subsidies

The government has also gradually eliminated almost all taxes and fees on agricultural production. China started the rural tax reform in 2000 to address the high tax burden on farmers. It is estimated that before the rural tax reform, Chinese farmers had to pay about 10% of their annual net income to central and local governments as taxes and fees²⁹. The rural tax reform began by merging most agricultural taxes, fees and charges into one tax and then capped the tax at a rate (8.4%) relative to the annual grain-equivalent value of agricultural output for the previous years. The reform included the removal of the Animal Slaughter Tax and Special Agricultural Tax on all products except tobacco. In 2005, the government announced that agricultural tax reform would be further accelerated to phase out all national farm taxes in 2006. In 2006 China totally eliminated national agricultural taxes that had been implemented thousands of years ago.

Meanwhile, China has increased its agricultural subsidies. The national grain subsidy system, which is designed to increase grain production for national food self-sufficiency and to reduce poverty by income transfer, is a combination of four kinds of subsidies – i) grain subsidy; ii) seed subsidy; iii) aggregate input subsidy; and iv) agricultural machinery subsidy. Agricultural subsidies have increased significantly in China since 2004. The primary goals of the subsidies are to enhance China's grain security and to improve farmers' income. Grain

²⁷ de Brauw, A., Huang, J., Rozelle, S. 2004. "The Sequencing of Reform Policies in China's Agricultural Transition". *The Economics of Transition* 12(3): 427-465.

²⁸ Huang, J., Li, N. 2003. "China's Agricultural Policy Analysis and Simulation Model – CAPSiM". *Journal of Nanjing Agricultural University* 3(2): 30-41.

²⁹ Liu, M., Xu, Z., Su, F., Tao, R. 2012. "Rural Tax Reform and the Extractive Capacity of Local State in China". *China Economic Review* 23(1): 190-203.

and aggregate input subsidies accounted for about 80% of total subsidies in 2004-2011. These two subsidies hit 101.1 billion yuan (or US\$15.7 billion at an exchange rate of 6.46) in 2011.

Agricultural Trade Policies

Trade policies have an important influence on farmers as they provide export opportunities and potential access to better and less expensive commodities. It transmits price signals from the world markets to China's domestic market, and sends information to the nation's policymakers, agricultural producers and related personnel as to which commodities China has a comparative advantage. Such signals, if allowed to get through to farmers via a liberalized trade system, will enable the economy to run more efficiently and increase farmers' incomes.

China has been successful in liberalizing its agricultural trade. It has become one of the most liberalized countries in agricultural trade. China's average import tariff of agricultural commodities had reduced gradually from 42.2% in 1992 to 15.2% in 2010. It is worth noting that China's agricultural trade liberalization began before China's WTO accession. The agricultural average import tariff tumbled from 42.2% in 1992 to 21% during the 1992-2001 period. After China's WTO accession, China's agricultural import tariff has been further reduced following China's WTO commitments. The average agricultural import tariff slipped from 21% in 2001, the year China joined WTO, to 15.2% in 2010. China's agricultural import tariff is equal to only one-quarter of the global average.

Water Policies

In water management, China focused largely on building dams and canal networks before the economic reform, accounting for its advanced level of surface water management and flood control. Comparatively, after the 1970s there has been a greater focus on increasing the use of China's vast groundwater resources³⁰. By 2005 the country had more tube wells than any other country except India. Investment was first initiated by local governments with the support of county and provincial water bureaus; in the 1990s, however, farming families were encouraged to own irrigation equipments³¹. At the same time, private water markets in which farmers sold pumped water were also encouraged. After the mid-1990s, there was a reform in surface water management to increase the efficiency of water usage.

The new investment in groundwater has increased the cultivated area for agriculture and increased farmers' incomes and productivity³², while the privatization movement has made

³⁰ Wang, J., Huang, J., Blank, A., Huang, Q., Rozelle, S. 2005. "The Development, Challenges and Management of Groundwater in Rural China". In: Giordano, M., Shah, T. (ed) *Groundwater in Developing World Agriculture: Past, Present and Options for a Sustainable Future*, International Water Management Institute.

³¹ Wang, J. 2000. *Property Right Innovation, Technical Efficiency and Groundwater Management: Case Study of Groundwater Irrigation System in Hebei, China*. Ph.D. thesis. Beijing, Chinese Academy of Agricultural Sciences.

³² Huang, Q., Lohmar, B., Rozelle, S., Huang, J., Wang, J. 2006. "Irrigation, Agricultural Performance and Poverty Reduction in China". *Food Policy* 31: 32-52.

water management more efficient³³. However, China's groundwater tables are falling remarkably in many places and some wells have been pumped dry. In the long term, sustainability issues need to be addressed seriously³⁴.

Fiscal Policies

China has implemented several reforms to increase fiscal revenue and public investment. The government has made considerable progress in supporting public finances since the early 1990s. If extra budgetary and social security funds are included, government spending was 25% of gross domestic product (GDP) by 2006³⁵, comparable with lower-income OECD (Organization for Economic Co-operation and Development) countries and higher than most East Asian countries. China has maintained a prudent fiscal policy with low deficit and debt in terms of GDP, with higher government spending stimulating the economy.

Government expenditures in most areas of agriculture had increased gradually during the reform period, but the ratio of agricultural investment to agricultural GDP steadily declined from the late 1970s to the mid-1990s. In the same period, there was significant capital outflow from agriculture to industry and from rural to urban areas through the financial system and government agricultural procurement³⁶. In 1978, officials invested 7.6% of GDP in the agricultural sector, but by 1995 the figure had dived to 3.6%³⁷. However, the situation changed remarkably afterwards and the proportion increased continuously and significantly.

Local Investment

Local infrastructure is essential for agricultural production efficiency. Apart from a few suburban and coastal regions, rural infrastructure in China is poor: roads, bridges, irrigation, drainage, drinking water, schools and health facilities are decades behind city infrastructures. However, there have been improvements in recent years. Research shows that on average every village in China had one infrastructure project during the late 1990s, far more than most other developing nations in Asia. Investment activity has increased sharply in recent years to almost one project per year³⁸. Most of these projects are public goods such as orchards, which enjoyed frequent government investments in the 1980s. Research also suggests that the investment is targeted at the poor, minorities and remote parts of China. Compared to more

³³ Wang, J., Huang, J., Rozelle, S., Huang, Q., Zhang, L. 2008. *Understanding the Water Crisis in Northern China: What are the Government and Farmers Doing?* Working paper, Center for Chinese Agricultural Policy. Beijing, Chinese Academy of Sciences.

³⁴ Wang, S. 2008. "Overview". In: Lou, J., Wang, S. (ed) *Public Finance in China – Reform and Growth for a Harmonious Society*, The International Bank for Reconstruction and Development / The World Bank.

³⁵ Ibid.

³⁶ Nyberg, A., Rozelle, S. 1999. *Accelerating China's Rural Transformation*. Washington DC, World Bank.

³⁷ National Statistical Bureau of China (NSBC). 2001. *China Statistical Yearbook*. Beijing, China Statistical Press.

³⁸ Luo, R., Liu, C., Zhang, L., Rozelle, S. 2007. *Investing in Rural China: a Report on a Survey of Public Infrastructure Investment*. Working paper, Center for Chinese Agricultural Policy. Beijing, Chinese Academy of Sciences.

developed countries like Japan and Korea, China's per capita investment in public goods enjoyed by rural residents is still quite low. It is only beginning to narrow the rural-urban infrastructure gap; an enormous sustained effort is required to transform the rural economy.

Education and Health Programmes

Rural services, particularly education and health, correlate with people's access to healthy and nutritious lifestyle. There has been renewed government interest in improving education by reducing fees. In 2005, fees for elementary schools were eliminated in poor areas; in 2006 the elimination was extended to the entire rural economy and by 2007 all compulsory education was free. The income effects of such policies are potentially enormous: Huang et al. (2004) show that the benefit of tuition fees elimination outstrips the losses resulting from tariff reductions of China's protected crops by two times. The national and regional governments have also begun to build a rural healthcare system: the New Cooperative Medical System. By 2007, the government had invested up to RMB40 (US\$22 in PPP term) per capita in the system. Anticipating the skill needs of its labour force and equipping its people for new jobs are a fundamental goal of the government.

Labour Policies

China began its reform period with most of the workforce concentrated in agriculture. To shift China's agricultural labour force to the industrial and service sectors, it had to embark on massive urbanization and move its rural population to the towns. Such policies aim to give migrants legal status in the cities and increase migrants' access to health and education services. Farmers are the beneficiaries of these policies. Migration is without doubt one of the driving forces for enhancing the rural economy. Rozelle (1996) shows that access to off-farm jobs is the most effective way to raise the income of rural households³⁹. Brauw and Giles (2008) link migration with rising rural income and a falling poverty rate⁴⁰.

Yet there are still policy constraints that hamper more permanent shifts in labour from rural to urban areas as well as from the agricultural to industrial and service sectors. One is the *hukou* residence registration system, which has restricted labour movement out of the rural area⁴¹; another is the land tenure system, where households leaving the agricultural sector are not able to collateralize their land – there are villages which pressured families migrating to cities to relinquish their land (Zhao, 1999). Other institutional barriers that separate rural and urban population include the inequities in levels of spending and access to education, health and welfare services.

³⁹ Rozelle, S. 1996. "Stagnation Without Equity: Patterns of Growth and Inequality in China's Rural Economy". *China Journal* 35(1): 63-96.

⁴⁰ Brauw, A., Giles, J. 2008. *Migrant Labor Markets and the Welfare of Rural Households in the Developing World: Evidence from China*. Policy Research Working Paper Series 4585. Washington DC, World Bank.

⁴¹ Zhao, Y. 1999. "Leaving the Countryside: Rural-to-Urban Migration Decisions in China". *American Economic Review* 89(2): 281-286.

Taken together, the recent policies in expanding rural infrastructure, providing free tuition in rural schools, reducing tax and providing subsidies in agriculture and health insurance are substantial. They have contributed significantly to the observed improvements in household income and food security in rural areas.

OPPORTUNITIES FOR AGRICULTURAL COOPERATION BETWEEN CHINA AND THE EU

Bilateral agricultural trade between China and the EU expanded tremendously after China's WTO accession. China's agricultural export to the EU increased by 2.2 times, from US\$1,901 million in 2001 to US\$6,102 million in 2011, at an average annual growth rate of 12.4%. Meanwhile, China's agricultural import from the EU had risen much faster, with an average annual growth rate of 19.5%, than its export. Total agricultural import from the EU increased by five times from US\$875 million in 2001 to US\$5,213 million in 2011. The rapid rise in bilateral agricultural trade shows rising complementarities and great opportunities for both sides. China's massive agricultural import from the EU in recent years is indicative of China's economic growth and the rising affluence of its consumers. China is thus a huge potential market for the EU agricultural sector.

China's main imports from the EU come from two broad categories: high value-added food and raw materials for industrial usage. The raw materials for its textile and apparel industries (mainly cotton, raw hides and skins) soared from US\$190 million in 2001 to US\$1,559 million in 2011, at an average annual growth rate of 23.4%. The share of raw materials for textile and apparel industries in total agricultural export from the EU thus jumped from 21.7% in 2001 to 29.9% in 2011. With the rapid growth of per capita income and urbanization, the demand for healthy and nutritious food by Chinese consumers is on the rise. China's import of high value-added food from the EU has increased significantly. For example, China's import of dairy products and olive oil from the EU grew from US\$52 million and US\$0.4 million in 2001, to US\$408 million and US\$125 million in 2011 respectively. The average annual growth rate of the two products reached 22.9% and 77.7% during 2001-2011.

Besides bilateral trade, there exist extensive areas for cooperation. As the second largest economy and the fastest growing economy in the world, China's agriculture sector has been experiencing dramatic changes and facing lots of challenges. In production, the severe constraints of land, water, environment and rising cost of labour have caused China's agricultural development to deviate from its previous growth pattern. Advanced agricultural technology will be the fundamental driver of its future growth. Therefore, cooperation on seed technology, agricultural machinery and advanced management will be urgently needed in the next decades. In terms of demand, Chinese consumers will further shift to high value-added foods and pay more attention to food safety issues. The Chinese government has put in great efforts and paid increasing attention to setting up stringent, efficient and science-based food standards and regulation systems. No doubt, EU's experiences and current regulations provide will be a good lesson for China.

THE ROLE OF URBAN AGRICULTURE

The development of modern urban and periurban agriculture (UPA) has been promoted as a result of the growing concern for agricultural production and food security in China. The central government of China had developed a balanced scheme between industry and agriculture in the 1960s after the domestic famine. The promotion of both industrial and agricultural sectors and the integration of urban and rural economies have led to enlarged city administrative boundaries. For example, the total administrative area of Beijing expanded from 63 km² in 1949 to 16,808 km² in 1958, with 10 urban and periurban districts as well as eight counties. This enlargement in administrative boundaries has given rise to urban and periurban agriculture.

UPA has three main characteristics. First, UPA is mainly located in the suburban areas of cities and is a physical link between agricultural suppliers and urban consumers. Periurban agriculture provides a stable and diversified food supply for urban dwellers and is demand driven. More than 70% of non-staple food in the city, mainly consisting of vegetables and milk, was produced in the city in the 1960s and 1970s. Second, UPA is a relatively labour- or capital-intensive activity because of the competition between different economic activities for the scarce land in the urban area. Third, UPA has provided employment to many rural workers and rural migrants in the big cities. Because of these benefits brought about by UPA, many municipal governments have embarked on programmes to modernize the periurban agriculture sector and establish urban and periurban agricultural bases within the city.

Many successful urban and periurban agricultural sites demonstrate that UPA can play an important role in urban economic development and food security. It creates jobs and economic returns to urban agricultural producers, increasing urban dwellers' accessibility to food, providing a wider range of agricultural products for the urban population and supplementing the food supply. Moreover, it improves the ecological capacity of the urban areas by improving air quality and preventing further urban sprawl, all of which contribute to the sustainability of food supply.

UPA has proven to be successful in major cities of China. It is also highly profitable because of the expanded demand for green products. Some of these agricultural sites grow into agro-tourism zones and become increasingly important in urban society characterised by higher living standard and more leisure time. It is a successful approach to ensuring sufficiency, sustainability, accessibility, diversity and the nutrition side of food supply.

CONCLUSIONS AND POLICY IMPLICATIONS

China became one of the fastest growing economies in the world during the late 20th century and early 21st century. Its GDP has grown at about 10% annually in the past three decades. Over the course of the reform period, both rural and urban incomes have increased noticeably. The rising income is also associated with a substantial reduction of poverty and significant improvements in food security. However, China still faces many challenges to its food security. Agricultural production is constrained by scarce land and water availability and

dramatic competition from fast-growing non-agricultural sectors. Rapid economic growth on the other hand also further stimulates demands on agricultural commodities both for food consumption and industrial use.

China needs more institutional reforms to increase its agricultural supply and to enhance its competitiveness. Its success in significantly improving food security in the past three decades was mainly due to economic reforms and appropriate agricultural policies. These policies include the land reform of HRS, marketisation, trade liberalisation, abolition of agricultural tax and increase in agricultural R&D investment. All these policies contribute to market efficiency and promote farmers' economic incentives. Further institutional reforms are necessary and critical for overcoming the challenges faced by its agricultural sectors currently and in the future. Possible innovative policies should include enlarging farming size and facilitating the mechanisation and adoption of new technologies.

China's economic growth and changing food consumption patterns have created and will continue to create great opportunities for agricultural export and bilateral cooperation with the EU. China's agricultural import from the EU witnessed remarkable growth, from US\$875 million in 2001 to US\$5,213 million in 2011, at an annual growth rate of 19.5%. This growing demand for high quality food products from the EU is likely to maintain and even accelerate when China's food consumption pattern upgrades, induced by rapid economic growth and urbanization. Advanced agricultural technologies on seed breeding, machinery and agricultural management will be urgently required to strengthen China's agricultural production. It will create tremendous cooperation opportunities for the EU and China.

China's experience has proven that UPA can play an important role in urban economic development and food security. UPA has provided a stable and diversified food supply to urban residents. More than 70% of non-staple food in the city, mainly consisting of vegetables and milk, was produced in the city in the 1960s and 1970s. As UPA is a relatively labour-intensive activity, it helps to provide employment to rural migrants. Many UPA areas have grown into agro-tourism zones and become increasingly important in urban society with higher living standards. It is a successful approach to ensuring the sufficiency, sustainability and diversity of food supply.

Food Security Policies in Indonesia: Perspectives on Past and Present Situation for Future Development

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EXECUTIVE SUMMARY

Food security is an integral component of national development strategies, particularly for developing countries such as Indonesia. An effective food security development strategy requires a systematic, structured, and comprehensive policy framework from the national to local level. The three main subsystems of food security are food availability, distribution, and consumption/utilisation, the integration of which will shape the food security condition in a region. Reinforcing simply one aspect of food security, for example the availability of food with surplus production, cannot fully solve the real food security problem. Therefore the major challenge in building a stable national food security system lies in implementing a comprehensive and coordinated approach.

By 2030, with a population growth rate assumed at 1.49 per cent per year, Indonesia's population is expected to reach 320 million people. The large population will provide benefits in terms of abundant availability of human resources to meet the requirements of various development sectors. However, it should be noted that a growing population will require an increase in primary, secondary, and tertiary basic needs, such as housing and food availability. As food is a basic human need for survival and for improving the quality of life, the demand for food increases with population growth. Maintaining food supply-demand balance, which can be fulfilled by domestic production and imports, is important for averting any turmoil or food crisis.

Maintaining or improving food security is certainly rife with problems and difficulties. Indonesia is facing severe challenges from rapid population growth with high dependence on rice as the staple food. These challenges are (i) the availability of new and more productive land to offset the conversion of agricultural land into non-agricultural land; (ii) inadequate rural and agricultural infrastructure, such as broken irrigation network and lack

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of road access to farmlands; (iii) trade-off in the agricultural sector that may have detrimental impact on farmers as producers; (iv) fluctuating food prices affecting farmers' profits and benefits; (v) increasing risk of a decline in food production capacity due to potential threats of drought, harvest failure, and the impact of climate change; (vi) uneven food distribution due to Indonesia's vast geographic area; and (vii) lack of farmers' empowerment due to the absence of an institutional role in farmers' activities in rural areas.

Based on the above conditions, the issue of food security development should involve all concerned stakeholders. The Food Law no. 18/2012 defines food security as the fulfilment of food supply from the state to individuals in terms of food availability that is sufficient, both in quantity and quality, safe, diverse, nutritious, prevalent, and affordable as well as not conflicting with religion, belief, and culture for healthy, active and productive living in a sustainable manner.

This paper provides an overview of the food security situation in Indonesia and attempts to discuss the food security policy. The objectives of this paper are to determine (i) the policies adopted by Indonesia in creating a stable and sustainable food security development; and (ii) the improvement of activities based on the potential of agricultural resources in order to strengthen the national food security.

FOOD POLICY IN RETROSPECTIVE: THE POLITICAL ECONOMY OF FOOD SECURITY IN THE OLD ORDER, NEW ORDER AND REFORM ORDER PERIODS

Indonesia has been known to seek food security since the Dutch colonial period. This can be seen from the institutions dealing with food distribution and rice logistics that were established by the Dutch colonial government, namely *Stichting Het Voedings Midlen Fonds* (SH-VMF) in late April 1939.² The Dutch colonial government controlled the rice trade between the Indonesian islands, distributing rice from surplus areas such as Java, Bali and South Sulawesi to deficit regions under the direct supervision of a rice milling company.³ These rice distribution efforts were made to provide food supply for workers in the Dutch's plantation areas of many large estates, such as cocoa, tea, coffee and rubber plantations outside of Java Island. During the Japanese occupation (1943-1945), the SH-VMF was renamed *Sangyobu-Nannyo Kohatsu Kaisha* (SKK) by the Japanese, with the duty to purchase rice from farmers at very low prices.⁴ During the early independence era in 1945, Indonesia experienced vulnerability in its food security in virtually all regions in Indonesia due to lack of food production and distribution.

² Mears, Leon A., Mulyono, Sidik, 1990. "Kebijaksanaan Pangan" (Food Policy), in Booth, Anne and McCawley, Peter (eds.), *Ekonomi Orde Baru (The Economy of New Order)*, Cetakan kelima, LP3ES, Jakarta.

³ Ibid.

⁴ Anonymous, "The brief history of BULOG" <<http://dologdiy.tripod.com/sejarah.htm>> (accessed September, 5 2012).

The transformation of food security development undertaken by the Indonesian government since gaining independence through various reform eras are outlined in Table 1.

Table 1 Food Security Policies from Independence till Today

Regime/Era	Policy	Activities
Soekarno (1952-1956)	Food self-sufficiency (under the welfare programme of Minister Kasimo*)	1950 – 1952: <i>Jajasan Bahan Makanan</i> or Foundation for Food (BAMA Foundation) established to manage food issues 1953 – 1956 : <i>Jajasan Urusan Bahan Makanan</i> or Foundation For Food Issues (JUBM)
Soekarno (1956-1964)	Food self-sufficiency through rice centre programme	1956: <i>Jajasan Badan Pembelian Padi</i> (JBPP) or food groceries foundation set up 1964: Government Law no. 3/1964 enacted on <i>Badan Urusan Pangan</i> or Food Material Board 1964: <i>Bimas</i> and <i>Panca Usaha Tani</i> (the incentive programme on agricultural activities under specific management)
Transition Period (1965-1967)	Food self-sufficiency	1966: The National Logistic Command (<i>Kolognas</i>) was set up 1967: <i>Kolognas</i> was dismissed and replaced by <i>Badan Urusan Logistik</i> (national logistic agency, BULOG) under Government Regulation no. 114/U/KEP/1967
Soeharto's <i>Repelita</i> (Five-Year Development Plan) I (1969–1974) and II (1974–1979)	Food self-sufficiency	1969: Strengthening the role of BULOG and food surplus became a standard for food security. The introduction of farm credit scheme. 1971: BULOG became importer of sugar and wheat 1973: Indonesian Farmers' Union was set up 1974 and 1977: BULOG's additional role as controller of soybean import
Soeharto's <i>Repelita</i> III (1979 –1984) and IV (1984–1989)	Food self-sufficiency	Presidential Decree no. 39/1978 restored BULOG's supervisory role in food supply and distribution The Food and Agriculture Organization (FAO) awarded a medal to the Indonesian government for achieving food self-sufficiency in 1984
Soeharto's <i>Repelita</i> V (1989–1994) and VI (1994–1998) until the fall of his regime in 1998	Food self-sufficiency	1995: BULOG became a government institution 1996: Food Law no. 7/1996 was released 1997: BULOG's reduced role in controlling rice and sugar 1998: BULOG's role was limited to rice only due to government's agreement with International Monetary Fund to open market mechanism for food trade
Habibie, Early Reform Order (1998-1999)	Food self-sufficiency	There was no significant policy implementation under Habibie administration, which lasted for a short period, except a bilateral trade agreement that was signed between Indonesia and Russia to enable a trade swap of Indonesian rice for Russian airplane

Regime/Era	Policy	Activities
Abdurrahman Wahid (1999-2000)	Food self-sufficiency	2000: Strengthening BULOG's role in rice management (stock, distribution, and price)
Megawati (2000-2004)	Food self-sufficiency	2001: Food Security Council was formed under President Decree no. 132/2001 2003: BULOG became a non-governmental institution (Government Regulation no. 7/2003)
Susilo Bambang Yudhoyono (2004-2009)	Agricultural Revitalisation	Structural change to Food Security Council Increased agriculture's contribution to the gross domestic product (GDP) and BULOG's revitalisation Farm credit scheme introduced for agricultural activities, food diversification and rice self-sufficiency was achieved in 2008
Susilo Bambang Yudhoyono (2009- 2014)	Agricultural Revitalisation	Agriculture's revitalisation continues with re-election of President Susilo Bambang Yudhoyono for a second term Food Law no. 7/1996 revised and replaced by Law no. 18/2012

Note: Ignatius Joseph Kasimo Hendrowahyono, Minister of Welfare Affairs, the Republic of Indonesia, 1947-1949.

Sources: Leon Mears, "Rice and Food Self-Sufficiency in Indonesia", *Bulletin of Indonesian Economic Studies*, vol. XX, no. 2 (1984): 122-38; Lassa, Jonathan A., "Memahami Kebijakan Pangan dan Nutrisi Indonesia: Studi Kasus Nusa Tenggara Timur 1958-2008" (Understanding Food and Nutrient Policies in Indonesia: Case Study in East Nusa Tenggara 1958-2008) (in Indonesian), *Journal of NTT Studies* Vol. 1 (1) (2009) <<http://ntt-academia.org/nttstudies/Lassa-2009.pdf>> (accessed September 2, 2012); Lassa, Jonathan A., "Politik Ketahanan Pangan Indonesia 1952-2005", (Political Food Security in Indonesia 1952-2005) (in Indonesian), *modul paper online*, 2005, at <http://www.zef.de/module/register/media/3ddf_Politik%20Ketahanan%20Pangan%20Indonesia%201950-2005.pdf> (accessed September 2, 2012); Ekoningtyas Margu Wardani et al., "Food Security for Ethnic and Urban Communities", *EADN Research Report*, 2009; Ekoningtyas Margu Wardani and Muanja Ssenyonga, "The Impact of the Soaring Food Prices on Food Security Status and Poverty in Indonesia", paper presented at the Conference of Human Development and Capabilities Association, September 5-7, 2012, Jakarta; and BULOG <https://docs.google.com/viewer?url=http://www.bulog.co.id/pdf/dokumen/ppbulog/ppbulog_no_7_th_2003.pdf&chrome=true> (accessed September 2, 2012).

After independence, the government set up a foundation for food (BAMA Foundation) that served to collect, process and distribute rice to consumers.⁵ The foundation met the food needs of the Indonesian people during difficult times in the early 1950s. The "Old Order" Indonesian government began to implement the rice self-sufficiency programme in 1960 to address the need to import rice in order to stabilise the food deficit.

At the beginning of the New Order era in 1967, the National Logistics Command (Kolognas) was disbanded and replaced with the National Logistics Agency (BULOG). The New Order intensively implemented various programmes and policies in the agricultural sector such as the mass guidance programme (*Bimas*), and mass instruction programme (*Inmas*)

⁵ Anonymous, "The brief history of BULOG" <<http://dologdiy.tripod.com/sejarah.htm>> (accessed September 5, 2012).

to stimulate agricultural activities. As a result, the New Order government gained FAO's recognition and was recognised for its rice self-sufficiency achievement in 1984.⁶

To vouch for its strong commitment to the food security programme, the government passed the Food Law in 1996, which was essential to the development of food security. However, the 1997-1998 economic crisis, followed by the transition into the Reform era from the New Order era, led to some structural changes in the food supply system and control. For example, the institutional reform of BULOG, as part of the government's agreement with the International Monetary Fund (IMF), reduced the government's intervention in food commodity markets. Food commodity prices were mostly determined by the market mechanism with little government intervention. BULOG has no authority to control the food market for food commodities except rice. Under Yudhoyono's regime, the agricultural development process focused on agricultural revitalisation aimed at achieving food self-sufficiency.

The latest amendment to the Food Law shows a significant shift in the food security policy, geared towards accommodating changes in national food security development. Table 2 details the adjustments made to Law no. 7/1996, which was replaced by Law no. 18/2012.

Table 2 Changes to Food Law no. 7/1996 and Law no. 18/2012

Issues	Law no. 7/1996	Law no. 18/2012
Chapters and articles	13 chapters and 65 articles	17 chapters and 154 articles
General provision of food development	Food security (and defining other food-related issues such as food system, food safety, food trade, food sanitation, food irradiation, food quality, and nutrients)	Food sovereignty, food self-sufficiency, and food security (and defining other food-related issues such as government food reserves, staple food, food diversification, local food, food export and import, food crisis, and food aid)
Definition of food security	Food security is a condition in which the fulfilment of food supply for the households is reflected by the availability of sufficient food, both in quantity and quality, that is safe, and evenly distributed and affordable	Food security is the fulfilment of food supply from the state to individuals in terms of food availability that is sufficient, both in quantity and quality, safe, diverse, nutritious, prevalent, and affordable as well as not conflicting with religion, belief, and culture for healthy, active and productive living in a sustainable manner
Food security and decentralisation	The central government takes on a very dominant role while the local government's role is seen as supportive, providing assistance to food security development (Chapter XI, article 60)	The local government takes on a broader role than before with more defined responsibilities

⁶ Nuhfil Hanani Ar, "Paradigma Ketahanan Pangan Indonesia: Tinjauan Kebijakan Pangan di Indonesia Pada Masa Lalu" (Food Security Paradigm: an Overview of Food Policy in the Indonesian History) (in Indonesian), *Lecturer Material*, Brawijaya University, 2009, at <<http://nuhfil.lecture.ub.ac.id/files/2009/03/3paradigma-ketahanan-pangan-3.pdf>> (accessed September 5, 2012).

<p>Food import</p>	<p>The food import regulation is not well defined. Food labelling (containing food product information), and importers' responsibility on food safety, quality, and nutrition require passage of standards from the authorised food agency (Chapter V, articles 36 to 40)</p>	<ul style="list-style-type: none"> • More details on food import (Chapter IV, articles 36 to 40). • Food import can only be implemented if domestic food production is not sufficient and/or food cannot be produced domestically. • Staple food can only be imported if domestic food production and national food reserve are not sufficient as determined by the minister or authorised institution. • Imported food to fulfil domestic consumption must fulfil the requirements of safety, quality, nutrition, and not in conflict with religion, belief or culture. • The food import policy and regulation established by the government will not make a negative impact to the sustainability of domestic farming, production, welfare of farmers, fisheries, and small businesses.
<p>Government's role in domestic food trade</p>	<p>Government's exercise of supervisory authority on food trade/ distribution (Chapter IX, articles 53 and 54 and Chapter X, articles 55 to 59)</p>	<ul style="list-style-type: none"> • Greater government intervention in food trade, especially for staple food (Chapter IV, articles 51 to 57). • The government has the obligation to regulate food trade to (i) stabilise food supply and price (ii) manage food reserve, and (iii) create conducive climate on food business. • Food businesses are prohibited from hoarding or storing staple food in excess of the maximum quantity as intended by the government's regulation. • The government has the obligation to stabilise the supply and price of staple food on the producer and consumer levels to protect the income and purchasing power of farmers and consumers. • Price stabilisation can be implemented through (i) price fixing on producer level according to the government purchasing guidelines; (ii) price fixing on customer level according to the government selling guidelines; (iii) management and maintenance of government food reserve; (iv) provision and management of food supply; (v) establishment of tax and/or tariff policy in favour of national interests; (vi) regulating even distribution between regions; and (vii) regulating export/import.

Note: This is an unofficial translation of the law.

Sources: Food Law no. 7/1996 both Indonesian language and English version <<http://codexindonesia.bsn.go.id/uploads/download/UU%20Pangan%20Ind%20English.pdf>> (accessed September 5, 2012) and Food Law no. 18/2012 in Indonesian language <http://www.kemendagri.go.id/media/documents/2012/12/13/u/u/uu_no.18-2012.pdf>(accessed December 18, 2012) and the unofficial english version of the Food Law no. 18/2012 <<http://usdaindonesia.org/wp-content/uploads/2012/11/DPR-FOOD-REGULATION-final.pdf>> (accessed January 8, 2012).

The latest version of the Food Law, believed to be more comprehensive than the previous law, gives more provisions for food security development in the future. The amendments enacted provide greater details on food security development. The concepts of food sovereignty, food self-sufficiency, food security and its three subsystems, as well as nutrition issues are introduced in the updated law. Food security takes a new, deeper form at micro level that includes aspects of local culture and religion.

Food trade includes both domestic and international trade. Food trade as enacted in Food Law no. 18/2012 is stipulated to manage the inter-linkages between food self-sufficiency, food sovereignty, and food security. The Food Law stipulates that food import can only be implemented if domestic food production is insufficient and/or food cannot be produced domestically, especially for staple food, as determined by the minister or authorised institution. Meanwhile, the local food production is mainly to support local consumption rather than to cater for export. This regulation has seemingly raised the significance of food sovereignty and food-sufficiency issues to maintain food balance.

For the domestic market, the government has greater power to intervene in the market for staple food and strategic food. The central government should control the food supply and food price volatility to enhance food accessibility especially in the poor and remote areas. The BULOG, as the authorised agency, will play a more important role in managing food supply and food distribution in the future (provided there is no other new authorised institution formed by the government). Besides controlling the market, food accessibility can be improved through food processing, food storage and distribution, empowering rural community, infrastructure provision, and buffer stock management.

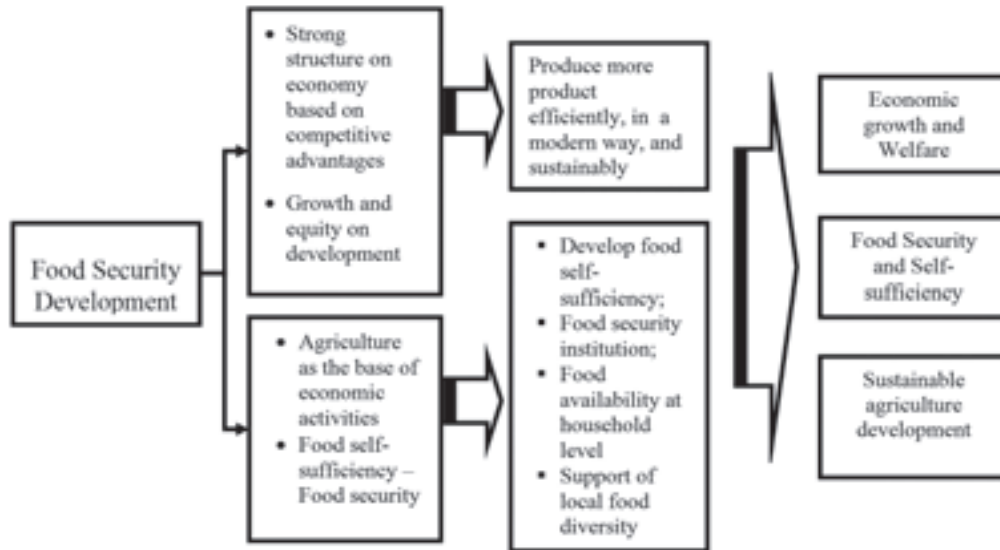
INDONESIA'S FOOD SECURITY IN THE CONTEXT OF NATIONAL DEVELOPMENT PLANNING

Indonesia's food security is part of the national development that is socially, economically and politically highly sensitive. The sensitivity level can be explained by anecdotal evidence. Any small incidences of food insecurity, hunger, or malnutrition would negate all success stories of food security at the national level. Incidences of food insecurity have been conveniently used to criticise the government for its failure to address the food issue. Using anecdotal evidence is not an objective approach in evaluating the failure or success of food security development, but it illustrates the sensitivity of food security in the national development context.

Besides providing food, the other key challenges confronting food security development include ensuring (i) the availability and capacity of local resources to attain food self-sufficiency; (ii) equitable food distribution; (iii) affordable food price for all people; (iv) food price stability; and (v) the supply of food commodities that cannot be produced domestically. The National Development Planning Agency Republic of Indonesia, also known as BAPPENAS, noted that the objectives of long-term development encompass (i) the ability to meet basic food needs from domestic production; (ii) building a strong foundation for the economy; (iii) increasing the quality of agricultural commodities; (iv) building a strong food security institution; and (v) ensuring food diversification based on local resources. BAPPENAS has

included food security as part of the 11 national development priorities for mid-term development planning from 2009 to 2014. The general framework of food security development in the context of the national development planning is shown in Figure 1.

Figure 1 Development of Food Security in National Development Planning Agenda



Source: National Development Planning Agency (BAPPENAS), "Perencanaan Pembangunan Nasional Di Bidang Ketahanan Pangan Dan Air Untuk Mendukung MP3EI" (National Development Planning on Food and Water Security to support MP3EI) (in Indonesian), paper presented in Focus Group Discussion (FGD), 23 May 2012, P3K-OI, Ministry of Foreign Affairs, Jakarta.

Food security is an integral part of national development. Agricultural development can act as an engine for economic growth, promoting prosperity, and sustainable management of agricultural resources. In support of the development of a food security policy, the Ministry of Agriculture incorporates the following as priorities in its plan:

- (i) to increase production and productivity to ensure availability of food and raw materials for the food processing industry;
- (ii) to improve the efficiency of distribution system and food price stabilisation;
- (iii) to increase the compliance of food consumption;
- (iv) to increase the value-added, competitiveness, and marketing of agricultural products, fisheries and forestry; and
- (v) to strengthen the capacity in agriculture, and marine fisheries.

The three pillars of food security development are inherent in the priority foci of the agricultural development plan 2010–2013. This is to boost agriculture's contribution to the GDP

growth to between 3.7 and 3.9 per cent annually.⁷ Soybean production is expected to increase to 20 per cent annually in order to reduce heavy dependency on imported soybeans. Similarly, rice production is expected to increase by 3.22 per cent to achieve a targeted production of 72.1 million tons in 2013. Corn production is intended to increase by an average of 10 per cent with a target production of 26 million tons in 2013.⁸

In order to realise the short- and medium-term development goals of food security by 2015, the government's budget allocation for agricultural development will increase to Rp19.3 trillion (USD2.03 billion) in 2015 from Rp16.7 trillion (USD1.76 billion) in 2011.⁹ The largest budget allocation at Rp4.35 trillion (USD458 million¹⁰) is assigned to the provision and development programme for agricultural infrastructure and will reach Rp6.1 trillion (USD642 million) in 2015. The improvement programme for diversification and community food security in 2011 was allocated Rp 618.9 billion (USD65 million) and the budget is expected to increase to Rp836 billion (USD88 million) in 2015. The increase in the agricultural budget is expected to improve the performance of the agricultural sector and to address problems during the programme implementation.¹¹

The growth of paddy production in Indonesia is supported by an increase in the harvest area and productivity of land from 1996 to 2012. Land productivity increased by 15.38 per cent from 4.42 tons per hectare in 1996 to 5.10 tons per hectare in 2011. Rice supply in Indonesia is supported by 13,440,900 hectares of harvest area which can produce paddy up to 68,594,100 tons per year with a productivity rate of approximately 5.1 tons per hectare¹². At a paddy-to-rice conversion rate of 56 per cent for milling, rice production is about 38,412,696 tons per year. Currently, Indonesia's rice supply is able to meet domestic consumption, for which about 33,548,502 tons of rice feed a total population of 244.77 million people¹³ (on average consumption of 139.15kg per capita per year, including consumption from industrial and other sectors). There was a rice surplus of 4,352,144 tons in 2012.

The current budget allocation and development plan for food security are expected to address the challenges in building the food security system. These challenges apply to the food security subsystems, namely production, distribution and consumption/utilisation of food. A map of food insecurity and vulnerability provides a measure of a region's agriculture performance and food security status. The Indonesian government, in collaboration with the

⁷ National Development Planning Agency (BAPPENAS), "*Perencanaan Pembangunan Nasional Di Bidang Ketahanan Pangan Dan Air Untuk Mendukung MP3EI*" (National Development Planning on Food and Water Security to support MP3EI) (in Indonesian), paper presented in Focus Group Discussion (FGD), 23 May 2012, P3K-OI, Ministry of Foreign Affairs, Jakarta.

⁸ Ibid.

⁹ Ibid.

¹⁰ Currency conversion based on USD1 = Rp9,500.

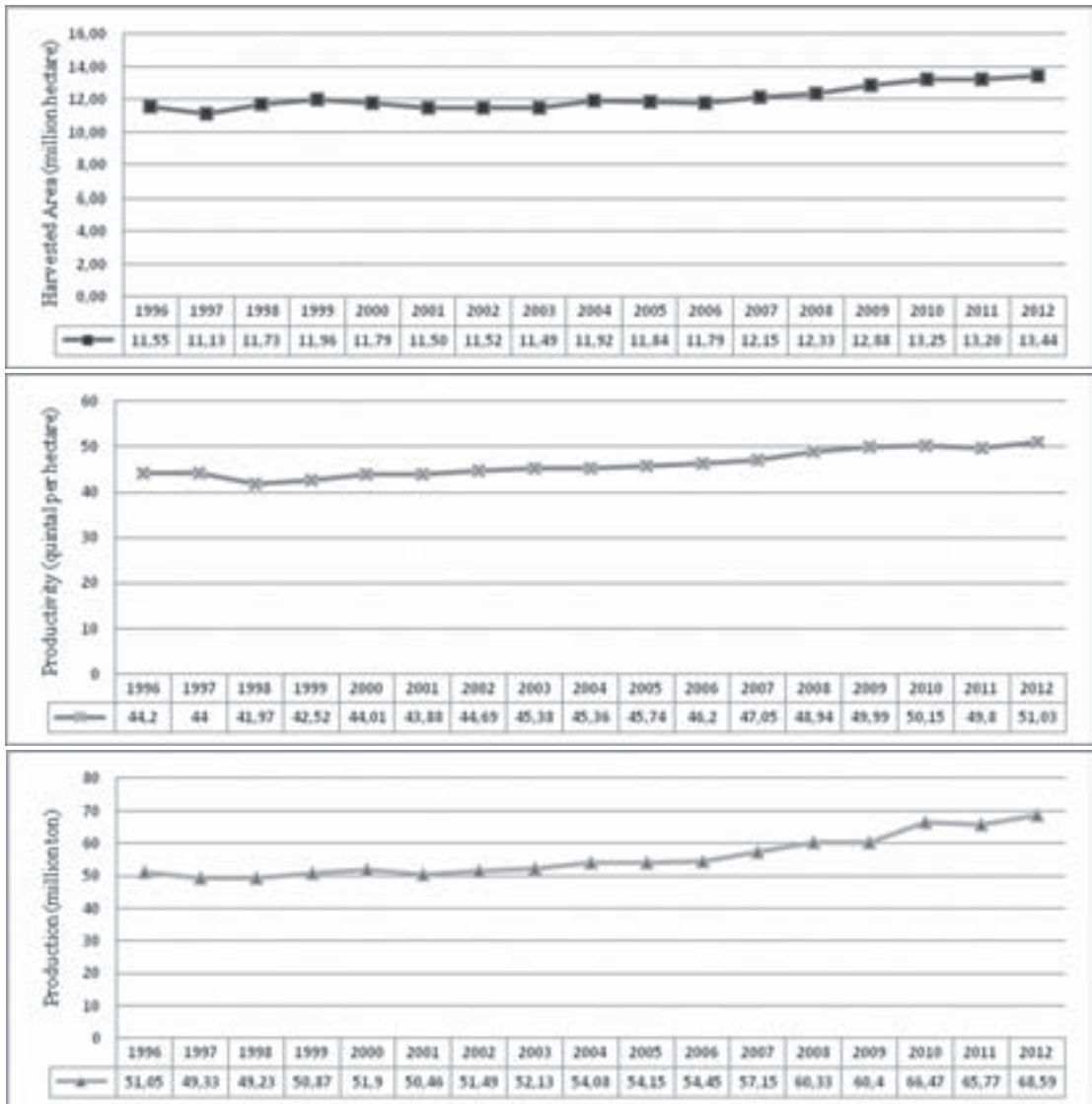
¹¹ Ibid.

¹² Statistics Indonesia, *Statistical Yearbook of Indonesia 2012*, BPS Statistics Indonesia, Jakarta.

¹³ Data projected. Data on population is calculated from the basis data of census in 2010 with total population 237,641,326 people and assuming the population growth is 1.49 per cent per year (BPS-Statistics Indonesia, 2011).

World Food Programme (WFP), has issued the Food Insecurity and Vulnerability Atlas of Indonesia 2009 (Figure 3), the research of which is conducted every four years to show the change in food security conditions in Indonesia.

Figure 2 Harvest Area, Productivity, and Production of Paddy in Indonesia, 1996–2012



Notes:

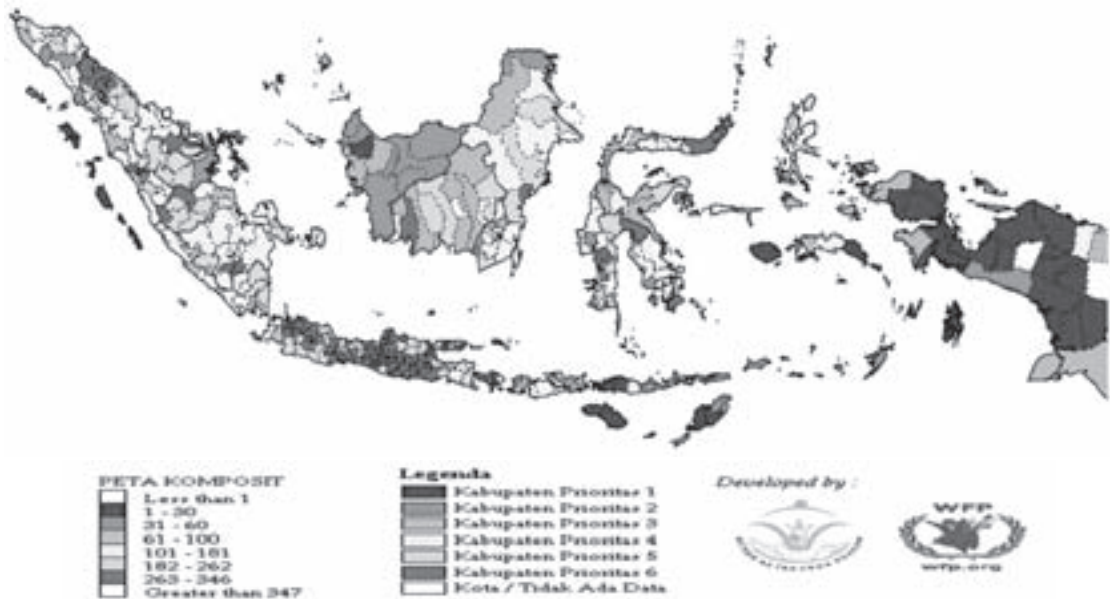
Production, harvested area, and productivity in 2012 are projection data.

The production form is dry unhusked rice.

1 quintal = 100kg = 0.1ton

Source: Statistics Indonesia, Statistical Yearbook of Indonesia 2012, BPS Statistics Indonesia, Jakarta.

Figure 3 Food Insecurity and Vulnerability Atlas in Indonesia, 2009



Notes:

Peta komposit = composite map

Legenda = legend

Kabupaten/kota prioritas = priority regency/municipal

Source: World Food Programme, “Food Insecurity and Vulnerability Atlas of Indonesia 2009”, Food Security Council, Ministry of Agriculture, Jakarta, 2010.

Regions of higher priority are highlighted in brown and dark brown while that of lesser priority are indicated in shades from dark to light green. The eastern part of Indonesia—covering the areas of West Nusa Tenggara, East Nusa Tenggara, Maluku and Papua—faces challenges of food insecurity and vulnerability. Some parts of Kalimantan, especially in West Kalimantan, Central Kalimantan, and the northern part of East Kalimantan region, and Sulawesi experience similar challenges. In Java, the problems of food insecurity and vulnerability are still obvious in small parts of Banten and the Madura Island in East Java province. In Sumatra, the small islands of Nias and Mentawai are high priority areas of food insecurity and vulnerability that need serious attention.

Dry climate and limited access to infrastructure are two main causes that are attributed to areas that experience food insecurity and vulnerability. However, these priority areas are not considered densely populated regions of Indonesia and thus, do not significantly affect the macro condition of national food security. This leads to an inaccurate understanding of the food security issues at the macro level, and therefore there is an overemphasis on food security at the micro or household level rather than at the macro level.

Table 3 Food Self-Sufficiency Index on Main Food Commodities in Indonesia, 2011-2012 (thousand tons)

No	Commodities		2011*	2012**
1	Rice	Production	36,969	38,767
		Consumption	33,045	33,035
		Self-sufficiency Index	111.87	117.35
2	Corn	Production	17,643	18,961
		Consumption	15,272	19,097
		Self-sufficiency Index	115.52	117.79
3	Soybean	Production	851	783
		Consumption	2,122	2,246
		Self-sufficiency Index	40.10	34.84
4	Beef	Production	292.45	399.32
		Consumption	449.31	484.07
		Self-sufficiency Index	65.09	82.49
5	Sugar	Production	2,230	2,660
		Consumption	2,790	2,850
		Self-sufficiency Index	79.93	93.33

* ATAP (published data) 2011, Badan Pusat Statistik (BPS, Statistics Indonesia)

** ARAM (projection data) II 2012, Badan Pusat Statistik (BPS, Statistics Indonesia)

Self-sufficiency Index = production/consumption

Source: Suryana, Achmad, 2012. "Ketahanan Pangan dan perbaikan Gizi Masyarakat Berbasis Kemandirian dan Kearifan Lokal: dari Perspective UU Pangan Baru" (Food Security and Nutrient Recovery based on Self-sufficiency and Local Wisdom: On the Perspective of New Law on Food), (In Indonesian). Paper presented in National Workshop on Food and Nutrient X, November 21, 2012, LIPI, Jakarta.

The food self-sufficiency index in Table 3 indicates the supply and demand of Indonesia's food commodities in 2011 and 2012. The food self-sufficiency indices for rice and corn are over 100, indicating that supply exceeds demand while it is the opposite case for soybean, beef and sugar. With soybean's self-sufficiency index at 40.10, Indonesia imported 59.90 per cent of its total soybean consumption in 2011. The beef's self-sufficiency index at 65.09 implies that Indonesia imported 34.91 per cent of its total beef consumption in 2011. In 2012, Indonesia's soybean imports increased slightly to 65.16 per cent of its total soybean consumption, while beef imports decreased significantly to 17.51 per cent of its total beef consumption. The positive growth in domestic sugar production had decreased reliance on imports from 21.07 per cent to 6.27 per cent of its total domestic consumption during the 2011-2012 period.

Rice consumption shows a fluctuating trend but has been on a decline from 105.2kg per capita per year to 102.82kg per capita per year during the 2005–2011 period. There is a shift in dietary habit from rice to wheat and its derivative products, with decreased rice consumption and wheat consumption increasing from 8.4kg per capita per year to 10.92kg per capita per year. Chicken consumption increased slightly from 4.1kg per capita per year to 4.75kg per capita per year while the consumption of beef and fish remained stable at around 2kg per capita per year and 18.75kg per capita per year, respectively. Public education, campaigns and community activities had served to increase awareness about the importance of nutritional balance and standards in healthy eating.

Table 4 Strategic Food Consumption (kg per capita per year)

Food Consumption*	2005	2006	2007	2008	2009	2010	2011	Trend
Rice	105.2	104	100	104.9	102.2	100.76	102.82	-
Wheat	8.4	8.2	11.3	11.2	10.3	10.34	10.92	+
Tubers/Roots	21.9	18.5	19.4	18.9	14.7	14.2	14.61	-
Chicken	4.1	3.2	4.4	4.2	3.9	4.5	4.75	+
Beef	1.8	1.4	1.8	1.7	1.6	1.7	2.02	
Fish	18.6	17.8	17.9	18.4	17.1	18.1	18.9	
Vegetables	50.8	51.1	57.8	56.3	49.7	49.3	48.8	-
Fruits	31.7	23.6	34.1	31.9	23.1	27.9	23.11	-

* Consumption is measured at household level and does not include industry and other sectors.

Sources: Statistics Indonesia, "National Socio-economic Surveys 2005, 2006, 2007, 2008, 2009", Badan Pusat Statistik (BPS, Statistics Indonesia, 2010), calculations by Center of Consumption and Food Safety, Food Security Agency, Ministry of Agriculture, 2012.

NATIONAL FOOD SECURITY POLICIES: CURRENT SITUATION AND FUTURE PERSPECTIVES

The framework of Indonesia's food security system is outlined by (i) food availability in sufficient quantity and quality for the entire population; (ii) efficient and equitable food distribution; (iii) nutrition content of food to meet dietary needs of individuals. Thus, food security issues encompass not only the production, distribution, and food consumption at the macro (national and regional) level but also the micro aspects, namely access to food at household level. Although the conceptual understanding of food security is well-reviewed in many literatures, the practice often fails in the case of Indonesia due to weak implementation of food security development as explained by Simatupang:¹⁴

- a. Indonesia is solely focused on a food supply approach in pursuit of food security, which in fact, requires a comprehensive integration of all three subsystems of food security.
- b. The earlier food security concept failed to anticipate the role of income and non-market mechanisms on improving food access for the people, thus leading to the failure of food security programmes. Food crisis is not always about food shortage, but also about insufficient household/individual income (e.g., caused by economic crises, natural disasters, and poverty, etc.) to buy food.
- c. The importance of the local and household aspects of food security development had been overlooked as the old paradigm focused on food security at macro and national

¹⁴ P. Simatupang, "Anatomi Produksi Beras Nasional, dan Upaya Mengatasinya" (The Anatomy of National Rice Production and its Solution) (in Indonesian), paper presented at the National Seminar on the Perspective of the Future of Agriculture and Forestry Development, 9-10 November 2000, Center for Socio-economic Agricultural Research, Ministry of Agriculture, Bogor.

levels. Though experience has taught Indonesia that national food security is important, it is not sufficient to ensure food security for local people and specific households at the micro level. Food security in some remote areas was neglected, leading to incidents of hunger and famine.

- d. The government was faced with a policy dilemma in maintaining low and stable food prices that has led to the following repercussions: (a) reduced motivation for domestic food production and less attractive farmers' income; (b) high subsidies from the government budget; (c) cheap food prices that benefit consumers, but become a disincentive for producers; and (e) the strategy is unfair and inconsistent with the philosophy of equitable income distribution, and thus unsustainable in the long run.

Food security development is an ongoing process that will impact broadly on all areas of development. In addition to food availability, other facets of food security, such as food distribution and access to food, are given objective consideration. This will lead to efforts to increase public revenues such as development of human resources, health standards and productivity. The Indonesian government adopts a dual-track strategy in food security development by: (i) developing agriculture and rural-based economy, and (ii) improving food availability for the poor to empower them to achieve food security independently.¹⁵ The dual-track strategy encourages synergistic coordination between the government (central, regional and rural) and society (farmers, farmers' institutions, private sector, social and civic organisations) in building national food security. Table 5 outlines the policy direction and strategy development of food security for 2009-2014 under the President Susilo Bambang Yudhoyono administration.

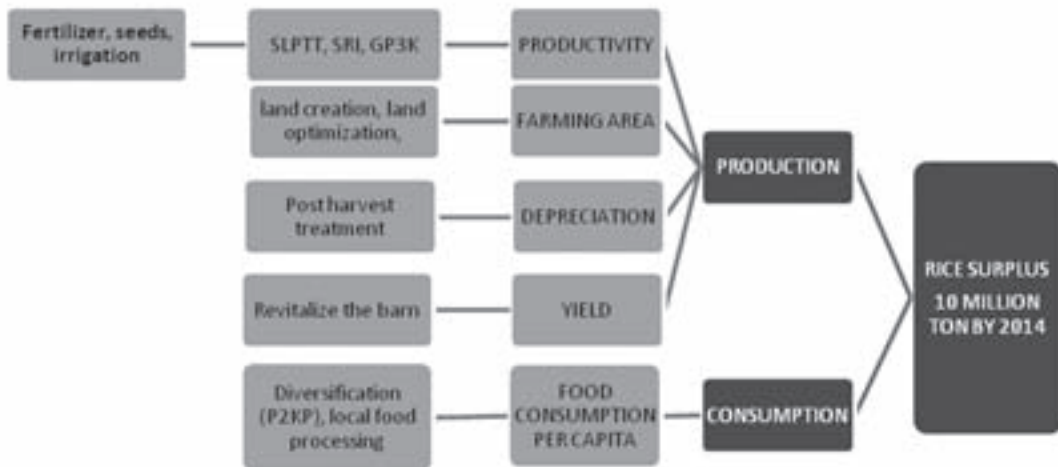
¹⁵ Food Security Council, "*Kebijakan Umum Ketahanan Pangan 2006-2009*" (General Policy on Food Security 2006-2009) (in Indonesian), 2008, Jakarta.

Table 5 Food Security Policy in Indonesia, 2009–2014

Subsystem of Food Security	Policies
Food production and food availability	<p>Preferred food supply from domestic production.</p> <p>Self-sufficiency in strategic commodities (rice, corn, soy, sugar, beef).</p> <p>Provision of a variety of foods based on potential resources and the local culture.</p> <p>Provision of food aid (social security) and empowerment programme (self-help) for chronic food insecurity.</p> <p>Provision of direct food assistance for quick handling/emergency and non-food aid for recovery and productive activities for transient food insecurity.</p>
Food distribution and food stock	<p>Maintaining sufficient national rice reserves to address issues on supply and food price volatility</p> <p>Promoting staple food reserve/stock at local government level (province, city and district).</p> <p>Developing community food distribution agencies in the environs of production centres and revitalising barns in food-insecure areas.</p> <p>Maintaining stable supply and price of staple food and strategic food commodities throughout the year.</p>
Food consumption, food utility, and food diversification	<p>Increasing the number of activities on socialisation, education and promotion of diverse food cultures, nutrition, and balanced, healthy and <i>halal</i> food.</p> <p>Encouraging people to reduce rice consumption per capita (approximately 1.5 per cent annually).</p> <p>Optimising usage of household's yard for food crop plantation.</p> <p>Developing starch-based local food products.</p> <p>Improving the handling process and food safety supervision in farms and fresh markets.</p>

Source: Food Security Agency, “Ketahanan Pangan Sebagai Agenda Nasional : Kebijakan, Strategi Dan Upaya Dalam Pemenuhan Kebutuhan Pangan Nasional” (Food Security as National Agenda, Policy, Strategy, and Effort to Fulfil the National Food Need) (in Indonesian), paper presented in Focus Group Discussion (FGD), 23 May 2012, P3K-OI, Ministry of Foreign Affairs, Jakarta.

In addition, the central government attempts to implement a comprehensive food security policy, targeting to achieve 10 million tons of rice surplus in 2014 as stated in the president's directive by increasing rice production by 5 per cent annually on an ongoing basis.

Figure 4 President's Directive on Achieving 10 million tons of Rice Surplus

SLPTT: Integrated training for farming

SRI: System of rice Intensification

GP3K: Movement on increasing food production based on corporate farming

P2KP: Acceleration programme on the diversification of food consumption

Source: National Development Planning Agency (BAPPENAS), "Perencanaan Pembangunan Nasional Di Bidang Ketahanan Pangan Dan Air Untuk Mendukung MP3EI" (National Development Planning on Food and Water Security to support MP3EI) (in Indonesian), paper presented in Focus Group Discussion (FGD), 23 May 2012, P3K-OI, Ministry of Foreign Affairs, Jakarta.

The president's directive is an effort to achieve 10 million tons of surplus in rice production. Various policies will be carried out to launch agricultural programmes and activities such as land creation and production expansion, improved post-harvest handling, rice-mill and barn revitalisation, and diversification of food consumption. The government believes that there will be (i) an increase in the production means to improve the efficiency of production processes; (ii) a reduction in rice consumption at the community level; and (iii) an increase in the availability of stock production which will support the 10 million tons of rice surplus target in 2014. It may seem to be an ambitious target in terms of the short time frame, but it is achievable and feasible with support from stakeholders. The efforts are in line with the goals of agricultural development—(i) achieving sustainable food self-sufficiency; (ii) increasing diversification in food production and consumption; (iii) increasing value added, competitiveness, and exports, and (iv) improving farmers' welfare.

The Indonesian government announced a new plan in early 2012, Master Plan for the Acceleration and Expansion of Indonesia's Economic Development (MP3EI), to support the food security development. The programme, launched in the form of Presidential Decree no. 32/2011, is a breakthrough of the Indonesian government. The MP3EI sketches out the strategic direction of the acceleration and expansion of Indonesia's economic development for a period of 15 years from 2011 to 2025. This is part of the framework of the National Long-Term Development Plan 2005-2025. Figure 5 illustrates the extent of development planning in the MP3EI main programme.

Figure 5 Implementation of National Development Corridors in MP3EI



Notes: The Economic Corridors include:

- Sumatra Economic Corridor as “Centre for Production and Processing of Natural Resources and as Nation’s Energy Reserves”
- Java Economic Corridor as “Driver for National Industry and Service Provision”
- Kalimantan Economic Corridor as “Centre for Production and Processing of National Mining and Energy Reserves”
- Sulawesi Economic Corridor as “Centre for Production and Processing of National Agricultural, Plantation, Fishery, Oil & Gas, and Mining”
- Bali–Nusa Tenggara Economic Corridor as “Gateway for Tourism and National Food Support”
- Papua–Kepulauan Maluku Economic Corridor as “Centre for Development of Food, Fisheries, Energy, and National Mining

Source: Coordinating Ministry for Economic Affairs, *Masterplan for Acceleration and Expansion of Indonesia Economic Development 2011–2025* (in Indonesian), 2012, Ministry Of National Planning and Development/National Development Planning Agency, Jakarta.

The MP3EI identifies eight main programmes, namely agriculture, mining, energy, industrial, marine, tourism, telecommunications, as well as the development of strategic zones in accordance with the main economic activities. The programme identifies six major development corridors that spread from Aceh province in the western part of Indonesia to Papua in the eastern part of Indonesia. The MP3EI will focus on agricultural projects to develop the agricultural sector activities across the board, including agro-food, fisheries, timber, livestock, food and beverage, oil palm, rubber, cocoa and tourism (in the form of agro-tourism). The corridors of Sulawesi and Bali-Nusa Tenggara will provide for national food security, projected to support the Java region as the key rice-production region.

Supporting activities related to food security development within the development corridors in the MP3EI requires collaboration between stakeholders and the international community. Food Law no. 18/2012 cites some possible forms of collaboration, such as cooperation, partnership, and foreign food aid programme. Food research and development can be initiated through cooperation with international research institutions, both government

and private. Domestic research institutions can initiate to seek food R&D collaboration covering a broad scope of research fields (as stated in Chapter XI, article 122, Law no. 18/2012) after obtaining permits from the minister in charge of research. The research scope includes (as stated in Chapter XI, article 118, Law no. 18/2012):

- a. creating food products that are competitive at local, national and international levels;
- b. accelerating breeding and [research] application process and assembly to produce a variety of superior food sources, e.g., plants, livestock and fish, that are disease-resistant, able to withstand biotic and abiotic stress, and adaptive to climate changes;
- c. technological innovation and institutional engineering in plant and animal sciences to improve productivity, efficiency and competitiveness as food sources as well as to preserve the biodiversity;
- d. technological innovation and institutional engineering in post-harvest, food processing, and food marketing to increase value added, the use of local food processed product, and food nutrient safe for consumption;
- e. creating local food products with comparable nutrient and vitamin content that can serve as a substitute to staple food;
- f. optimising the utilisation of land, water, climate and plant and animal genetic resources to increase and sustain the capacity of food production and agriculture; and
- g. policy recommendations for food development.

Food Law no. 18/2012, forming the legal foundation of food security development, has provided a comprehensive and all-encompassing framework that also reflects people's aspirations in the backdrop of national and global environmental concerns. This is also in response to the increased global awareness of the impact of climate change on agricultural activities. The deployment of "climate mitigation and anticipation" technology is urgently needed to transform agricultural practices in various fields and increase the resilience of food crop to disruptive climate extremes such as floods and drought. Another important issue on food security addressed by the government in Food Law no. 18/2012 is the tight control on food additives, genetically engineered food products, and food irradiation. For example, article 77 states that food that are genetically produced or engineered, including raw materials and additive materials that have not obtained food safety approval from the authorised institution, are prohibited. The government has established principles and standards for research, development, and utilisation of genetic engineering methods in food production processes and activities, as well as setting up regulatory requirements for food examination. To strengthen the sustainability of food security development, the government should look into collaboration opportunities with other institutions in food R&D.

CONCLUSION

The brief discussion on Indonesia's food security development policies demonstrates that the country has developed a comprehensive plan on food security as evidenced from the

implementation of various programmes and activities incorporating the three subsystems of food security in its development plan. However, many problems and challenges were encountered in the policy implementation that will require greater efforts from Indonesian stakeholders. A sustainable food security development must be supported by a synergistic and systematic policy framework. The architecture of food security development must also take into consideration all local potential resources of food development and capacity of stakeholders. Promoting international cooperation broadens alliances and helps facilitate the acquisition of advanced technologies in agricultural and food processing at both upstream and downstream aspects of food security. In sum, the debate on food self-sufficiency, food sovereignty, and food security should focus on finding and creating synergies for a comprehensive approach.

Indonesia, as a country, is endowed with vast and diverse food resources (and biodiversity) that have great potential to produce food in sufficient quantity to feed even the world. The diversification of food production and consumption is needed to enrich and develop the domestic market. It can be achieved by optimising the utilisation of biological resources, and technological advances in crop cultivation, post-harvest handling, and distribution.

Indonesia's future development of food security should be more integrated with the grand design of rural development. The strengthening of economic activities, both agricultural and non-agricultural, in rural areas will bring positive impact and benefits. In addition, the efforts to improve food security have contributed to (i) empowering the poor to attain food self-sufficiency; (ii) revitalising the function of rural or local barns; (iii) dietary diversification, thus promoting other local food in addition to rice and wheat as sources of staple food; (iv) improved health and nutrition of the population; and (v) improved detection and mitigation of food insecurity and malnutrition. Thus, Indonesia's food security development policy not only demonstrates and showcases its capability to provide food for the population, the initiative has also become one of the pillars of national development.

Green Growth and Food Security in India

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INTRODUCTION

The global food crisis of the 1970s triggered discussions on the concept of food security. In the early 1980s, the Food and Agriculture Organisation's (FAO) definition of food security was expanded to include access to available food supplies by vulnerable people. By the mid-1990s food security was recognised as a significant concern, spanning a spectrum of issues from the individual to the global level². Food security is an important issue from a developing country's perspective and is determined by a whole range of issues, such as domestic food production, import and export of food and access to food³.

Developments around the food security discussion were very closely influenced by the concept of human development^{4, 5, 6}. The UNDP Human Development Report of 1994 also used the concept of food security to encompass the human rights perspective. FAO (2003)⁷ believed that "[f]ood security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life". The National Food Security Bill of India mentions that its aim is "to provide for food and nutritional security in human life-cycle

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² United Nations Food and Agriculture Organization. www.fao.org/. Last accessed on December 7, 2012.

³ M.S. Swaminathan Research Foundation (MSSRF). (2010). *Report on the State of Food Insecurity in Urban India*. MSSRF. Chennai.

⁴ Sen, A. (1987). Food and Freedom. In F. X. Sutton, *A World to Make: Development in Perspective* (pp. 239-267). Transaction Publishers.

⁵ Dreze, J., and Sen, A. (1991). *The Political Economy of Hunger: Entitlement and Well-being*. Oxford University Press.

⁶ IFAD. (1995). *Food Security: A Conceptual Framework*. International Fund for Agricultural Development (IFAD): http://www.ifad.org/hfs/thematic/rural/rural_2.htm. Last accessed on December 3, 2012.

⁷ FAO. (2003). *Trade Reforms and Food Security: Conceptualizing the Linkages*. Rome: Food and Agriculture Organization.

approach by ensuring access to adequate quantity of quality food at affordable prices, for people to live a life with dignity”.

Given the relevance of sustainable development and green growth, food security needs to be examined in the context of sustainable production-consumption systems; food security could be defined as “ensuring that dietary requirements of current and future generations are met in a safe and sustained manner without disturbing the integrity of natural and socio-economic ecosystems at every stage in the life cycle of food production and consumption ranging from farming practices to processing to distribution to consumption”⁸.

The food security issue for a household can be viewed from the perspectives of a short time period and a long time period. If a household is unable to meet the food requirements over a long period of time then it is known as chronic food insecurity. Short-term problems may take the form of shock such as crop failure, seasonal sacrifices, temporary illness or unemployment among productive members of the household that may lead to transitory food insecurity. Food security relates to protection against the two kinds of insecurity and access to food should be nutritionally adequate.⁹ Periodic access based on biophysical, political conditions, or economic factors (unemployment, rising food prices) has an impact on food security status¹⁰.

USAID has defined the three pillars of food security as *availability* of food (production and trade); *access* (purchasing power or capacity to produce) and *utilisation* (household’s ability to use food they have), and the biological ability of the human body to digest food. But over the years the notion of food security has taken a leap from the issue of food availability and stability to affordability and individual level of energy intake (nutritional aspect)¹¹. The three major components of sustainable food security are¹²:

- availability of food in the market, which is a function of internal production, and, where essential, imports.
- access to food, which is a function of adequate purchasing power, and
- absorption of food, which is a function of clean drinking water, sanitation and primary health care.

India’s 13th Finance Commission Report articulates green growth as “rethinking growth strategies with regard to their impact(s) on environmental sustainability and the environmental resources available to poor and vulnerable groups”. It may be said that environmental sustainability and inclusive growth are both relevant. With regard to green growth and food

⁸ Kapur, S., & Kedia, S. (2011). Production–Consumption System for Oilseeds. *Commodity Vision*, 4(5), 64-76.

⁹ http://www.ifad.org/hfs/thematic/rural/rural_2.htm. Last accessed on December 15, 2012.

¹⁰ FAO. (2008). *An Introduction to the Basic Concepts of Food Security*. Europe: EC - FAO Food Security Programme.

¹¹ Fanzo, J., & Pronky, P. (2010). *An Evaluation of Progress Toward the Millennium Development Goal One, Hunger Target: A Country-Level, Food and Nutrition Security Perspective*. Columbia: WFP.

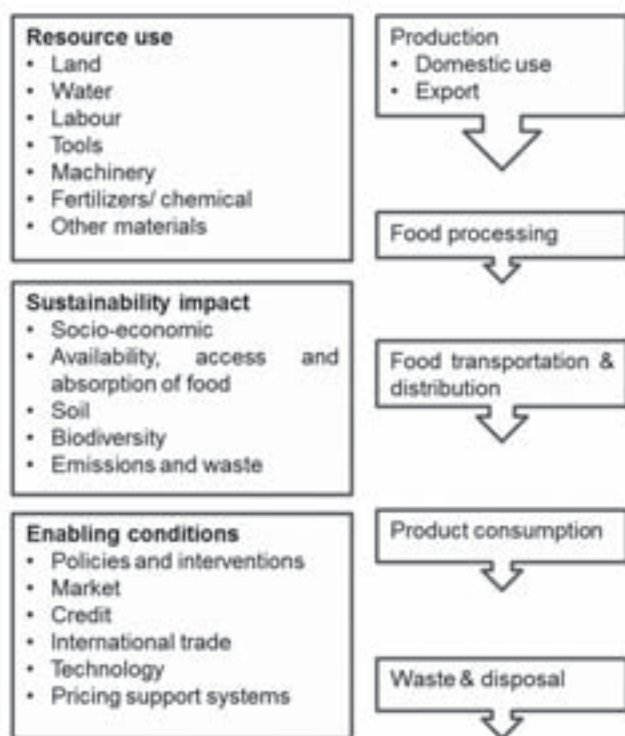
¹² Swaminathan, M. (2012). *Remember Your Humanity: Pathway to Sustainable Food Security*. Delhi : New India Publishing Agency.

security, food systems need to be studied within a framework of production consumption systems. Such systems must ensure minimization of the use of resources and reduction in the generation of waste and pollutants (Figure 1).

FOOD SECURITY AND DEVELOPMENT CHALLENGES IN INDIA

The first Millennium Development Goal (MDG) – to eradicate extreme poverty and hunger – recognises that food and good nutrition are the most basic human needs¹³. For a country like India, which pledges to halve the proportion of hungry people by 2015, the issue of food security is certainly of great importance. Food security has a lot to do with the purchasing power of households and other factors that determine the levels of malnutrition¹⁴.

Figure 1: Production Consumption System Framework for Food Systems

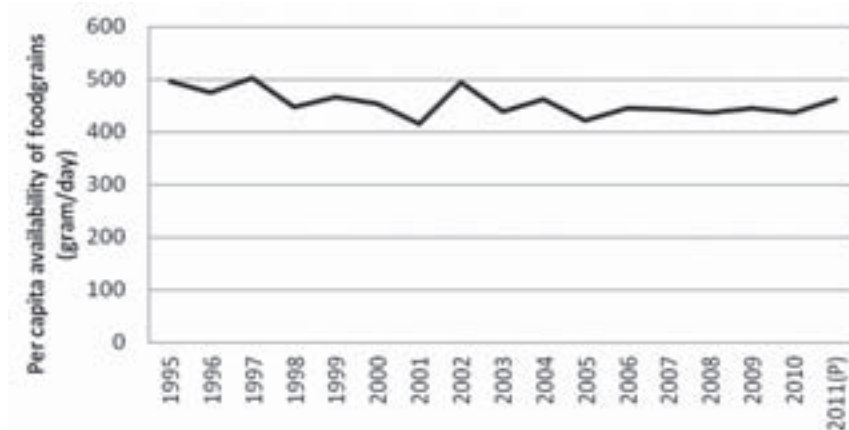


Source: Authors' compilation

India has a chronic problem of food security even though food and nutritional security has been the prime concerns of India's policies. As can be seen in Figure 2, the per capita food grains availability has declined from 495g per day to 462g per day over the period 1995-2011.

¹³ United Nations (UN). (2010). *Millenium Development Goals*. <http://www.un.org/millenniumgoals/>. Last accessed on December 3, 2012.

¹⁴ Saxena, N. (2011). Hunger, Under-Nutrition and Food Security in India. *CRPC-IIPA Working Papers*.

Figure 2: Per Capita Net Availability of Food Grains per Day in India (1996-2011)

Source: Ministry of Agriculture (GoI 2011)

According to estimates, India has 29% of the world's 872.9 million undernourished people¹⁵, 47% of the world's underweight children, and over 46% of its undernourished children¹⁶. The present inflation of food prices to almost record high levels and the pressure of a rising population lend urgency to the issue of food security. Around 43% of children in India are underweight and the calorie consumption of the bottom half of the population has been consistently declining since 1987^{17, 18}. These indicators point to the fact that endemic hunger continues to afflict a large proportion of the Indian population. The Global Hunger Index (GHI)¹⁹ for 2012 places India in the category of nations where hunger is alarming. In fact, India ranks lower than many sub-Saharan African countries, which have lower GDP²⁰.

Looking at the demand and supply of food grains production over the period of the last three five-year plans (FYPs), it is observed that the projected demand for food grains exceeds the actual absorption for all the three periods, and for the ninth and tenth plan, the projected supply also exceeds the actual production (Table 1).

¹⁵ United Nations. Food and Agriculture Organization. www.fao.org/. Last accessed on December 7, 2012.

¹⁶ UNICEF (United Nations). http://www.unicef.org/india/children_2356.htm. Last accessed on December 10, 2012.

¹⁷ HUNGaMA. (2011). *HUNGaMA Survey Report*. HUNGaMA for Change.

¹⁸ Dhar, A. (2012, January 10). "42 per cent of Indian children are underweight". *The Hindu*.

¹⁹ GHI designed by the International Food Policy Research Institute (IFPRI) is based on three equally weighted indicators: the proportion of undernourished as a percentage of the population (reflecting the share of the population with insufficient dietary energy intake); the prevalence of underweight among children under the age of five (indicating the proportion of children suffering from low weight for their age); and the under-five mortality rate (partially reflecting the fatal synergy between inadequate dietary intake and unhealthy environments).

²⁰ IFPRI. (2012). *2012 Global Hunger Index*. Washington: International Food Policy Research Institute.

Table 1: Food Grain Demand and Supply (1997-2012)

Five-Year Plan – FYP (year)	Commodity	Actual absorption during the period (million tonnes)	Projected Demand (million tonnes)	Difference in actual absorption and projected demand (million tonnes)
9th FYP (1997-2002)	Cereals	193.4	194.5	-1.1
	Pulses	15.42	19.5	-4.08
	Food grains	208.82	214.25	-5.43
10th FYP (2002-2007)	Cereals	200.25	215.53	-15.28
	Pulses	16.22	18.72	-2.5
	Food grains	216.47	234.26	-17.79
11th FYP (2007-2012)	Cereals	212.45	224	-11.55
	Pulses	20.48	20	0.48
	Food grains	232.93*	244	-11.07

Source: Ministry of Agriculture, 2011. Last accessed on December 8, 2012.

Economic growth alone cannot reduce malnutrition in the country. Literature reveals that the percentage decline in malnutrition is roughly half the rate at which GNP per capita grows. Low access to food and nutrition is clearly a result of low income growth and severe levels of poverty. Lack of employment opportunities for people below the poverty line and their inability to be absorbed into alternative sectors due to inadequate skill sets has been leading to low incomes, which is one of the major challenges to food security. In time to come, reduction in malnutrition is seen as a bigger challenge than income growth and reduction in poverty^{21, 22}.

The social status of women is said to have a direct impact on the food intake and health of children. Factors like mother's education, financial and economic empowerment, intra-household decision-making power, and community-level empowerment will affect the nutrition outcomes of the child. In the context of India, which is largely a patriarchal society, women usually do not enjoy a very high status in both social and economic terms. Usually, it has been observed that a mother suffers from poor nutritional status at the time of her pregnancy, which gets perpetuated, and the children are also not given sufficient quality food – particularly in cases where the mothers have low education. The issue of women's empowerment is essentially important for food security^{23, 24}.

²¹ Behrman, J., and Deolalikar, A. (1987). "Will Developing Country Nutrition Improve with Income? A Case Study for Rural India". *Journal of Political Economy*.

²² Popkin, B., Horton, S., Kim, S., Mahal, A., & Shuigao, J. (2001). *Trends in Diet, Nutritional Status, and Diet-related Noncommunicable Diseases in China and India: The Economic Costs of the Nutrition Transition*. International Life sciences Institute.

²³ Garikipati, S. (2008). "The Impact of Lending to Women on Household Vulnerability and Women's Empowerment: Evidence from India". *World Development*, 2620-2642.

²⁴ Saxena, N. (2011). Hunger, Under-Nutrition and Food Security in India. *CRPC-IIPA Working Papers*.

AGRICULTURE SECTOR PERFORMANCE

The performance of agriculture is a crucial factor in ensuring the availability and access to food as more than 55% of people in the country are dependent on this sector. The Indian economy is mainly an agrarian economy. But over the years, with sustained economic growth, increasing population and changing lifestyles, there have been changes to the Indian food basket. Increase in agricultural outputs and production impacts economic growth with the enhancement of farm productivity and food availability. Thus, food security involves an understanding of not only the current consumption pattern, nutritional status and health, and socio-economic impacts, but also vulnerability to and coping with food insecurity.

Domestic agriculture is being increasingly exposed to international competition, further adding to the volatility in agricultural prices. There are also huge disparities in productivity across regions and crops; some states have outperformed others in terms of better reach of new technologies and improved methods of production.

The slowdown in the performance of the overall agriculture sector and the factors responsible for this slowdown provide an explanation for the decline in the growth of food production. Short-run and long-run problems have been inhibiting the growth of the agricultural sector. Overall, the agriculture sector has been facing constraints on its resources and net sown area is limited to catering to the increasing demand of the population^{25, 26}. Natural resources are jeopardised in attempts to increase agricultural production and various unsustainable farming practices have led to land degradation, loss of soil fertility, soil erosion and water logging. Table 2 shows that the growth rate of food grain production and the growth rate of food grain yields have witnessed declines.

Table 2: Growth Rates in the Production and Yields of Food grains and Oilseeds (% per annum)

Crop groups / crops	Production		Yields	
	1986-87 to 1996-1997	1996-97 to 2007-2008	1986-87 to 1996-1997	1996-97 to 2007-2008
Foodgrains	2.93	0.93	3.21	1.04
Cereals	3.06	0.97	3.36	1.19
Coarse cereals	1.19	1.53	3.66	2.25
Pulses	1.32	0.36	1.49	-0.02
Oilseeds	6.72	1.99	3.32	1.49
Rice	3.06	1.02	2.37	1.22
Wheat	4.09	0.65	2.93	0.34

Note: These are fitted trend growth rates

Sources: CACP, Ministry of Agriculture (2009). Last accessed on December 9, 2012.

²⁵ Foster, A., and Rosenzweig, M. (2004). *Agricultural Productivity Growth, Rural Economic Diversity, and Economic Reforms: India, 1970–2000*. The University of Chicago Press.

²⁶ Jeromi, P. (2007). "Farmers' Indebtness and Suicides: Impact of Agricultural Trade Liberalization in Kerala". *Economic and Political Weekly*, 3241-3247.

Triennium averages reveal that during the past 16 years, the area under food grain cultivation has fluctuated around a constant value of 121 million ha whereas total production has increased due to the gradually improving productivity. The growth rate in sown areas and production is bumpy over the years with considerable negative values. This is due to uncertainties in weather especially rainfall, its onset, long dry spells in between, withdrawal and distribution, floods, hot/cold waves, cyclones etc. The intensity and frequency of occurrences of extreme weather events or risks have increased during the past 10-15 years as manifestations of global warming and climatic changes. This calls for mitigation measures, innovative and alternative land uses for reducing vulnerability and improvements in safety nets especially in rain-fed areas to ensure that farmers can use intensive modern technologies²⁷.

Apart from the aforementioned challenges, there are global concerns over the following:

- Increase in global surface temperature by an average of about 0.74°C in the last 100 years
- Change in weather pattern, alterations in soil moisture storage, and pests and weeds affecting productivity
- Decrease in freshwater availability in Asia
- Occurrence of disasters such as flood and drought due to the melting of the Himalayan glaciers
- Increase in temperatures that favour the growth of bacteria in food, thus raising the issue of food safety

SAFE STORAGE OF GRAINS, MOVEMENT AND DISTRIBUTION

Warehousing capacity, quality of storage infrastructure, moisture content of procured grains, drying losses/gains, breakage and recovery of rice during milling and shelf life of grains are important considerations for food security. Food Corporation of India (FCI) has about 30.6 million tonnes of capacity in godowns (90%) and in cover and plinth (CAP, 10%) storage (Table 3). About 51% of storage capacity was owned by the FCI, while 49% was on lease from the private sector during 2010. The latest utilisation figure ranges from 71 to 73%. Maintaining buffer stocks of 16.2 million tonnes on 1 April, 2010, 26.9 million tonnes on 1 July, 2010, 16.2 million tonnes on 1 October, 2010 and 20.0 million tonnes on 1 January of the year is necessary for taking care of year-to-year variation due to droughts, floods, other extreme weather/disastrous events, epidemics etc²⁸.

²⁷ NRAA. (2011). *Challenges of Food Security and its Management*, Planning Commission, Government of India. New Delhi: National Rainfed Area Authority.

²⁸ NRAA. (2011). *Challenges of Food Security and its Management*, Planning Commission, Government of India. New Delhi: National Rainfed Area Authority.

Table 3: Storage Capacity with Food Corporation of India (FCI) and its Percentage Utilisation as at 31 December 2009 and 31 December 2010 (million tonnes)

	Covered Storage (Godowns)			Open Storage Covered and Plinth (CAP)			Grand Total
	Owned	Hired	Total	Owned	Hired	Total	
2009							
Capacity (Million tonnes)	12.9	12.36	25.33	2.39	0.37	2.77	28.1
	-46%	-44%	-90%	-9%	-1%	-10%	-100%
Utilisation %	75	76	76	40	66	43	73
2010							
Capacity (million tonnes)	12.99	14.49	27.48	2.62	0.5	3.13	30.61
	-42%	-48%	-90%	-9%	-1%	-10%	-100%
Utilisation %	69	78	74	42	78	48	71

Source: Food Corporation of India, 2011. Last accessed on December 10, 2012.

INITIATIVES IN INDIA

The government of India has undertaken several political initiatives to attain food security. The recent 12th FYP also emphasises the need to integrate natural resource management techniques to enhance livelihoods, remove poverty and ensure household food security²⁹. Programmes such as integrated watershed management and joint forest management aimed at improving environmental sustainability and livelihoods of rural communities have also contributed to food security³⁰. Sustainable farming practices and initiatives like organic farming also contribute to a large extent to the promotion of food and nutritional security.

The National Food Security Mission (NFSM) of India is a centrally sponsored scheme launched in 2007 to increase rice, wheat and pulses production; cater to the growing population and tackle the problem of food insecurity in the country. The scheme also targeted to increase rice production by 10 million tons, wheat by eight million tons and pulses by two million tons by the end of the 11th FYP (2011-12). The scheme was carried out by way of interventions in various states and districts throughout the country³¹. Figure 3 depicts the response framework, within which interventions exist in Indian public policy.

The Department of Agriculture and Cooperation, Ministry of Agriculture launched the Rastriya Krishi Vikas Yojana (RKVY) to enable and support the agricultural sector to achieve

²⁹ GoI. (2011). *Annual Report 2010-11*. New Delhi: Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India (GoI).

³⁰ United Nations Food and Agriculture Organization. www.fao.org/. Last accessed on December 7, 2012.

³¹ *National Food Security Mission*. <http://nfsm.gov.in/Default.aspx>. Last accessed on December 7, 2012.

four per cent annual growth during the 11th FYP^{32, 33}. Targeted Public Distribution System (TPDS) is another important instrument of government policy to manage the problem of food scarcity and the distribution of food grains at affordable and below market prices. Under TPDS essential commodities such as rice, wheat, edible oils and kerosene are made available to the consumers through a network of fair price shops. TPDS in India is said to have the largest distribution network of its kind in the world, catering to about 160 million families by way of 462,000 fair price shops and distributing commodities worth more than Rs 300 billion annually^{34, 35}.

Other initiatives such as the Integrated Child Development Services (ICDS) programme of the government are for the holistic development of children up to six years of age with a special focus on children within the age group of 0 to 2 years. The programme also focuses on the nutritional and health status of expectant and nursing mothers. The programme is carried out through a package of six services comprising health check-ups, immunisation, referral services, supplementary feeding, non-formal pre-school education, and advice on health and nutrition. Another programme that targets primary and upper primary school children is the Mid-day Meal (MDM), which ensures food security for school children by providing them with one cooked meal in the day, across 12.65 lakh schools in the entire country. It is the world's largest school feeding programme, reaching out to around 120 million children throughout the country. It helps in attaining the twin objectives of improving the nutritional status of children and increasing their enrolment, attendance and retention in the school education system^{36, 37}. It has been observed that rural works programmes (RWPs) have been instrumental in the alleviation of poverty as well as in the contribution to environmental sustainability. Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) is one such programme. It provides employment guarantee of 100 days in every financial year to adult members of rural households who are willing to do public work. MGNREGS has helped to improve agricultural wages across the rural sector and the socio-economic status of the poor. The rise in purchasing power of poor MGNREGS has facilitated their access to

³² Ministry of Agriculture. *Rashtriya Krishi Vikas Yojana (2009)*. <http://rkvy.nic.in/>. Last accessed on December 5, 2012.

³³ GoI. (2011). *ICDS*. Department of Women and Child Development : <http://wcdel.in/icds.html>. Last accessed on December 3, 2012.

³⁴ Dev, M. S., & Sharma, A. N. (2010). *Food Security in India: Performances, Challenges and Policies*. New Delhi: Oxfam.

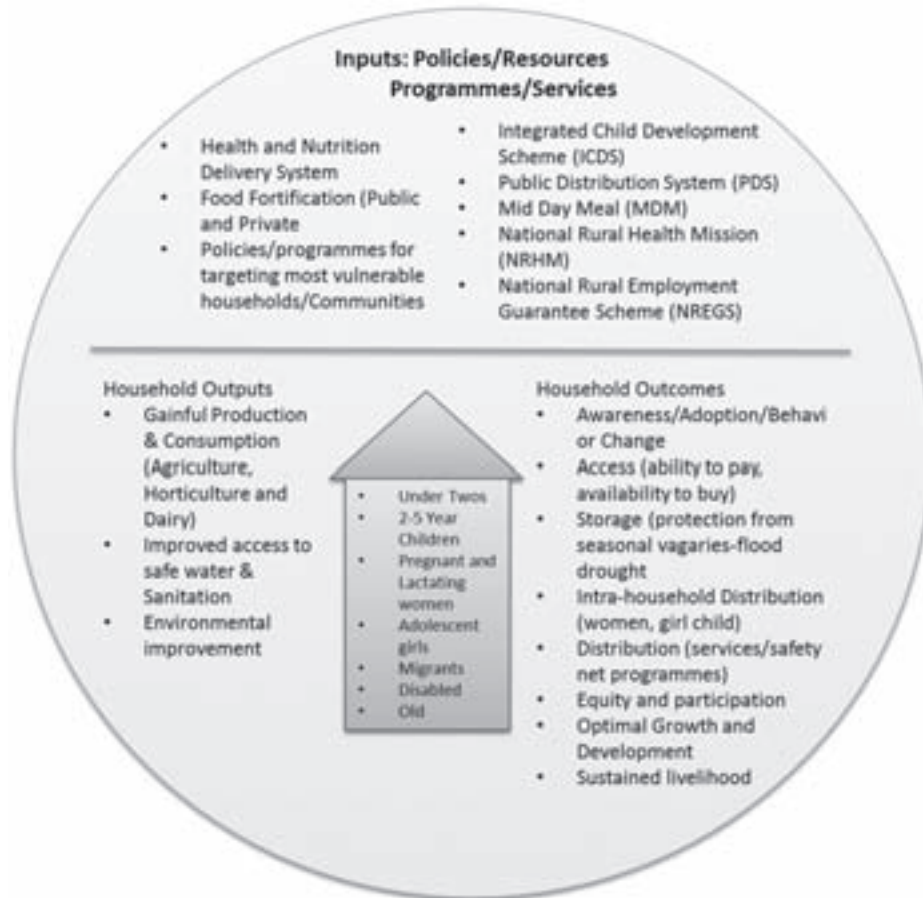
³⁵ DFPD. (2009). *Targeted Public Distribution System (TPDS)*. Retrieved December 3, 2012, from Department of Food & Public Distribution: dfpd.nic.in/

³⁶ MoHRD. *Mid Day Meal Scheme*. Ministry of Human Resource Development (MoHRD): <http://mdm.nic.in/>. Last accessed on December 7, 2012.

³⁷ GoI. (2011). *ICDS*. Department of Women and Child Development : <http://wcdel.in/icds.html>. Last accessed on December 3, 2012.

adequate food and nutrition^{38, 39}. MGNREGS has contributed to the building up of water conservation structures such as ponds and wells; reducing water stress and making the land more cultivable and increasing food production.

Figure 3: Food Security Response Framework in India



Source: Adapted from MSSRF (2008)

Recently the Indian government is planning to introduce a comprehensive Food Security Bill which is expected to cover 70% of the country’s population and which will cost the exchequer at least Rs 1.19 lakh crore by way of subsidy. It would ensure a definite quantity of food to a family at some fixed minimum affordable prices based on a detailed socio-economic analysis. Pricing of rice, wheat and millets would be at Rs 3, Rs 2 and Rs 1 per kg respectively. Apart from financial resources, it envisages enabling commitments of assured productivity, production, marketable surplus, procurement, rice milling, adequate stocks, quality control,

³⁸ MoRD. (2005). *National Rural Employment Guarantee Act*. New Delhi: Ministry of Rural Development (MoRD).

³⁹ Sanju, S., and Pellissery, S. (2011). *NREGA to Bridge the Missing Link for Food Security: Improving the Natural Resource*. Institute Of Rural Management Anand (IRMA).

extended storage and leak-proof distribution networks. Studies have shown that states improved food distribution by making the food programme universally open to all residents.

With the launch of the National Project on Organic Farming in the 2004-2005 period, organic farming in India gained impetus. Nine states have drafted organic farming policies; out of these, four states, Uttarakhand, Nagaland, Sikkim and Mizoram, have declared their intention to go 100% organic.⁴⁰

Apart from government initiatives, there have been several innovations by the non-governmental sector to include the development of technologies for enhancing agricultural productivity. One such technology developed by The Energy and Resources Institute (TERI) which is relevant to green growth and food security is highlighted in Box 1.

Box 1: Mycorrhizal Technology to Enhance Agricultural Productivity



Mycorrhiza applied to soya bean cultivation gave 30% more yield with a reduction of 25% fertiliser application

TERI has been working on the reclamation of environmentally vulnerable and uncultivable lands using mycorrhizal technology for more than a decade and has developed an expertise on it. Through this technology TERI has demonstrated the growth of grass on wastelands with salinity 73 times more than cultivable land. With 30% lesser production costs and 25% lesser water consumption than conventional methods, this technology has the potential of earning carbon credits by making wastelands cultivable.

The mass inoculum technology developed at TERI offers the mass production of viable, healthy, genetically pure and high quality fungal propagules without any pathogenic contamination in vitro sterile environment. The only known fungal system categorised as a biofertiliser, mycorrhiza provides plant roots with extended arms to help them tap soil nutrients that are otherwise beyond their reach.

Source: Compiled from teriin.org. Last accessed on December 22, 2012.

⁴⁰ Government of India Press Release. Available from <<http://pib.nic.in/newsite/efeatures.aspx?relid=72921>> . Last accessed on December 20, 2012.

BI-REGIONAL COOPERATION BETWEEN ASIA AND EUROPE

Apart from trade and commerce, food security presents several avenues for cooperation between Asia and Europe. Table 4 lists some key voluntary initiatives relating to food security and nutrition and sustainable agriculture that were signed during Rio+20. Statistics on voluntary initiatives reveal that for food security, major groups have played a major role.

Table 4: Key Voluntary Initiatives Related to Food Security and Nutrition and Sustainable Agriculture

Adaptation for Smallholder Agriculture
Consultative Group on International Agricultural Research (CGIAR) Challenge Programmes
Deploying nature-based solutions to global challenges in climate, food and development for a sustainable future
Ecoagriculture: Promoting Science, Practice and Policy for Land Use Systems that Jointly Increase Food Production, Reduce Rural Poverty, and Conserve Biodiversity and Ecosystem Services
Food Fortification
Globally Important Ingenious Agricultural Heritage Systems (GIAHS)
International Federation of Organic Agriculture Movements (IFOAM)

Source: Compiled from <http://sustainabledevelopment.un.org/index.php?section=1004&type=12&page=view&nr=391&menu=1348&str=&56=on>. Last accessed on December 22, 2012.

Most of these initiatives involve major groups such as research institutions and civil society. It can be said that major groups will play a key role in bi-regional cooperation between Asia and Europe with regard to food security. One example involving civil society, governments and the Food and Agriculture Organization is the Sustainable Agriculture for Rural Development initiative.

CONCLUSION

The issue of food security in India is increasingly discussed in the context of rising food prices. Structural gaps in the economy have created an imbalance between the supply side and demand side of the food grains. The recent emerging phenomenon is that of changing consumption baskets of the rural poor and a sudden upsurge in the demand for food grains⁴¹.

With these existing challenges, there is a need for green growth in the agriculture and food sectors. Green growth strategies for the agriculture sector would focus on providing sufficient food for the growing population in a sustainable manner. This would involve reducing the carbon intensity and adverse environmental impacts throughout the food chain and improving the agricultural practices for both the upstream and downstream food supply chains.

Rain-fed agriculture on 60% of cultivated land, supporting 40% of population, 60% of livestock and 40% of food is having significantly lower productivity than assured irrigated farming and has some unexploited potential. Marginal returns or a response to investments in rainwater management, energy, fertilisers and other inputs is much higher in rain-fed areas

⁴¹ Heade, D., & Shenggen, F. (2010). *Reflections on the Global Food Security Crisis*. Washington: International Food Policy Research Institute (IFPRI).

than that in irrigated well-endowed regions. However, rainfall and its distribution are very erratic and lead to significant year-to-year fluctuations in rain-fed production, market volatilities and distress of primary producers and end-consumers. Climatic changes have led to high frequency and occurrences of extreme weather events like drought, flood, heat/cold wave etc. and increased distress of farmers and consumers. Safety nets and risk management are required as the most important driver of the latest technologies, investments and productivity.

In terms of international cooperation, major groups from Asia and Europe will continue to play an important role and knowledge-sharing will facilitate dialogues between the two regions.

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Food Security of Bangladesh: A Comprehensive Analysis

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EXECUTIVE SUMMARY

Bangladesh, one of the most densely populated countries in the world, has been suffering from food deficiency for a long time.² Food crisis has become a threat for those people who live below the poverty line. Among South Asian nations, Bangladesh faces the most severe food crisis due to current food security challenges, e.g., cyclone, flood, salinity intrusion, high food prices, middlemen intervention in the market system, illegal trading of Bangladeshi food products across the Indian border, lack of food supply in the market, etc.³ These factors are severely affecting Bangladesh's agriculture and its attempt to attain food security and self-sufficiency.⁴ In addition, inadequate food supply puts the poor as well as the middle-class people in great risk.

This study conceptualises the current food security challenges in Bangladesh and the socio-economic impact. The study also focuses on the initiatives of the government of Bangladesh as well as regional cooperation to overcome the food crisis in the South Asian region.

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² See "Impact of Irrigation on Food Security in Bangladesh for the Past Three Decades", at <<http://www.thefreelibrary.com/Impact+of+irrigation+on+food+security+in+Bangladesh+for+the+past...-a0210520707>> (accessed 23 November 2012).

³ See "Bangladesh: Striving for Food Security", October 2012, at <<http://www.saglobalaffairs.com/regional/1319-bangladesh-striving-for-food-security.html>> (accessed 23 November 2012).

⁴ Mehruna Islam Chowdhury, Mohamed Avdul Baten and Jabin Tahmina Haque, "Food Security in Crisis Period: Challenges for a Hunger Free Bangladesh", 15 October 2010, at <<http://www.unnayan.org/reports/food/FoodSecurityincrisisPeriod.pdf>> (accessed 7 November 2012).

ENVIRONMENTAL CHALLENGES

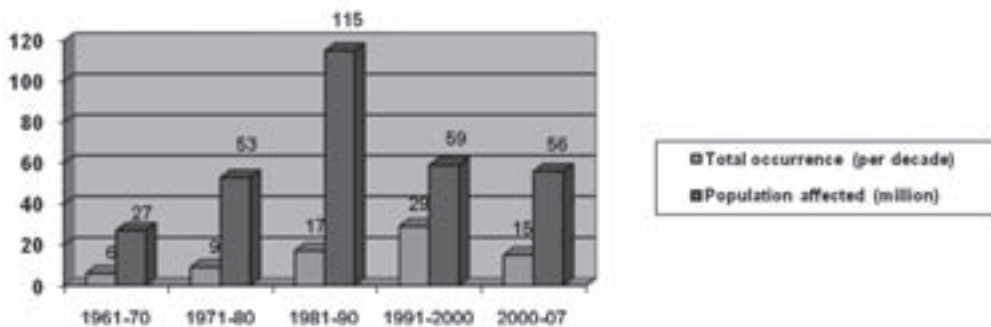
Climate Change

The changing monsoon, rising sea level and increasing temperature cause damage to food production in Bangladesh.⁵ Agricultural scientists have predicted that rice production in Bangladesh will decrease by 8 per cent and wheat by 32 per cent by 2050 due to the severe impact of climate change.⁶ According to the Ministry of Agriculture of Bangladesh, the country loses about 80,000 hectares of arable land due to the impact of climate change, such as through droughts, salinity and floods.⁷ Rice production in Bangladesh will fall by 80 million tons by 2050 due to climate change.⁸ It may also result in a cost of US\$26 billion to Bangladesh's agricultural sector during the 2005-2050 period.⁹

Frequency of Floods

Another environmental challenge to Bangladesh's agricultural production is the tendency of flooding. It is estimated that floods destroy about 20 per cent of Bangladesh's total agricultural output every year.¹⁰

Figure 1 Decade-wise Occurrence of Floods and the Number of Population Affected in Bangladesh (1961-2007)



Source: Centre for Research on the Epidemiology of Disasters (CRED), at <www.wamis.org/agm/meetings/rsama08/Bari101-Yusuf-Climate-Change.pdf> (accessed 20 December 2012)

⁵ "Bangladesh: Striving for Food Security", October 2012, op. cit.

⁶ M. Abdul Latif Mondal, "Challenges to Our Food Security", *The Daily Star*, 23 November 2010, at <<http://www.thedailystar.net/newDesign/news-details.php?nid=163215>> (accessed 20 December 2012).

⁷ See <<http://www.live-pr.com/en/bangladesh-agribusiness-report-q-r1049827715.htm>> (accessed 19 December 2012).

⁸ See <<http://www.irinnews.org/Report/89920/BANGLADESH-Unemployment-food-prices-spur-growing-hunger>> (accessed 21 December 2012).

⁹ See "Climate Change Risks and Food Security in Bangladesh", 13 July 2010, at <<http://www.farmingfirst.org/2010/07/climate-change-risks-and-food-security-in-bangladesh/>> (accessed 20 December 2012).

¹⁰ See <<http://www.scribd.com/doc/7118970/Agriculture-in-BD>> (accessed 18 December 2012).

Recently, the country faces severe losses in agricultural production because of frequent floods. At the end of June 2012 and in mid-July 2012, floods resulted in large-scale food shortages. In September 2012, the north-western region of Bangladesh was again hit by floods.¹¹

Saline Intrusion and Soil Fertility Reduction

Extreme drought and contamination of paddy fields by salt water have become very common in Bangladesh.¹² In January 2013, saline water coming with the sand flooded around 100 hectares of farmland, affecting 500 families in Khajura village of Kuakata area. Sweet water sources like ponds have also been polluted due to the mixing of saline water.¹³

Water Crisis

The lack of sweet water availability is one of the major challenges for food security in Bangladesh. Currently, the country faces severe threats to getting access to water for irrigation and fertile cultivable lands. The 30-year-long water-sharing treaty of Ganges River signed with India has adversely affected Bangladesh's agriculture, navigation, irrigation, fisheries, forestry, industrial activities, salinity intrusion of the coastal rivers, groundwater depletion, river silting, coastal erosion, sedimentation as well as normal economic activities.¹⁴

At present, water availability in Bangladesh is around 90 billion cubic metres (BCM) during the dry season against the demand of about 147 BCM. This is a large shortfall of nearly 40 per cent that results in drought in most parts of the country.

Loss of Cultivable Land

Almost one-third of Bangladesh's farmland has disappeared in the last 30 years because of unplanned urbanisation and transfer of lands to other uses.¹⁵

Bangladesh is a land-scarce country where per capita cultivated land is only 12.5 decimals. It is claimed that every year about one per cent of the farmland in the country is being con-

¹¹ See <<http://politicalpress.eu/2012/11/flood-stricken-bangladeshi-to-get-food-aid-and-livelihood-support-thanks-to-new-eu-assistance/>> (accessed 22 December 2012).

¹² Syful Islam, "Bangladesh Resistant Rice may not Fill Food Gap –Experts", 25 October 2012, at <<http://www.trust.org/alertnet/news/bangladesh-resistant-rice-may-not-fill-food-gap-experts>> (accessed 20 December 2012).

¹³ *The Daily Star*, "Saline Water Floods Farmland due to Mindless Sand Lifting", 2 January 2013, at <<http://www.thedailystar.net/newDesign/news-details.php?nid=263505>> (accessed 3 January 2013).

¹⁴ Md. Shariful Islam, "Water Scarcity and Conflict: A Bangladesh Perspective", *Forum* 5, no. 6, June 2011, at <<http://sharifulshuvo.blogspot.com/2012/05/water-scarcity-and-conflict-bangladesh.html>> (accessed 3 January 2013).

¹⁵ Mamun Rashid, "Future of Farming and Farmers in Bangladesh", *The Financial Express*, 12 September 2012, at <http://www.thefinancialexpress-bd.com/more.php?news_id=143792&date=2012-09-18> (accessed 25 November 2012).

verted to non-agricultural uses. According to the 2009 report of the Planning Commission, 80,000 hectares of agricultural lands are being converted every year to non-agricultural use.¹⁶

In 1980, Bangladesh had nine million hectares of farmlands, which were reportedly reduced to about six million hectares in 2012.¹⁷ At present, the cultivable land has been declining by almost one per cent per year, and every day 325 bighas of land are being lost to other uses.¹⁸ Experts warn that at the rate that agricultural land is declining against the growing population, it will be very difficult to ensure food security after 10 years.¹⁹

SOCIO-ECONOMIC CHALLENGES

Overpopulation, Overconsumption and Food Shortage

Bangladesh is one of the most densely populated countries in the world with a population of more than 164 million living on a small land area of 130,170 square kilometres.²⁰ According to a report by Unnayan Onneshan, a Dhaka-based research group, Bangladesh will undoubtedly face far more severe food shortages in the next few years, reaching a critical level by 2050.²¹ It is also estimated that to overcome food shortage, Bangladesh has to import about 2.5 million (25 lac) tons of wheat each year.²²

¹⁶ See “Conversion of Agricultural Land to Non-agricultural Uses in Bangladesh: Extent and Determinants”, *Bangladesh Development Studies* XXXIV, no. 1, March 2011, at <http://www.bdresearch.org/home/attachments/article/627/05_Conversion%20of%20Agricultural%20Land_Abul%20Qasem.pdf> (accessed 22 January 2013).

¹⁷ Mamun Rashid, 12 September 2012, op. cit.

¹⁸ Goutam Gourab Barua, 24 October 2012, op. cit.

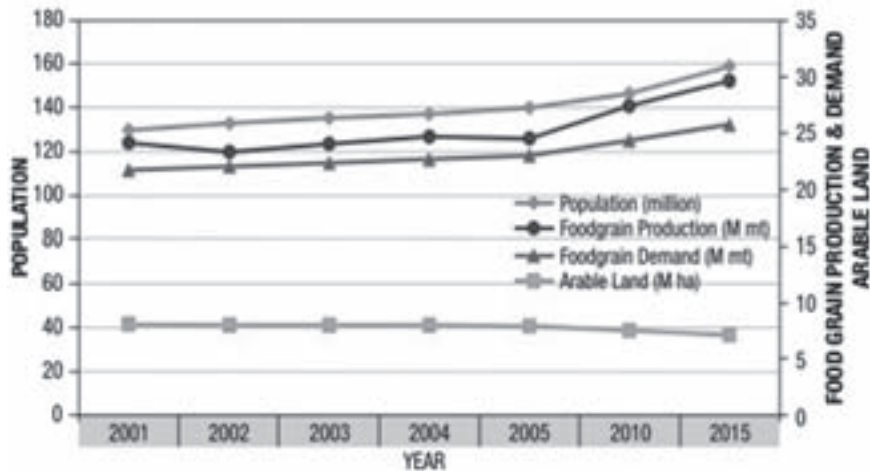
¹⁹ Mamun Rashid, 12 September 2012, op. cit.

²⁰ See Amber Holloway, “Tribal Groups in Bangladesh Facing Severe Food Shortage”, 5 June 2012, at <<http://www.partnersintl.org/blog/news/tribal-groups-in-bangladesh-facing-severe-food-shortage>> (accessed 22 December 2012).

²¹ See <<http://www.irinnews.org/Report/89920/BANGLADESH-Unemployment-food-prices-spur-growing-hunger>> (accessed 22 November 2012).

²² See <<http://bdoza.wordpress.com/2008/06/06/overcoming-food-crisis-bangladesh-has-little-shortage-in-food-production/>> (accessed 25 November 2012).

Figure 2 Food Grain Production, Demand and Arable Land (2001-2015)



Source: Anwar Iqbal, "Food Security: Facing the Hard Truth", *The Daily Star*, 2011, at <<http://www.equitybd.org/onlinerecords/mnuagrifoodsov/daily-star-food-security-facing-the-hard-truth>> (accessed 13 January 2013).

Figure 2 shows that since 2005, the arable land of Bangladesh has decreased and food demand has increased significantly. The figure demonstrates that population growth increased at a faster rate than food production from 2005 onwards.

Food shortages are prevalent too because of the fraudulent practices in Bangladesh's food market system and by middlemen. For example, only 1,950 tons of rice were imported in the first five months of 2012-2013 marketing years, 90 per cent of which were by the private sector. The private sector also imports low-quality rice and agricultural products from India because of the lower price. It is estimated that rice import may rise to 250,000 tons in 2013, mostly by the private sector. In 2012-2013 MY, wheat import may reach three million tons, of which 600,000 tons are imported by the government and 2.4 million tons by the private sectors.²³

Poverty

Most of the farmers in Bangladesh are poor and live below the poverty line. About 90 per cent of the farms are small and marginal.²⁴ Over 60 per cent of the rural population are classified as landless with less than 0.05 acres of land or functionally landless with 0.05 to 0.5 acres of land. Most of the poor farmers, thus, have to depend on the market to meet much of their food needs. Due to severe financial constraints, they also cannot afford the high cost of agricultural production.²⁵

²³ See <<http://www.thebioenergysite.com/reports/?category=39&id=1157>> (accessed 25 December 2012).

²⁴ See Mohammad H. Mondal, "Crop Agriculture of Bangladesh: Challenges and Opportunities", *Bangladesh Journal of Agricultural Research* 35, no. 2 (June 2010): 235-45.

²⁵ See USAID Office for Food Peace Bangladesh Food Security Country Framework by 2010-2014, October 2009.

Inadequate Credit Support to Farmers

The credit amount is often inadequate and not issued in advance to the poor farmers. They are also not eligible for microcredit of non-governmental organisations (NGOs) that deal mainly with landless farmers. The situation compels these farmers to adopt low-quality methods for agricultural production due to high cost in fertilisers, thereby resulting in low-yield production.²⁶

Food Adulteration

In the food market, basic food items like rice, fish, fruits, vegetables, and sweetmeats are adulterated with hazardous chemicals in an indiscriminate manner. In 2004, a random survey conducted by the Public Health Laboratory of Dhaka City Corporation reported that more than 76 per cent of food items on the market were found to be adulterated.²⁷

Rising Food Price

The increasing food price is one of the major current challenges of food security in Bangladesh. Since 2007, the price of essential food commodities has been rising rapidly, reaching a peak in the 2008 worldwide food crisis. If 2005 is taken as the base year of the food price hike, the increasing prices of food in 2011 and 2012 is startling. The prices of coarse, medium and fine rice have nearly doubled in 2011 compared to those of 2005.²⁸

Figure 3 Bangladesh Inflation Rate (2011-2012)



Source: See <<http://www.tradingeconomics.com/bangladesh/inflation-cpi>> (accessed 25 November 2012).

²⁶ Mohammad H. Mondal, June 2010, op. cit.

²⁷ See “Food Adulteration Rings Alarm Bell”, 11 August 2011, at <<http://www.thedailystar.net/newDesign/news-details.php?nid=198096>> (accessed 28 December 2012).

²⁸ Shamsu Uddin Shakib, “Impact of Price Hike over Lower Middle Class: A Case Study on Dhaka Metropolitan Area and Sylhet Division of Bangladesh”, *European Journal of Business and Management* 4, no.3, 2012.

The figure shows that in January 2012, inflation rate reached the highest level though it reduced slightly in July 2012. The January 2013 reading indicates that the inflation rate may decrease in Bangladesh. In 2011, the overall inflation rate was 10.70 per cent. Food inflation stood at 7.83 per cent in 2012 while it was 12.83 per cent in the previous year. Food inflation rose to 7.33 per cent in December from 6.45 per cent in November 2012.²⁹ According to the FAO report in 2012, food price was at a record level, having risen from 1.4 per cent in September following an increase of 6.0 per cent in July 2012.³⁰

Lack of Sufficient Fertiliser

Most of the farmers of Bangladesh do not use balanced fertilisers that are necessary for high productivity. Insufficient fertiliser is severely damaging food production in Bangladesh.³¹ In the past, Bangladesh witnessed fertiliser crises in 1974, 1984 and 1989. Recently, fertiliser crises occurred in 2005, 2007 and 2008. Still, poor farmers do not have access to fertilisers in sufficient quantity to meet their agricultural requirements.³²

Lack of Quality Seeds

The demand for quality seeds in Bangladesh is still weak due to a lack of costly seed preservation and processing facilities.³³ The Bangladesh Agricultural Development Corporation (BADC) obtains a subsidy from the government which allows it to provide seeds at a lower cost. Poor farmers, however, have less access to BADC seeds and thus have to depend on the private sector to purchase quality rice seeds at a higher price. In most of the cases, farmers also do not adopt and apply recommended packages for their agricultural production.³⁴ As a result, 26 per cent of the farmers purchase from other farmers in local markets and only 10 per cent of the seeds are purchased from the government's seed suppliers.³⁵

²⁹ See <<http://news.priyo.com/2013/01/08/business-65320.html>> (accessed 13 January 2013).

³⁰ Goutam Gourab Barua, 24 October 2012, op. cit.

³¹ Mohammad H. Mondal, June 2010, op. cit.

³² W.M.H. Jaim and Shaheen Akter, "Seed, Fertilizer and Innovation in Bangladesh: Industry and Policy Issues for the Future", *International Food Policy Research Institute*, September 2012.

³³ Mohammad H. Mondal, June 2010, op. cit.

³⁴ Md. Najrul Islam and S.M. Altaf Hossain, "Studies on Policy Option for Quality Seed Production and Preservation of Cereal Crops at Farmer's Level for the Improvement of Food Security", National Food Policy Capacity Strengthening Program, USAID, November 2010.

³⁵ Salina P. Banu, J.M. Duxbury, J.G. Lauren, Craig Meisner and Rafiqul Islam, "Wheat Seed Quality – A Study on Farmers' Seed", 4th International Crop Science Congress, at <[http://www.cropscience.org.au/icsc2004/poster/2/3/1169_banus.htm](http://www.cropsscience.org.au/icsc2004/poster/2/3/1169_banus.htm)> (accessed 10 December 2012).

THE SOCIO-ECONOMIC IMPACTS OF FOOD INSECURITY ON BANGLADESH

Social Impacts of Food Insecurity

Malnourishment and Poor Health Condition

There is a clear link between malnutrition and household food insecurity. According to a government report, about 40 per cent of Bangladesh's 160 million people live on less than US\$1 a day. The Bangladesh Bureau of Statistics (BBS) reported that nearly 60 per cent of food-insecure households were hit by hunger due to insufficient income.³⁶ Malnutrition also increases at an alarming rate in Bangladesh, affecting nearly 30 million women and 12 million children under five years old. Bangladesh has the world's highest proportion of newborns with low birthweight.³⁷

Due to food shortage, rural areas present higher rates of three types of malnutrition – wasting, stunting and underweight – in comparison to urban areas.³⁸ Over 60 per cent of all pregnant and lactating women have insufficient caloric intake, and this implies birth of malnourished babies.³⁹ At present, at least 46,000 indigenous people in the Bandarban and Rangamati districts are foraging for food, even resorting to eating leaves from trees, on hill-sides and forests.⁴⁰

Disease and Rate of Maternal Mortality

According to the 2004 World Bank report, 40 per cent of adolescent girls, 46 per cent of non-pregnant and 39 per cent of pregnant women are anaemic. Around 36 per cent of births are born underweight in Bangladesh due to malnutrition. The report also highlights that approximately 50 per cent of children under the age of five are stunted and underweight.⁴¹ The gender bias against women also reduces the possibility of sufficient access to food to them.⁴²

Economic Impacts of Food Insecurity

Low Labour Income and Loss of Labour Productivity

Dependency on agricultural wage labour leaves a household vulnerable to cyclical food insecurity. During the lean seasons, March-April and October-November, prior to harvesting the

³⁶ See <http://www.unicef.org/bangladesh/media_4942.htm> (accessed 15 January 2013).

³⁷ See <<http://www.irinnews.org/Report/89920/BANGLADESH-Unemployment-food-prices-spur-growing-hunger>> (accessed 22 December 2012).

³⁸ See <http://www.unicef.org/bangladesh/media_4942.htm> (accessed 19 November 2012).

³⁹ World Food Programme, "Food Security at a Glance" 2005, at <<http://www.foodsecurityatlas.org/bgd/country/food-security-at-a-glance>> (accessed 24 November 2012).

⁴⁰ See <<http://philippines.ucanews.com/2012/04/08/food-crisis-hits-bangladesh-hill-tribes/>> (accessed 5 December 2012).

⁴¹ World Food Programme, "Food Security at a Glance", 2005, op. cit.

⁴² Ibid.

main rice crops, job opportunities are low. This results in low wage rates, while food prices are at their highest. Income derived from non-agricultural sources provides a possible safeguard against the cyclical nature of agricultural income and therefore can improve household food security.⁴³

Unemployment and Lack of Economic Growth

According to World Food Programme (WFP), in recent years, devastating cyclones and floods, the dramatic increase in food prices in 2008 and the global recession have led to a deterioration of food security and nutritional situation in the country.⁴⁴ The lack of food security sometimes creates huge impact on the future of children, who are being taken out of school to engage in income-generating activities to achieve sufficient food supply. Male members are also migrating to cities in search of employment to cope with the high price hike of food and to meet their basic demand for food.⁴⁵

Debt Crisis

During the world food crisis in 2008, food expenditure represented 62 per cent of total household expenditure, which was 10 percentage points higher than the national average in 2005. As a result of the higher food prices, the poor were forced to take loans, thereby sinking deeper into debt.⁴⁶ Poor families take loans from their relatives and moneylenders to reduce food insecurity and meet the extra consumption of their families.⁴⁷ After 2005 and the world food price hike in 2008, the debt crisis is now even more severe due to the continuous impact of the global financial crisis on the poor.⁴⁸

INITIATIVES OF THE GOVERNMENT OF BANGLADESH ON FOOD SECURITY

Level of Production through Input Distribution Cards

In 2012, the government of Bangladesh introduced input distribution cards for nine million small and marginal farmers for purchasing fertiliser at government-fixed prices and for other forms of government support. Now, yields are increasing as more farmers adopt hybrid seeds varieties, invest in small-scale mechanisation, and use fertilisers and agrochemicals more efficiently.

⁴³ Ibid.

⁴⁴ See <<http://www.irinnews.org/Report/89920/BANGLADESH-Unemployment-food-prices-spur-growing-hunger>> (accessed 22 December 2012).

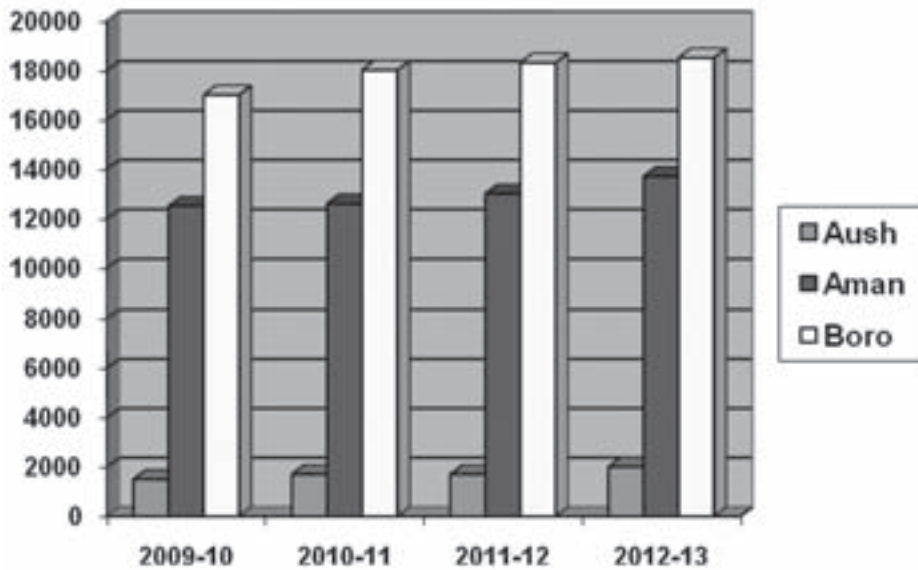
⁴⁵ World Food Programme, “Food Security at a Glance”, 2005, op. cit.

⁴⁶ See “Child Malnutrition and Household Food Insecurity remain Major Concerns for Bangladesh”, 19 March 2009, at <http://www.unicef.org/bangladesh/media_4942.htm> (accessed 19 December 2012).

⁴⁷ World Food Programme, “Food Security at a Glance” 2005, op. cit.

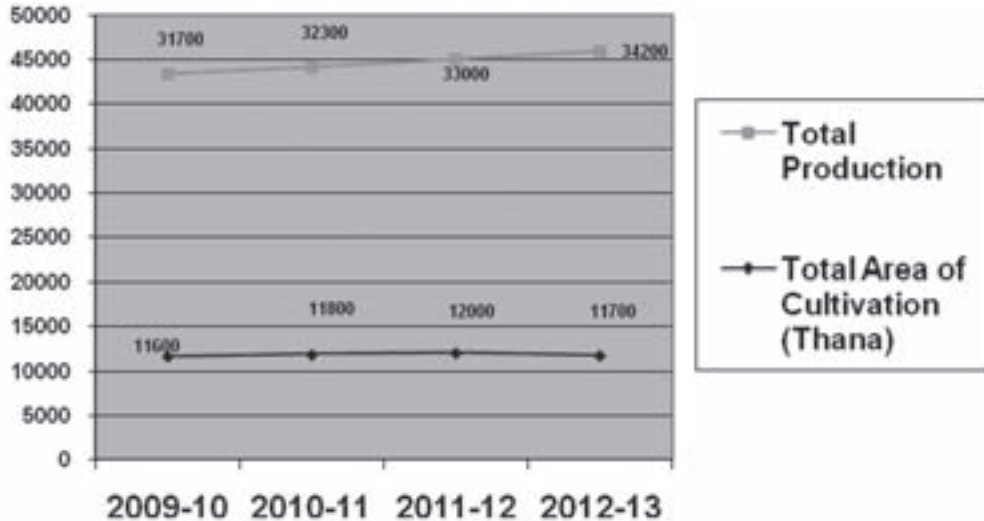
⁴⁸ “Child Malnutrition and Household Food Insecurity remain Major Concerns for Bangladesh”, 19 March 2009, op. cit.

Figure 4 Bangladesh: Area of Cultivation of Rice and Production of Rice by Season (million tons)



Source: See <<http://www.thebioenergysite.com/reports/?category=39&id=1157>> (accessed 12 January 2013).

Figure 5 Bangladesh: Area of Cultivation of Rice (hectares) and Production of Rice by Season (million tons)



Source: See "USDA GAIN: Oilseeds, Cotton, Sugar, Grain and Feed", at <<http://www.thebioenergysite.com/reports/?category=39&id=1157>> (accessed 25 December 2012).

In 2012-2013 MY, the production of Boro crop is estimated at 18.8 million tons. Rice production in 2011/2012 MY was 33.7 million tons. In 2012/2013 MY, rice production has been revised marginally lower to 33.8 million tons.⁴⁹

National Livestock Development Policy

In 2007, the Bangladeshi government formulated a very comprehensive National Livestock Development Policy (NLDP) to address the key challenges and opportunities for sustainable development of the livestock sub-sector and agricultural production of Bangladesh.⁵⁰

Climate Change Strategic Action Plan

In 2009, Sheikh Hasina, the prime minister of Bangladesh, adopted the Climate Change Strategic Action Plan for meeting the impacts of climate change in the next 25 years. The government also formed the Multi-Donor Trust Fund to attract the support of developed countries.⁵¹ Prime Minister Sheikh Hasina has called for innovations to make crops adaptive to climate change and has reaffirmed her commitment to make Bangladesh self-sufficient in food.⁵²

The National Food Policy Capacity Strengthening Programme (NFPCSP)

The government of Bangladesh launched the National Food Policy (NFP) in 2005 as well as the Plan of Action (POA) in 2010.⁵³ The plan recognises agricultural issues with gender, climate and nutritional issues.⁵⁴

The government of Bangladesh initiated the National Food Policy mainly for two objectives – adequate and stable supply of safe and nutritious food and increased purchasing power and access to food by the people.⁵⁵ This POA has also four major goals: (a) food availability; (b) physical and social access to food; (c) economic access to food; and (d) utilisation of food for nutrition for the period 2008-2015.⁵⁶ In addition, the National Food Policy Capacity

⁴⁹ See <<http://www.thebioenergysite.com/reports/?category=39&id=1157>> (accessed 12 January 2013).

⁵⁰ “Ensuring Food Security through Increased Agricultural Production with Efficient Water Resource Management”, *Government of the People’s Republic of Bangladesh*, 15 February 2010.

⁵¹ See <<http://www.bangladeshnews.com.bd/2009/09/28/pm-outlines-ways-to-ensure-food-security/>> (accessed 27 December 2012).

⁵² See “Bangladesh Commits to Food Security by 2013”, 28 July 2010, at <<http://southasia.oneworld.net/news/bangladesh-commits-to-food-security-by-2013>> (accessed 4 January 2012).

⁵³ See <<http://www.gafspfund.org/sites/gafspfund.org/files/Documents/NationalFoodPolicyPlanofActionFINAL.pdf>> (accessed 25 December 2012).

⁵⁴ Loewenthal Massey, “U.S.-Bangladesh Partnership Advances Food Security”, 4 June 2010, at <<http://dhaka.usembassy.gov/3-june-10-other-embassy-news-usbangladesh-partnership-food-security.html>> (accessed 3 January 2013).

⁵⁵ See <<http://www.nfpcsp.org/agridrupal/national-food-policy>> (accessed 25 November 2012).

⁵⁶ National Food Policy Plan of Action (2008-2015), Food Planning and Monitoring Unit (FPMU) Ministry of Food and Disaster Management, Dhaka.

Strengthening Programme helps build Bangladesh's institutional and human capacities to design, implement, and monitor food security policies as well as to strengthen food security governance.⁵⁷

Duty-free Rice Import

To alleviate food shortage, the government has now allowed the import of food products, in most cases duty-free. For instance, in May 2008, Bangladesh imposed a ban on rice exports, but the government has now taken action to achieve a balance between import and export of food products.⁵⁸

Public Food Distribution System

The Public Food Distribution System (PFDS) is the government's main mechanism for addressing shortfalls in household food. The government initiated this programme to increase access to food for the vulnerable groups through price subsidies on food grain and targeted income transfer.⁵⁹

National Climate Change Fund

The government of Bangladesh has recently established the National Climate Change Fund (NCCF) which mainly focuses on adaptation. Bangladesh is also going beyond its borders to try to find common causes with its neighbours to manage climate change impacts through regional action plans. The country also seeks to enhance cooperation with its neighbours on key issues.⁶⁰

Poverty Reduction Strategy Paper for Agriculture and Rural Development

The government of Bangladesh has launched the Poverty Reduction Strategy Paper (PRSP) in 2005 that puts emphasis on achieving productivity and profitability gains, broad-based support to agriculture, and diversification and commercialisation of agricultural enterprises. This strategy also stresses on agricultural research and technology generation, farmers' demand-led extension services, energising the agricultural marketing and agro-processing, land use and involving women in agriculture.⁶¹

⁵⁷ See <http://transition.usaid.gov/bd/programs/food_sec_response.html> (accessed 23 November 2012).

⁵⁸ See <<http://www.thebioenergysite.com/reports/?category=39&id=1157>> (accessed 29 December 2012).

⁵⁹ Food Grain Marketing and Food Distribution System in Relation to Achieving Food Security in Bangladesh, Bangladesh Agricultural Research Council.

⁶⁰ Bangladesh Climate Change Strategy and Action Plan, 2009.

⁶¹ C.Q.K. Mustaq Ahmed, "Agriculture in Bangladesh, Present Position, Problems, Prospects and Policy", 1 March 2010.

Open Market System Programme

The government of Bangladesh has introduced the Open Market System (OMS) programme in order to ensure affordable food for people from the low-income group. In this system, a consumer can buy either rice or flour or both the items up to a maximum of five kilogrammes at a time from designated OMS truck dealers. According to the Department of Food, the country currently has 1.2 million tons of rice and 0.25 million tons of wheat in public warehouses.⁶²

Agricultural Loan

The government of Bangladesh provides agricultural loan for poor farmers. On 28 July 2012, the Bangladesh Bank announced the agricultural loan policy for 2011-2012 fiscal year with a target to disburse Taka 13,800 crore (US\$1,767.4 million), 9.4 per cent higher than that of the previous fiscal year.⁶³

Agricultural Subsidy

The government of Bangladesh provides agricultural subsidies to poor farmers to ensure food production in the country. Bangladesh has provided subsidies to the agricultural sector since 2001.

Table 1 Subsidy Disbursement in Agriculture, 2001-2011

Year	Disbursement in taka, in crore (US\$)
2001-2012	100 (US\$12.8 million)
2002-2003	200 (US\$25.6 million)
2003-2004	300 (US\$38.4 million)
2004-2005	600 (US\$76.9 million)
2005-2006	1,200 (US\$153.7 million)
2006-2007	1,541 (US\$197.4 million)
2007-2008	2,250 (US\$228.2 million)
2008-2009	5,789 (US\$741.5 million)
2009-2010	4,950 (US\$634.04 million)
2010-2011	4,000 (US\$512.4 million)

Sources: Bangladesh Economic Review, 2009; and budget speech, 2010; and Jhinuk Parvin, "Agricultural Input Assistance Card: Direct Input Subsidy Disbursement", Unnayan Onneshan.

⁶² Talha Bin Habib, "Food Stock Sufficient Govt Plans to Reduce OMS Rice Price", *The Financial Express*, 8 December 2012, at <<http://www.thefinancialexpress-bd.com/index.php?ref=MjBfMTJfMDhfMTJfMTV85MF8xNTI0NTE=>> (accessed 27 November 2012).

⁶³ Ibid.

Government subsidies on agriculture have substantially increased over the years though it slightly declined in 2009-2010 and 2010-2011 fiscal years.

Agricultural Input Assistance Card

The government of Bangladesh has implemented an Agriculture Input Assistance Card Programme to provide cash subsidies to poor small and medium-sized farmers. The programme conducts smooth cash transfers and reduces misappropriation of financial support. Of the total 18.2 million farmers in Bangladesh, 9.1 million marginal, small and medium-sized farmers will get cash subsidies under the programme.⁶⁴ In this system, farmers can receive incentives from banks through using the Agriculture Input Assistance Card and for drawing subsidy and monetary transactions, and farmers need to open bank accounts for only Taka 10 (US\$0.128). They do not need any identification to open a bank account.⁶⁵

Vision 2021 for Climate Change Management

The government of Bangladesh has prepared a plan entitled Vision 2021 regarding the management of climate change. The foci of this programme are to ensure food security, eradicate poverty, increase employment opportunities, provide access to energy and power, and to achieve the economic and social well-being of all Bangladeshi citizens.⁶⁶

Master Plan for Southern Region of Bangladesh

The goal of this project is to improve the productivity of crops, livestock and fisheries in the coastal zone, especially in the southern delta of Bangladesh. It also includes better use of technology, and improved management practices with available knowledge in Bangladesh as well as from other countries. The Ministry of Agriculture is planning a road map to support the integrated development efforts in the southern region of Bangladesh. The master plan also intends to provide a road map for an integrated rehabilitation and development effort in Bangladesh's coastal zone, aiming at sustainable food security, poverty reduction and livelihood development for the poor.⁶⁷

Goal of Self-sufficiency in Food Production

Since 2010, the local government of Bangladesh has been active in subsidising improved seed varieties and fertiliser, contributing to the record harvest of staple rice. In 2011, Bangladesh opened discussions with some African countries and Cambodia with a view to leasing foreign land to grow food for import.⁶⁸

⁶⁴ See <<http://southasia.oneworld.net/news/bangladesh-streamlines-agriculture-subsidy>> (accessed 22 January 2012).

⁶⁵ Jhinuk Parvin, "Agricultural Input Assistance Card: Direct Input Subsidy Disbursement", Unnayan Onneshan.

⁶⁶ Bangladesh Climate Change Strategy and Action Plan, 2009.

⁶⁷ See <<http://waterclubs.net/challenges-for-food-security-in-bangladesh-inclusive-dialogue-for-a-comprehensive-approach/>> (accessed 22 January 2012).

⁶⁸ See <<http://www.gafspfund.org/sites/gafspfund.org/files/Documents/NationalFoodPolicyPlanofActionFINAL.pdf>> (accessed 25 December 2012).

At present, the government aims to ensure food security and attain self-sufficiency in rice by 2013.⁶⁹ The country has also set the goal of ensuring food security through a plan of availability, accessibility and nutrition support by 2017 and the goal of becoming a middle-income country by 2022.⁷⁰

REGIONAL COOPERATION ON FOOD SECURITY: OPPORTUNITIES AND POSSIBILITIES FOR BANGLADESH

SAARC Food Security Reserve

In 1988, the SAARC Food Security Reserve entered into force in 1988 as ratified by the South Asian countries. Regional cooperation began to progress on two separate technical committees as early as 1990.⁷¹

SAARC Food Bank

SAARC Food Bank was established on 3 to 4 April 2007, through an agreement among the heads of the member states.⁷² The fifth special meeting of the SAARC Food Bank Board was held in Dhaka, the capital city of Bangladesh on 13 May 2012. In this agreement, the member states came into an agreement to provide national efforts in ensuring food security in the region.⁷³ The council of ministers recommended the establishment of a Regional Food Bank, which was endorsed by the 12th SAARC Summit in order to improve its functioning.⁷⁴ SAARC Food Bank also provides a mechanism for governments to obtain an early assessment of production of major food grains in the region as well as beyond the region.⁷⁵

SAARC Agricultural Information Centre (SAIC)

In 1989, SAARC Agricultural Centre (SAC), which originally started its journey as SAARC Agricultural Information Centre (SAIC), was established in order to exchange regionally generated technical information and to strengthen agricultural research, development and innovations.⁷⁶

⁶⁹ “Bangladesh Commits to Food Security by 2013”, 28 July 2010, op. cit.

⁷⁰ C.Q.K. Mustaq Ahmed, 1 March 2010, op. cit.

⁷¹ See <http://www.saarc-sec.org/areaofcooperation/cat-detail.php?cat_id=44> (accessed 5 January 2013).

⁷² See <<http://southasiamonitor.org/detail.php?type=sarc&nid=3976>> (accessed 15 January 2013).

⁷³ See <<http://dfpd.nic.in/?q=node/992>> (accessed 25 November 2012).

⁷⁴ See <http://www.saarc-sec.org/areaofcooperation/cat-detail.php?cat_id=44> (accessed 5 January 2013).

⁷⁵ Sheel Kant Sharma, “South Asian Regionalism: Prospects and Challenges”, *Indian Foreign Affairs Journal* 6, no. 3 (July-September 2011): 305-14.

⁷⁶ See <http://www.saarc-sec.org/areaofcooperation/cat-detail.php?cat_id=44> (accessed 14 December 2012).

Asian Development Bank (ADB) is now assisting the SAARC secretariat to fully develop some projects on food security,⁷⁷ e.g., in enhancing the agricultural productivity of smallholder farmers in selected water-limited areas of South Asia; promoting the balanced use of agricultural inputs in selected intensively cropped areas of South Asia; pre- and post-harvest management and value chain development in South Asia; upgrading of food safety in SAARC member states; and institutionalisation of SAARC mechanisms for the control of transboundary animal, aquatic animal and plant diseases.

South Asia Food Security Programme

The South Asia Food Security Programme pools together scientific and natural resources in order to improve crop production and nutrition in the South Asian region. This programme receives assistance from Asian Development Bank, the International Fund for Agricultural Development and the FAO to ensure food security in the South Asian region.⁷⁸

South Asian Association for Regional Cooperation Food Data System

The South Asian Association for Regional Cooperation Food Data System (SAARCFOODS) was established in 1996. The main objective of this initiative is to develop and maintain authoritative national and regional food composition data of a high quality. This system also attempts to develop linkages with International Network of Food Data Systems (INFOODS), the United Nations University (UNU), FAO and others interested in food composition activities.⁷⁹

CONCLUSION AND POLICY RECOMMENDATIONS

Food security in Bangladesh has become a challenging issue even in the age of globalisation. As its population increases day by day, the government of Bangladesh as well as the governmental and non-governmental organisations should be more concerned about the current challenges of food security in the country. Food crisis has become a dangerous challenge as thousands of its indigenous people suffer from scarcity of nearly every basic need. Malnutrition and mortality rates are very high in the hilly areas of the country.⁸⁰ People from all sectors of Bangladesh as well as member countries of the South Asian region should

⁷⁷ See <<http://www.adb.org/news/speeches/final-workshop-saarc-initiatives-regional-food-security>> (accessed 15 December 2012).

⁷⁸ See <<http://southasia.oneworld.net/archive/Article/saarc-to-ensure-regional-food-security>> (accessed 17 December 2012).

⁷⁹ Report of the SAARCFOODS Meeting, held at the Medical Research Centre (MRI) in Colombo, Sri Lanka, on 18-19 October 2010.

⁸⁰ Amber Holloway, "Tribal Groups in Bangladesh Facing Severe Food Shortage", 5 June 2012, at <<http://www.partnersintl.org/blog/news/tribal-groups-in-bangladesh-facing-severe-food-shortage>> (accessed 24 December 2012).

take some necessary measures to overcome the food crisis not only in Bangladesh but also throughout the region.

First, there should be some specific laws and regulations to monitor the food crisis management mechanism in Bangladesh. Legal frameworks should be in place to maintain a regular flow of food in the market, to balance between the import and export of agricultural products, and to formulate a disaster management mechanism. Law enforcement agencies and officials from the Ministry of Food and Disaster Management will have to be proactive in formulating these initiatives.

Second, the government should place more emphasis on developing scientific knowledge on food-based nutrition and adopt a multi-pronged strategy to attain self-sufficiency in non-cereal food grains, providing supplementary nutrition to children and pregnant women. The government should promote scientific study on how to develop agricultural products with limited access to agricultural land and water. Necessary steps should also be taken for the optimum use of limited resources. The government, development partners, non-government agencies, local government, academic and research institutions and other stakeholders should engage in a coordinated dialogue and also prepare a master plan for agricultural development. They should focus on the sustainable development of the agricultural process.

Third, food adulteration is one of the growing threats to food security in Bangladesh. The country is losing a huge number of agricultural products and foods due to illegal mixing of chemicals in vegetables, fishes, fruits and even in food for children. The government should enact strict laws and impose strong penalties on violators who engage in such illegal acts. The government should also launch the regular operation of a mobile court to stop these silent killings. A regular monitoring system should also be introduced to prevent adulteration of food products.

Fourth, the government should take some initiatives to ensure food security for poor farmers. Local government should take an interest in meeting this challenge. The government should provide some facilities to farmers who have to cope with natural disasters and fall victim to high cost in seeds and pesticides. The Bangladesh Agricultural Development Corporation (BADC) should provide training to farmers, supply fertilisers and other necessary aspects of agriculture as well as provide agricultural credit loans in simple-to-understand terms to farmers in remote areas.

Fifth, South Asian Association for Regional Cooperation (SAARC) should devise a comprehensive policy to deal with food crises in this region. The member countries of SAARC may formulate separate policies for the low riparian countries as well as for counties which do not have sufficient access to sweet water sources for agriculture. Water issue should be given more priority in SAARC meetings, because any unilateral treaty regarding unequal distribution of water may not only cause severe food crises, but also damage the process of sustainable development in the region.

There are huge possibilities for Bangladesh to become an economic power. Ensuring food security may bring about many possibilities for this country. However, if the government of Bangladesh neglects this non-traditional security issue, it may turn into a great threat to the human security of its people as well as to the security of the state.

Regionalism and Food Market Interventions: Lessons from ASEAN and the EU

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EXECUTIVE SUMMARY

Market interventions impact food systems throughout much of the world. For a myriad of reasons, states and groups of states see fit to intervene in processes affecting food production, price discovery, availability and access. These interventions come in many forms, including subsidised on-farm inputs, guaranteed food purchase prices, protectionist food import restrictions and minimum export price standards. The record of such measures is mixed, but trends in both domestic and international food market policies ensure that they will retain importance for at least the near to medium-term. However, the increasing importance of regional organisations is relatively newer to market intervention scenarios.

In Europe, the Americas and pockets of Asia, market integration efforts are creating complex challenges for interventionist traditions and practices. This paper explores such dynamics in the cases of the EU Common Agricultural Policy and the ongoing steps towards the ASEAN Economic Community. Each case gives special attention to the interventionist policies of a member state, France and Thailand respectively, and questions what these policies reflect about the EU and ASEAN along with wider regional integration efforts. The paper concludes with lessons drawn from comparing the two systems, and cautionary points about the particular difficulties wrought by the food sector in regional integration processes.

FOOD AND THE EMERGENCE OF A EUROPEAN COMMUNITY

The Common Agricultural Policy (CAP) was established as a response to food insecurity in Europe following the end of WWII. The policy was first introduced in the Treaty of Rome,

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and later with the creation of the European Economic Community in 1957. It has been suggested (Bache & George, 2011; Barents, 1994; Jack, 2009) that the creation of the CAP was the result of a compromise between Germany and France, with France allowing German industrial exports to have free access to its markets only if French agricultural produce gained similar access to German markets (Jack, 2009). France, together with the other two key exporters of agricultural products, Italy and the Netherlands, believed the exclusion of the agricultural sector from the common market would result in the lagging behind of intra-community trade while interstate trade in industrial products would increase (Barents, 1994). As such, the six original member states (France, Germany, Italy, Belgium, the Netherlands and Luxembourg) present at the Treaty of Rome confirmed that they wanted to introduce a common policy on agriculture. Despite this inclusion, a very limited amount of concrete objectives were established – it was more an agreement to emphasise that agriculture matters (Jack, 2009). The agricultural sector was seen to be structurally weak and inferior to other sectors in terms of income and social structure, which were both paramount for the attainment of the general objectives of the Treaty (Jack, 2009).

Nonetheless, the Treaty sets out a basic framework within which future European agricultural policies would be established. It sought to increase agricultural productivity, ensure fair standards of living for farmers, stabilise markets, and promote steady supplies as well as reasonable prices for consumers. At the Stresa Conference in 1958, the six member states attempted to set out the details of the future of the CAP; a goal that would take until 1962 to be reached. Three fundamental principles of the CAP emerged: 1) unity of markets, 2) community preference, and 3) financial solidarity. “Unity of markets” aimed to progressively liberalise trade between the member states and introduce common prices for the main agricultural products within the community. “Community preference” related to the removal of trade barriers within the Community as well as the setting of quotas and duties on imports into the Community and subsidies for exports out. “Financial solidarity” related to the common financing of the CAP by all member states with the aim to narrow the economic gap between regions and member states. The outcomes also established a European Agricultural Guarantee Fund (FEOGA) to finance agricultural policy measures and manage market interventions, export refunds and expenditures on structural measures.

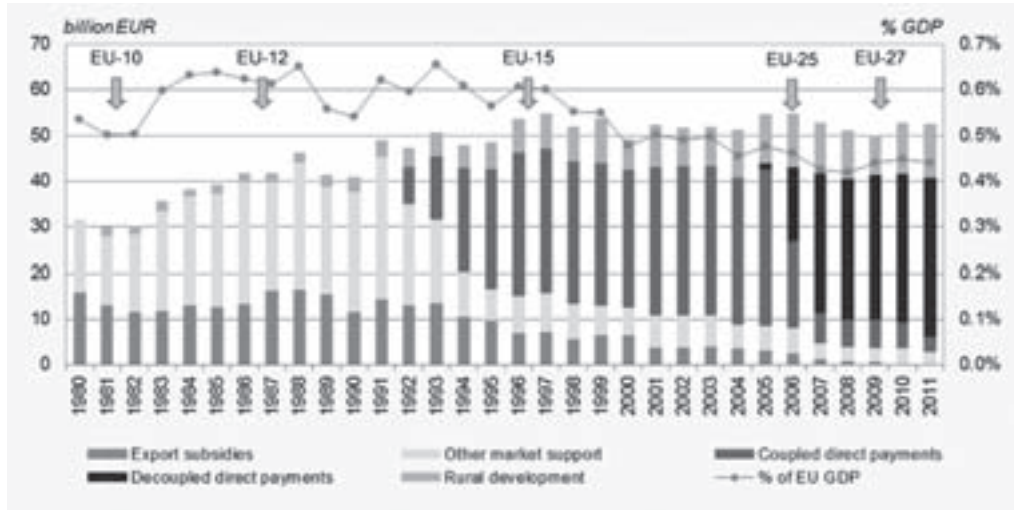
The CAP was in a sense a price-support system where the member states on a yearly basis set the level of prices for agricultural produce covered by the policy (Bache & George, 2011). The prices were ensured by the intervention of the European Commission in the market to buy up enough of each produce to maintain the agreed price. In theory, if prices rose above the agreed level, the European Commission would release the stored produce in order to bring the price back down. However, in practice, the European Commission’s intervention only occurred one way – to keep prices up through purchases. Prices were set at the level that would ensure the least efficient farmers in the Community an adequate income, while encouraging the more efficient large-scale farmers to maximise their output as the price was more than adequate to guarantee them a return on their investment. This led to large surpluses of most produce; prompting reports of “wine lakes” and “butter mountains”. The very nature of the CAP led to overproduction by farmers in order to maximise their benefits from subsidies, and

consequently created costly intervention and storage costs for the European Commission. In 1970, the CAP accounted for 87 per cent of the Community's annual budget.

The budgetary burden of the CAP, and notably the storage costs, was felt strongly by the major net contributors to European budgets during the 1970s; particularly Great Britain and West Germany. In an attempt to address the cost of storage, a decision was made to encourage the export of the surplus produce instead of storing it. This led to a dumping of subsidised European produce on the world markets, which in turn lowered the world prices by adding supply. The distortive impacts that the CAP had on international markets led to strong external pressure to reform it.

CAP reforms have been on the agenda since its founding days but have consistently proven difficult to realise. A first European Commission-led attempt to significantly reform the CAP made in 1968 – the Mansholt Plan – was met by strong opposition from the farming lobby. Smaller scale reforms were agreed in the early 1970s, including the modernisation of farms, the facilitation of early retirement and training. In the 1980-90s reforms were made due to the increasing budgetary cost of the CAP, the implications and costs involved in agricultural support to new member states, environmental pressures and external pressures in the context of world trade negotiations (GATT) (Bache & George, 2011). France – which has been the strongest opponent to the reform, and held the Presidency during key junctures of the negotiations – agreed to the so-called MacSharry reforms as a compromise for getting agreement on the single market in 1992. The MacSharry reforms commenced the shift away from product support through prices towards producer support through income assistance. The reforms aimed to improve competitiveness, stabilise agricultural markets, diversify production and protect the environment, all while stabilising European budget expenditures. As a compensation for the decrease in price support, direct payments were introduced, along with compulsory programmes such as agri-environmental measures, afforestation, early retirement and employment diversification.

These reforms were extended significantly in 2003 in efforts to make Europe more competitive through greater cuts to links between subsidies and production and continuing income support for farmers. The change in expenditure and allocation of funding, as illustrated in Figure 1, shows that market support has decreased significantly since the reforms were first implemented in 1993, while coupled market support significantly increased. Coupled direct market payments were replaced by decoupled direct market payments in 2006, which meant that payments were no longer tied to production but rather to the land and independently of the volume and type of production. There has also been a gradual increase in the share of rural development expenditure, a significant decrease in market support and the removal of export subsidies in recent years. Around 60 per cent of the total population in the EU member states is found in the rural areas, which cover around 90 per cent of the total territory (European Commission, 2012). Therefore, the increase in rural development was, and continues to be, needed to address economic, social and environmental challenges in rural areas and to incentivise the continuation of rural farming.

Figure 1. CAP expenditure and CAP reforms path (2007 constant prices)

Source: European Commission, DG Agriculture and Rural Development (Financial Reports), 2012

The CAP reforms have led to a smaller share of the total EU expenditure being spent on agriculture – a gradual decrease from 87 per cent in 1970 to 43.7 per cent in 2011. Specifically, that is EUR 54.7 billion out of EUR 126.7 billion spent on the CAP. France received the largest share of payments (17 per cent), followed by Spain (13 per cent) and Germany (12 per cent). Out of these outlays, 73 per cent was allocated to direct aid, 22 per cent to rural development and 5 per cent to interventions in agricultural markets. This means that agriculture within the EU was still highly dependent on direct taxpayer transfers. As a whole, around 30 per cent of farm income is from direct payments (European Commission, 2012). Following the reforms, large agri-businesses and big landowners – including rich landowners such as the British Royal family and farmers with large inherited estates – receive more from the CAP than small landholders. Consequently, approximately 80 per cent of the farm aid goes to around 25 per cent of EU farmers. The total amount allocated to agriculture is considerable given that the sector only employs about 5 per cent of EU citizens and that the economic importance of agriculture within the EU has consistently declined and only accounted for about 1.4 per cent of EU Gross Value Added in 2007 (European Commission, 2012).

DRIVERS OF THE CAP

Looking at the historical development of the CAP (see Table 1), there have been three key drivers and justifications of the policy: productivity, competitiveness and sustainability. Food security² was a driving force behind the creation of the policy in the post-WWII period when memories of hunger and food rationing were still fresh in people's minds. In the 1950s, the

² The most common definition of food security is from the 1996 World Food Summit, which states that food security 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” (World Food Summit, 1996).

founding member states of the EU were net importers of food as domestic productions were insufficient and faced with both structural and technological challenges. Rural poverty was vast and farmers were unable to produce and generate a living. The CAP was born with the challenges of food security and the perceived need to become self-sufficient squarely in mind. With greater production and self-sufficiency, EU competitiveness on the global food market gained greater focus. Aspects related to farming practices, including environment and sustainable farming, started to gain importance in the early 1990s and this trend continues to the present day. Due to the global food price crisis in 2008, a growing global population, increasing global food production needs, together with greater market volatility, extreme price hikes and threats posed by climate shocks and environmental degradation, food security has returned to the CAP discussion as a justification for the policy.

Table 1. Historical development of the CAP

Productivity ----->
 Competitiveness ----->
 Sustainability ----->

The Early Years: 1950-60s	The Crisis Years: 1970-80s	The 1992 Reform	Agenda 2000	CAP Reform 2003	CAP Health Check 2008
Food Security	Over production	Reduced surpluses	Deepening the reform process	Market orientation	Reinforcing 2003 reform
Improving productivity	Exploding expenditure	Environment	Competitiveness	Consumer concerns	New challenges
Market stabilisation	International friction	Income stabilisation	Rural development	Rural development	Risk management
Product support	Structural measures	Budget stabilisation		Environment	
				Simplification	
				WTO Compatibility	

Source: European Commission, DG Agriculture and Rural Development, 2012

The creation of the CAP was part of the foundational architecture of the European Community and has played a crucial role in European integration. From its outset, the policy has been the source of heated discussions among the member states, with France as the key supporter of the policy and the strongest opponent of reform. Thus, the following section explores France’s policies and in doing so seeks to demonstrate the importance that single member states can have for regional integration efforts.

FRANCE AND THE CAP

France, as a founding member of the EU, has influenced the CAP and EU policies in general from its outset and has been a key driver in promoting European integration. France is the biggest agricultural producer in the EU and accounts for approximately 17 per cent of

the total EU farm output. The country has consistently supported protectionist policies and state intervention into the agricultural sector since at least the late 19th century. France has continued to advocate for maintaining and strengthening the principles of the CAP and has been very influential in doing so. Key among the French government's supportive arguments has been the need to preserve the French countryside and support the unique lifestyles of small farmers and the culture as well as traditions prevailing in the rural areas. France's strong stance against any reform is also linked to the benefits it has received since the outset of the CAP. Despite being a highly developed EU member state with a strong economy, France has always been a net beneficiary of the CAP as opposed to a net contributor; although partly due to the previously discussed reforms it will likely become a net contributor in the near future.

France has utilised its influence over Europe's drive towards greater political, economic and social integration to help shape the CAP. It boasts the second largest economy in Europe after Germany and is one of the most influential member states in terms of voting power in the Council and the number of members of the European Parliament. Germany has historically been the key net contributor, the paymaster, to the CAP and France the key net beneficiary; a relationship in which France has wielded greater influence in terms of the policy outcome. Germany has agreed to be the banker to the agriculture sector as a compromise to gaining industrial advantages in the Community, but also as a means to create political-economic balance with France. The French-German partnership created the basic mechanisms of the CAP, namely price support, export subsidies and variable levies, which led to higher internal prices of cereal, sugar and animal products, and export subsidies to compete on the global market. France thus played a key role in setting the objectives and mechanism of the CAP from its outset. The Franco-German partnership has continued to be crucial in the development of the Policy. However, in recent years, disagreement and greater reliance on other alliances with other member states have decreased the primacy of the partnership. The decline of the Franco-German partnership as a guiding force of the CAP, and on EU policy as a whole, has put the ability of France to influence policies in the EU at risk.

Nevertheless, the CAP continues to be a key EU policy area of interest in France. Public awareness concerning the policy is higher in France than any other country, with a strong level of general awareness and interest in the CAP both amongst the public and the government. The public interest in EU policies and integration in France can be coupled with the fact that 50 per cent of the French population feels both French and European, which implies a relatively high level of cultural affinity for and integration with the wider continent. The interest is also linked to the importance of the CAP to French food systems. As France has received a consistently large share of EU expenditures under the CAP, and has in turn taken an interest in steering agricultural policies, it has over time developed a strong stake in how regional integration in the food space will progress.

However, there are deviations in the perceived policy priorities among the public and within the French government. In the discussion on the reforms ahead of 2013 (CAP2020, 2009), France identified four policy priorities: food security; production and exports; preservation of rural areas; and climate and environmental protection. *Food security* was regarded as a strategic sector of the EU and an important aspect of the European identity – import

dependence of certain products had to be alleviated. France sees the EU as duty-bound to obtain an important *production* capability and foresees an important role in supplying the increasing global demand. The *preservation of rural areas* and promotion of the diversity and viability of EU agriculture was also a key priority – aimed at maintaining a dense network of farms, food and retail businesses in rural areas. As a new way of legitimising the policy, contributions to the fight against *climate change* and support towards green farming were also identified as key priorities of the CAP.

These goals do not always jibe with French public opinion. A 2010 survey showed that the French population thought that the key priority of the CAP should be to ensure good quality, and healthy and safe agricultural products (Eurobarometer 2010). In contrast to the French Government's perceived priority areas, only 23 per cent of the respondents thought that the development of rural areas and preservation of the countryside should be a priority, and only 22 per cent favoured prioritising food security. However, the vast majority (over 90 per cent) of the French population agrees with its government that European agriculture and rural areas are important for the future of the EU. It is also important to note the influence the agricultural lobby groups have in France and the French farmers' success in organising demonstrations that have successfully impacted both politicians and public opinion. Thus, while there are differences in the perception of key priority areas, there is a broad yet tenuous consensus between the government and the public in France on the importance of the CAP.

On the whole, France's support of the CAP speaks less to robust regional integration policies and more to a desire to preserve agricultural traditions, become more self-sufficient as a region and continent and continue to reap the benefits of regional subsidy programmes. Preserving agricultural traditions can be a laudable social and cultural objective, but it can also impede food systems modernisation and moves towards greater efficiency – including those that beget greater sustainability. Allowing Europe to become less beholden to imports from beyond the region can help farmers at home, but the policies implemented to realise this goal can equate to protectionism by other names, and lead to the distortive economic impacts that protectionism often entails. The desire to continue reaping benefits from regional subsidy programmes has become an end in and of itself in France. This is, however, often disconnected from furthering regionally based efforts per se and instead largely pushed by farm lobbies that appeals to the continuing cultural relevance of France's rural areas. The cultural validity of these arguments is not at issue here, but it should be noted that there is little reason to expect efficient and well-functioning regional agricultural policies to emerge from such impetuses.

This scenario has some parallels with that of Southeast Asia. The region is on the pathway towards greater social, economic, and political integration through the apparatuses of the Association of Southeast Asian Nations (ASEAN). ASEAN is not the EU, but it is pursuing strategies that seek to lend greater unity, coherence and linkage among the policies of its member states – including throughout regional food systems. ASEAN does not have the same traceable history of food policy integration that the CAP evolution offers in Europe. As in Europe, however, modern integration efforts bring together a myriad of interests and capaci-

ties, along with at times dubious incentives for gaining the advantages that integration can bring without making the difficult changes that it requires.

SOUTHEAST ASIAN FOOD SYSTEMS: MODERNISATION AND INTEGRATION

Southeast Asia does not have a foundation for integration comparable to the CAP, nor does it appear set to go down a parallel pathway to that witnessed in Europe – particularly with regard to large budget allocations. However, regional efforts to integrate food systems in Southeast Asia will grapple with some similar issues to those in Europe. In both cases, the positions of key member states have formed the parameters of policy discourse, and as such helped to clarify both what is possible and what is likely for regional food markets. Given that this discourse is in a relatively fledgling phase in Southeast Asia, there is room for significant movement on the ultimate shape that regional policies will take. Importantly, this drive towards regional integration is occurring during a time of dynamic changes in Southeast Asia's wider food sector.

Southeast Asian food systems continue to modernise, but the process is both halting and uneven (Ewing 2013). Distribution chains, wholesaling, food processing, retail and supermarkets, and other midstream as well as downstream segments of regional food systems are undergoing transformative change, and these changes continue to accelerate particularly in Southeast Asia's least developed countries (Reardon and Timmer 2012). On-farm modernisation is occurring more sparingly. Previous advances in food production technology and methods have lost momentum, and much of the region faces questions about how to produce the amounts and types of food that markets require. This happens in light of shifting demographics, environmental stress, land scarcities and other defining characteristics of Southeast Asia. Regional integration is being proffered as one promising pathway forward, particularly in light of regional moves towards an ASEAN Economic Community (AEC) by 2015. The ambitions that drive calls for such integration can be traced in large part to the volatile food market conditions that have challenged the region over the past decade.

The sharp increase in international food prices in 2007/2008 were felt strongly in Southeast Asia and led ASEAN member states to reconsider existing regional measures to foster and maintain stable food supplies. An amalgam of factors was seen as responsible for compromising stable food access. On the supply side, production cost increases driven by fuel and fertiliser price spikes, yield reductions resulting from environmental changes, and the growing costs and logistical demands of food storage all contributed to volatile price conditions (Tretthewie and Ewing 2012). On the demand side, structural changes in global demand for food commodities, urbanisation, changing food preferences, competition for land and resources with biofuels and market speculation likewise made food access less dependable. Responses by ASEAN members were largely interventionist, and included export restrictions, drives towards greater self-sufficiency, price subsidies and import-facilitation strategies. Rice-exporting countries such as India and Thailand reduced exports and imposed minimum export prices in order to supplement domestic food markets during the period of price

instability for other staples (e.g., wheat and corn). Rice-importing countries, most notably the Philippines, responded by trying to rapidly increase stocks through purchases on the international market – which in turn drove prices higher in a compounding cycle of panic buying and climbing costs. “Nervousness” in Asian rice markets led to skyrocketing prices that saw rice move from USD375 per tonne at the beginning of 2008 to over USD1,100 per tonne by April of that year (Timmer, 2010).

This instance, and further price volatility in 2010-2011, highlighted the interconnectedness of regional food markets and the deficits in the level of integration needed to prevent disruptions to attaining affordable food. There was a growing recognition of the degree to which national policies have both direct and indirect effects on regional food systems, and this corresponded with a chorus in Southeast Asia proposing further regional cooperation in the food sector. Three cases exemplify recent efforts to this end: the ASEAN Integrated Food Security Framework (AIFS), the ASEAN Plus-Three Emergency Rice Reserves (APTERR) and the future ASEAN Economic Community.

The 2008 Special Senior Officials Meeting of the 29th Meeting of the ASEAN Ministers on Agriculture and Forestry (Special SOM-29th AMAF) officially introduced a concept note on the ASEAN Integrated Food Security (AIFS) Framework. AIFS is based on the principle that addressing food security challenges requires common understandings among ASEAN member states, cooperation on producing timely and reliable data for policy formulation and long-term agricultural development planning focused upon sustainable food production and trade (ASEAN 2009). In an attempt to take these ambitions forward, the Special SOM-29th AMAF began the process of formulating the Strategic Plan of Action on Food Security for the ASEAN Region (SPA-FS). Between them the AIFS and the SPA-FS cover an exhaustive range of food security goals, including strengthening national food security systems, integrating these national systems regionally through capacity building, information sharing, greater transparency and the like, improving the social safety nets geared towards the region’s least fortunate, and promoting food production systems that are high-yielding, diversified and sustainable (ASEAN 2009).

The goals of AIFS/SPA-FS are high-minded and ambitious. The APTERR programme is conversely more targeted and tangible. APTERR was launched in July 2012 by ASEAN and the “Plus Three” members of Japan, China and South Korea. It is designed to make rice available during emergencies, help stabilise rice prices and improve farmer income and welfare (Jongskul 2012). APTERR calls upon participants to earmark pledges from national reserves for potential use in appropriate future emergency situations. Earmarked pledges currently account for approximately 787,000 tons of rice, of which 700,000 tons is accounted for by Plus Three countries. This rice can be made available by a three-tiered system involving 1) special commercial contracts, 2) emergency grants and loans and 3) the delivery of donated rice in times of acute emergency. Member states are responsible for funding the costs of procurement, storage management and, if a recipient, distribution (Trethewie 2013). The APTERR Secretariat is tasked with supporting these roles through data collection and analysis of supply and demand trends, and assessing emergencies that might call for APTERR outlays.

Still further integration is now being promoted as part of wider regional efforts towards the AEC. The AEC seeks to build a single market and production base, promote more equitable development within the region, make the region more competitive internationally, and further integrate Southeast Asia into global markets (Anthony, Teng and Chng 2013). For the food sector, this entails harmonising quality and standards, standardising trade certifications, promoting transparency, fostering greater sector-wide connectivity and encouraging the reduction of tariff and non-tariff barriers to food trade (Anthony, Teng and Chng 2013; and ASEAN 2011). These efforts are to be situated within the ASEAN Cooperation on Food, Agriculture and Forestry mechanisms as well as the AIFS/SPA-FS. Where successful, AEC mechanisms can make food trade more robust and reliable, assuage health and safety concerns and create new market linkages that benefit farmers and downstream actors in food value chains. As the AEC has an ambit much larger than the food sector, it seeks to foster a systemic shift towards regional economic and social integration of which food and agriculture will be attendant parts.

ASEAN is therefore moving towards more robust regional integration, and efforts to this end are growing in importance for domestic and regional food systems. However, substantial uncertainty defines how successful these integration efforts will be. AIFS/SPA-FS contains a firm set of guidelines and principles, but little by way of strategies towards realising highly ambitious goals. Efforts to foster sustainable increases in food production and more robust trading systems have been promoted from various corners for decades in Southeast Asia, and while AIFS/SAP-FS codifies these efforts on a regional level to a greater degree than has been attempted before, it does not make the challenges inherent in doing so any less daunting. For APTERR, collective rice pledges account for less than two days of regional rice consumption (US Department of Agriculture 2013), and the low contribution levels from ASEAN member states render the programme more symbolic than strategically significant for rice markets (Trethewie 2013). Moreover, there are pervasive questions about when and under what circumstances APTERR stockpiles would be utilised, and historical precedents do not provide strong evidence that regional storage programmes will create more stable rice prices and access (Trethewie 2013). The future of the AEC vis-à-vis food remains to be seen, but it is clear that it also faces foundational challenges. There are reasons for optimism that some harmonisation of safety standards is in the offing, which may in turn help to promote trade and further market integration, but this will occur unevenly and it will likely take the region's least-developed countries some time to reach the sort of standards that can open up new markets for their exports. Reducing tariff and non-tariff barriers is still more difficult. Countries remain trepidatious about exposing their agricultural sectors to open competition, which subsidies and tariffs are designed to ward off. Non-tariff barriers may be a low-hanging fruit by comparison, but reducing logistic and bureaucratic impediments to trade often necessitates fighting corruption, graft, illicit economics and capacity deficits. These changes will likewise not happen overnight. Perhaps even more important is the degree to which key "sensitive" and "highly sensitive" products (rice included) will be exempt – at least initially – from trade liberalisation efforts under the AEC, and there is significant uncertainty surrounding when and under what circumstances these products might be traded more openly.

As with France and the CAP, Thailand helps to reveal some of the entrenched impediments to food systems integration in Southeast Asia. The following section uses the Thai case to show how national policies can distort regional trade conditions, along with the difficulty that is ever-present in addressing such policies at a regional level.

THAILAND AND INTEGRATION CHALLENGES

The case of Thailand reveals the pathways by which domestic outlooks – often highly politicised – can erode the possibilities of regional integration. Thailand sees a combination of “sufficiency” agricultural thinking and populist political strategies distort the role that the country plays (and could play) in regional food systems. Sufficiency thinking stems from agrarian mythologies that tell of the humble desires of rural Thai farmers to subsist off of their land with little desire to integrate into larger food markets. Farmer subsidies, meanwhile, have moved Thailand from being the world’s largest rice exporter to becoming plagued by high rice support and storage costs and arguably perverse incentives to keep rice away from actual consumers. Neither of these policy directions is immutable and both could change relatively quickly with future policy shifts. Both also demonstrate, however, the ability of a country to go its own way in agricultural policy formulation in Southeast Asia, and the carry-on effects that such policies can have for the region.

Thailand’s agrarian myths are rooted in historical imagery about previous periods of rural “contentment”, romantic visions of village life that underpin national identities and an assumed “sufficiency ethic” that suggests that rural farmers desire little by way of material gain (Dayley 2011). Influential Thai histories posit that a 13th-century king called for the fostering of idyllic sufficiency communities with “fish in the water and rice in the fields”, and these modest origins contribute to what has become a modern village-based Thai identity (Dayley 2011: 344, see also: Hirsh 2002). Subsequent rural norms have retained a focus on such simplicity, the narrative goes, so that contentment relies on little more than steady access to the basic accoutrements of life (Dayley 2011, Scott 1976). These agrarian myths enjoy support from the monarchy and a selection of Thai intellectuals, activists, military and government leaders as well as Buddhist fundamentalists. They have found their way into policy approaches, such as the monarchy’s “New Theory Agriculture” that calls on the country’s small-scale cultivators to seek total self-reliance by dividing up their limited land among water storage, rice cultivation, growing fruits and other crops, animal husbandry and housing (Priyanut 2004). Moreover, these rural farmers should avoid any agricultural debt, use no chemical herbicides or pesticides and farm for self-sufficiency rather than commercial purposes (Ampol 2004, Priyanut 2004). Such sufficiency principles have been lost through commercial agriculture, the arguments contend, and should be restored through further disengagement from regional and global food systems (International Network of Engaged Buddhists 2007).

These positions and ostensible goals are at odds with empirical realities in Thailand. As Dayley points out, “farmer behaviour [in Thailand] over the past 50 years or so belies any serious predisposition toward the sufficiency ethic or belief in the Thai agrarian myth”

(2011: 351). Over this period, the expectations of Thai farmers have grown as urbanisation, capitalism and a state-led push to commercialise agriculture made them more aware of their relative poverty compared to city-dwellers (Wyatt 1984). Like so many other members of Thai society, farmers seek material betterment and upward mobility – goals which could likely benefit from engagement with regional markets.

Agrarian myths, while often misguided, are not benign. Political divisions over agrarian management have contributed to an, at times, violent schism in Thailand. The benefits of agricultural modernisation during the early decades of the Green Revolution were not evenly distributed, and the resulting animosity created by the new rural “haves” and “have nots” helped fuel resentment towards the government and insurrectionist activities (Pasuk and Baker 1998). Today, divisions between coalitions loyal to the monarchy and those supporting the populist Thai regime also break on their approaches to Thailand’s agrarian character. In both cases the well-being of rural communities is often at the centre of debate but consultation with the communities themselves, and a willingness to recognise results that run counter to prevailing narratives, is found lacking.

One political response to addressing these rural issues in Thailand has been to heavily subsidise the rice sector. As a product that is vital to hundreds of millions of consumers and millions of producers and supply chain actors, it is unsurprising that rice commands unrivalled political attention among crops in Southeast Asia (Trethewie and Ewing 2012). Governments of exporting and importing countries alike have long taken a heavy-handed approach towards the rice economy, particularly because rice availability has for many years been considered the key indicator of food security in Asia. Wailes notes that in the rice economy, “the combination of a high degree of protection, geographic concentration, market segmentation, inelastic supply response to price, and inelastic demand response to price and income results in volatile prices and volumes traded” (2005).

The protectionist policies of the rice sector have been the source of considerable political tension and have been a major barrier to free trade in the region. The food price crisis of 2007–2008 worsened these conditions, and deepened existing distrust between exporting and importing players. It also triggered strong long-term policy responses that sought to secure domestic supplies and stable prices by fragmentation, rather than integration, of the international market (Trethewie 2012). Thailand implemented a rice mortgage intervention programme with the objective of driving up international rice prices in 2011, when it was the world’s largest rice exporter. The scheme, which has well-exceeded the scale of previous interventions in the region, includes income guarantee for rice farmers, a buy-in rice scheme and tighter control over trade, with a preference for government-to-government deals and minimal private sector activity. Rather than increasing prices, the scheme has led to a decrease in demand for Thai rice. As a result, the country is holding unmanageably high stocks and experienced a drop in exports of 37 per cent in 2012.

Thailand has also pursued the development of a rice exporters’ cartel involving Vietnam, Cambodia, Myanmar and Laos. The objective is to control rice exports in the region and drive up prices in the international rice market by 10 per cent each year. This would shift the dynamics of competitiveness in Southeast Asia and would undermine efforts to liberalise

and integrate the rice sector, creating a deep divide between the region's mutually dependent importers and exporters (Trethewie 2012). Although the cartel is unlikely to materialise as the countries involved have failed to come to an agreement and there is external pressure to conform to international trade principles, the pursuit of a cartel speaks volumes about exporters' hesitancy towards market integration.

Arguably, a more significant strategic shift in the longer term is the response of rice-importing countries to these developments (Trethewie and Ewing 2012). Some responding actions will support market integration, such as some countries' diversification of their import sources in response to the Thai scheme. Other more protective and isolationist measures will almost certainly undermine market integration however. These measures includes moves by importing countries with greater production potential to be less reliant on the world market, even if this strategy is neither economically viable nor an efficient use of resources. The Philippines and Indonesia, which were two of the world's largest rice importers pre-crisis, have both pursued substantial rice production initiatives and pledged to be self-sufficient in coming years, with the aim of becoming net exporters soon after. It remains unclear as to whether either country will realise these goals, but it is clear that doing so will come at significant environmental, social and economic costs.

Additionally, in the context of an opaque, thin and relatively unstable rice trade, the push by the Philippines and Indonesia towards self-sufficiency seems a logical move for securing domestic supplies and stabilising domestic rice prices. Both Indonesia and the Philippines are already significant producers of rice, being respectively the third- and seventh-largest producers of milled rice globally in 2011, but their roles as the world's largest rice importers are fundamental to regional trade characteristics. Their moves toward self-sufficiency will reduce the already thinly traded rice quantities in Southeast Asia to a degree that will erode the robustness of the regional rice market. These are precisely the sort of dynamics that undermine regional food systems integration.

While unique in its specifics, Thailand's agrarian myths and protectionist outlooks are not outliers. At international levels, groups such as Greenpeace, La Via Campesina and Friends of the Earth are unrelenting in their critiques of modern agricultural approaches and the dangers of liberal food markets (Miller and Kershen 2013). Protecting farmer interests and warding off exploitation are commendable goals, but disavowing moves towards greater food trade as "destructive neoliberal practices" (La Via Campesina 2011) is clearly anathema to regional integration and, as is reiterated in the conclusion, creates more, not less, food security challenges. As the Thai case demonstrates, such agendas do not necessarily jibe with the interests of small and medium-scale farmers, and lead to further protectionism and inward-looking policies among other members of the regional community.

CONCLUSION

Food is a fundamental need for all peoples and, as such, it is an unavoidable sector for government attention and policy interjections. Moreover, countries, communities and households cannot fully diversify or divorce their activities from food considerations, and as such a level

of integration will always be a part of political conversations on some scale. In Europe, decisions were taken decades ago to pursue such integration regionally, and a relatively symbiotic system of Franco-German balancing propped up a regime that garnered advantages for both parties in addition to well-placed actors across the continent. The heavy expenditures and inefficiencies of Europe's CAP ultimately led to its reform, but as the historical beneficiary of the programme France continues to clamour for its preservation and deepening. The reasons for it doing so often speak to national circumstances rather than the potential for wider regional benefits.

All told, the European story has been mixed. The continent was able to perpetuate agriculture during a phase of rapid industrialisation, but it came at great expense and uneven benefit sharing. More recent moves have addressed these problems to a degree, but the future of CAP reform remains uncertain – not least because of the agendas of France as one of the continent's most powerful players.

Southeast Asia has not been through such an experience, and the future of food systems integration in the region is a blanker canvas. It will not go the way of Europe in that the budget expenditures of the CAP – particularly during the earlier decades – are not in the offing in ASEAN. ASEAN is also defined by its respect for the sovereignty and internal affairs of its member states and these characteristics will continue to preclude it from forming political and bureaucratic architectures similar to those in Europe. However, some degree of food systems integration is intrinsic to Southeast Asia's economic, social, political and environmental character, and codifying this integration in regional frameworks is a goal without a viable substitute. It is now ASEAN's charge to build bridges between importing and exporting countries that can slow the fragmentation of food markets and create confidence in food trade. This charge will entail comparatively mundane efforts to unify and regulate food standards and practices in areas such as labelling and transport packaging, to much more contentious political efforts to chip away at the protectionist bents of key member countries. While the outcomes remain murky, it is clear that ASEAN has ambitions in this direction. It would do well to learn from Europe's experiences.

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The Challenge of Sustainable Agriculture

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EXECUTIVE SUMMARY

During the past century, both the world population and worldwide food production have changed considerably. While the world population has grown remarkably from 1.5 billion in 1900 to 7.2 billion people today, worldwide food production has increased even more. However, despite a bigger amount of food available per capita, access to food remains imbalanced. Although the surplus of food is enormous in some regions, roughly 800 million people are currently suffering from hunger. Nowadays, the most prominent places of food shortage are Sub-Saharan Africa and South Asia. In these regions, structural and chronic hunger often results from low incomes and the lack of local as well as regional production. The food shortage in these regions becomes obvious when the worldwide production and distribution of rice are considered. The annual amount of rice produced and consumed worldwide aggregates to 700 million tons. However, only 30 million tons are distributed on the world market because, in general, food is locally and regionally produced and consumed while only a small portion of the total amount is imported from the world market. Consequently, the world market for staple food is limited. On the other hand, the world market for feed is considerable in size as increasing welfare leads to higher animal protein consumption.

Nowadays, the whole supply and consumption chain, mainly the production, accessibility and utilisation of food, is considered when dealing with food systems. However, each phase of the production chain involves different actors, which increases the need for proper coordination and cooperation. The production phase involves the actors of the traditional farming systems and agro-technological suppliers such as the seed industry, the crop protection industry, irrigation, animal husbandry and feed and slaughter houses. The accessibility phase is dominated by food processors and food companies and the utilisation phase involves retailers.

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This paper summarises six megatrends in agriculture in an explanatory format. Further, it describes the role of various actors such as public and private investors and depicts the changes in their respective responsibilities. Subsequently, the paper illustrates the need for better integration and coordination as well as the increasing importance of food industries and their prominent role in directing the food chain and fighting the dominating role of the retailers. The role of food industries is of vital importance to directing the food systems towards more sustainability. In this context the role of Asia and Europe must be examined.

MEGATRENDS

Since the beginning of the last century, the agriculture sector and the food sector have gone through a range of gradual and sudden changes. Several driving factors have been identified as causing the so-called megatrends in these sectors (Bindraban and Rabbinge, 2012). First, ecological literacy has been identified as a driver that has improved the understanding of biological and ecological processes. It guides the search for appropriate technologies and management practices. Second, advances in technology had a huge impact. They range from tangible inputs, such as fertilizers and other agro-chemicals to stimulate plant and animal growth, to information technology to precisely target application and breeding, and biotechnology to develop plants with desired characteristics. Third, increasing societal concern for the environment and growing awareness for the need for sustainable ecosystem services have been identified as important drivers for agronomic practice that dramatically reduces the adverse impact on the environment. Fourth, ecological insight has raised awareness regarding possible benefits from ecological synergies by combining multiple functions and activities on farms and in the landscape. Finally, the link between human health and dietary requirements has catalysed agronomic adjustments and bio-fortification.

The above-listed drivers lead to the following changes in the food and agricultural sector. In the Netherlands, the productivity of grain crops has gone up from a mere 1000 kg per ha during the middle ages to about 2000 kg per ha at around 1900 and more than 9000 kg per ha today. Currently, the average European cereal yield is approximately 6500 kg per ha while the average global yield amounts to 3500 kg per ha, which reveals that there is still scope for improvement. The second trend is an evolution from agricultural practices based on habits and skills to a systematically organised and controlled way of production. Such practices include not only Information and Communication Technology (ICT)-driven and fully automated operation in greenhouses as well as precision agriculture with tractors guided through remote information in arable cropping but also increasing ecological knowledge about, for instance, prey-predator system to minimize spraying. Pests and diseases infestations are no longer seen as inevitable phenomena due to agricultural measures but merely as results of mismanagement in production. Third, agriculture and land use have evolved from generating food and income to include more objectives like ecosystems services, nature conservation, ecological corridors, touristic attractive landscape in multifunctional agriculture and land use. A fourth mega trend relates to the food chain, with advanced tracking, tracing and packaging of processed foods to guarantee quality, reduced perishability, monitoring of social

responsibilities of producing and trading corporations, and increased efficiency of logistics. Fifth, understanding of the physiological background of human diseases and deficiencies has led to the fine-tuning of diets in order to regulate health. Detailed physiological and medical information has contributed considerably to preventive measures in medical terms leading to healthy ageing with little pharmaceutical interventions. The last trend concerns the upcoming bio-based economy, which aims to utilise plants as a factor to replace fossil-bearing materials. A cascading approach, which first uses the highest value-adding bio-based products and moves to less value-adding products, is most feasible.

FOOD AND NUTRITION SECURITY

In addition to the production of bulk food items such as major cereals, root crops and plantains, locally or home garden-produced vegetables and fruits can make a significant contribution to improving the nutritional quality of a diet. While meat production puts a large claim on land and water resources, consumption of meat can improve people's health status (Randolph et al., 2007). The death of pregnant women and children due to anaemia can be prevented by consumption of only a little amount of meat to complement unbalanced diets. Specific nutrients contained in animal products can help to offset the incidence of non-communicable diseases and contribute towards health benefits (Macrae et al., 2005). Therefore, the ecological opportunity of exploiting grasslands for production of ruminant meat could be stimulated (Bindraban et al., 2010). Yet, the worldwide amount of bulk production of meat in feedlots is increasing steadily and requires considerable amounts of feed. The above-mentioned change in consumption is one of the trends that dominate agricultural production and productivity. A balanced diet comprising a buffet of food items should be stimulated for a healthy life, thereby benefiting from location-specific agro-ecological potentials.

In the recent past, food security only took account of the number of calories and did not explicitly address the composition of the food produced. It has, however, become clear that many problems of hunger and especially stunting are due to an unbalanced diet. The right composition of diets is needed to fulfil nutrient security. It is the key for the prevention of stunting and other food and diet-related problems. That latter requires more responsibilities in the later phases of the supply chain, namely more responsibility for the food and drink industries and retailers. The composition of diets is determined by them and the prevention of obesity or stunting is in the hands of these actors in the supply chain.

Developed, wealthier parts of the world with an increasing middle class and the BRIC states have adopted an approach where the food and drink industries as well as retailers have to ensure that food and nutrition security go hand in hand. At the same time, in the developing world the stunting of young children is a major problem: in some countries more than 20% of all children suffer from stunting. This situation requires a policy for the breadbasket to be enriched with more balanced diets including, for example, locally produced vegetables. In this way, policies appropriate for the various conditions may, on the one hand, strengthen food and nutrition security and reduce climate welfare diseases in wealthier parts and, on the other hand, fight chronic hunger in poorer parts of the world.

PRIMARY AND SECONDARY PRODUCTION

An increase in income normally results in more consumption of animal proteins in the diet, which requires more water and external inputs. In order to limit the use of such resources, one should proceed in a way that does not conflict with other aims. In the following section, the role of primary and secondary production and their interaction in different farming systems is explained in detail.

Increasing the productivity of natural resources such as land, water and nutrients is essential in order to reduce environmental impacts and meet the growing demand for food given the limitations to expanding the agricultural frontier into bio-diverse savannahs and forests. Additionally, the efficient use of natural resources is essential for most Asian nations with a booming food demand due to economic prosperity and strongly limited amounts of land and water resources.

Following the production ecological approach (Ittersum and Rabbinge, 1997), The Netherlands Scientific Council for Government Policy has analysed the production potential of Europe (WRR, 1992) and the world (1995). There are significant differences in food production potentials and food requirements between global regions, which imply the need for redistribution of food between surplus and deficit regions. The surplus production potential, the current production and trade volumes of Europe along with the desires of its society for non-food functions favours a dual agricultural path for Europe (Bindraban and Rabbinge, 2011). Thereby, it not only continues to guarantee its own food supply through a food-oriented path of intensive agriculture but it also cherishes a socially oriented pathway to meeting non-food desires.

Asian countries have effectively developed their agricultural systems since the 1960s, which, by stimulating the use of advanced technologies in combination with supportive market conditions, led to the *Green Revolution*. Alarmed by Brown (1995), who alleged that China was unable to feed itself, many researchers have studied the production potentials and implications of the deficient production capacity of China. They have observed that the accelerating consumption of meat in China has led to large claims on feed, increasingly supplied by Latin American countries. For example, China's import of soybean for pigs and chicken has increased from five million tons in 1990 to more than 40 million tons in 2009. At the same time, India has increased its soybean production from a mere two million tons in 1997 to more than eight million tons in 2006 to feed its chicken (ABIOVE, 2005; Oil World Annual, 2007). These dramatic developments in the production and trade of soybean were by far underestimated by projections of econometric analyses (Rosegrant et al., 2001). The actual production volume of 235 million tons of soybean in 2006/7 already exceeded their projected global production of 227 million tons in 2020.

The increasing demand for more luxurious food items creates a great export opportunity for Europe. Nowadays, surplus production as it was experienced during the 1980s is not likely to occur. The high production capacity, however, allows Europe to profit economically by increasing its exports (WRR, 1992; WRR, 1995). Europe can focus on the production of high-quality food products such as meat, milk and processed food items and should also

exploit its own production capacity for the production of feed and raw material. Cereals, and even soybean (Stehfest et al., 2007) or substitute fodder crops can be produced to feed Europe's livestock. Hence, Europe can assume an active role in world food security by using its surplus potential to supplement deficit regions in Asia. In fact, the flow of high-quality food items such as milk export to Asian countries is currently increasing.

As the availability of land and water is strongly limiting production in most Asian countries and even rapidly degrading in some regions (e.g., Bindraban et al., 2012), all ecological opportunities should be used. However, gains will not be easily attained. Molden et al. (2010) provided an overview of the global availability of fresh water, the use efficiencies and opportunities to enhance water productivity. Rainwater on current grazing lands can be better used if the fertility of its soil is increased for the production of ruminants for meat production (Bindraban et al., 2010). In fact, using the mid-west of the USA as an example, Gelfand et al. (2013) show that grassland productivity can be increased by fertilising soils. Yet the authors used grass in their analysis for the production of ethanol. Examples for ecological opportunities are the cultivation of rice, which can be grown with less water (e.g., Bindraban et al., 2006), the improvement in irrigation system efficiency (e.g. van Dam et al., 2006), the implementation of comprehensive packages of agronomic measures (e.g., Ahmed and Sanders, 1998) and various other options. The above-listed spectrum of ecological opportunities should be utilised, which would lead to a diversified composition of food items, including both crop and animal-based products. These opportunities can be attained through substantial investments in knowledge and institutional arrangements.

FOOD INDUSTRIES

The roles of various actors from the food industry and their respective powers in the supply chain have changed considerably over the years. As demonstrated by the hour glass model (Zandlopermodel), the power is now more or less concentrated in the hands of the supply chain managers. In Europe, for example, these managers connect the approximately 650 million consumers with the 6 million farmers.

At the same time, the power of producers is limited unless cooperatives become more competitive and thereby increase their power on the market. The role of food industries and cooperatives or farmer organisations should be expanded to have a more balanced distribution of power in the food supply chain.

METROPOLITAN AGRICULTURE

In the context of the ongoing urbanisation, it has been estimated that about 70% of the world's population will be living in cities by 2050. Such an estimate requires a reorientation of the way food is produced. Urban agriculture, i.e., the revitalisation of small local agriculture, is sometimes promoted and some even claim that such a renaissance of local production is the way forward for urban agriculture. However, the total production of urban agriculture will always be limited and the consequences in environmental and spatial terms are far from

optimal. Therefore, while it is valuable to connect the urban population to primary production, the way to go for substantial production of food may need to be different. Staple food production using the best ecological means at the most endowed lands is the most promising option and can be very well combined with metropolitan agriculture for high-valued products such as vegetables.

Metropolitan agriculture uses vertical farming systems but also integrates various other farming systems and ways of production, which are, in most cases, non-land related such as greenhouse cultivation, LED lamps-dependent systems and intensive cattle breeding. The private sector plays a vital role in these developments while the public sector facilitates and promotes innovation, strengthens knowledge systems and takes care of fair and well-functioning market systems. In general, the latter holds for all pillars in the agricultural sector, be it for the flower industry, the bulb industry, arable farming, dairy production, or seed production etc. Together all these parts form the agricultural sector and have a common denominator, namely food, feed or other agricultural produce although they have different characteristics. Ground-related chains are less numerous and variable than non-ground-related chains. Metropolitan agriculture at agro-industry parks may optimise the use of external inputs, reduce energy usage, minimize environmental side effects and strengthen the mutual interaction between the various chains. Vertical integration in the supply chain optimises the use of energy, demand orientation as well as minimises waste and pollution, whereas lateral integration between chains enables optimisation at the system level. This may lead to a substantial decrease in environmental side effects and a better use of scarce resources.

Metropolitan agriculture is still in its infancy but it will be a much needed way of producing in metropolitan areas as it is the most efficient eco-technological way of producing. In land-related agriculture, especially with regard to staple food and feed combined with animal husbandry, choosing the best-endowed places in agricultural terms will minimize pesticide use, pollution, costs, and water usage and will save land for other purposes such as nature conservation, biodiversity safeguarding, natural grassland and forests for carbon sequestration and mitigation of climate change. Studies on optimal land use (e.g., “Ground for Choices” of the WRR, 1992) already illustrate the enormous potentials and perspectives for reaching societal goals when the right choices are made.

THE ROLE OF GOVERNMENTS AND PUBLIC SECTOR

The megatrends reveal that an increasing number of actors have to interact in order to advance the ever-more complex agricultural and food systems, which encompass elements of efficient production systems with minimized environmental impact, integration of multiple functions, compliance with health requirements, and optimised use of biomass to contribute to the bio-based economy.

Governments and multilateral organisations can push the agricultural sector and the food sector towards more sustainable practices. They can, for example, exercise global governance and constitute international agreements, such as the agreement adopted in Rio in 1992 followed by the Rio+10 and Rio+20 events. Furthermore, they can contribute to the

adoption of national rules and regulations such as the existing water quality directives in the EU. More recently, Non-Governmental Organisations (NGOs) and private sector enterprises have also initiated negotiations in round table discussions. They have agreed on steps that need to be taken in order to bring forward sustainable agriculture in the production of palm oil, soybean, cacao, coffee, bio-fuels and fishery. Consequently, the former dominant role of the public and private sector is shifting gradually to NGOs and civil society organisations. The enlightened self-interest and the increasing importance of corporate responsibility is the most important driver for the optimal use of resources and for maximising the ecological basis of agricultural production systems. Instead of the director and organiser, governments and the public sector continuously facilitate, stimulate and provide conditions and coordination. The private sector constantly meets the societal demand to undertake social corporate responsibility. Multinational food companies such as Unilever and Nestlé take the lead in such developments with targeted actions towards sustainable production systems in order to help alleviate poverty and food insecurity. While multinational companies used to play a role as participants as part of their corporate responsibility, nowadays they are more and more leading the supply chains and taking responsibility for this development.

THE ROLE OF NON-STATE ACTORS IN SUSTAINABLE AGRICULTURE

The increasing importance of the role of food industries, the cooperatives and the civil society with regard to stimulating sustainable agriculture and food and nutrition security results from self-interest. The renewal of the societal contracts for companies includes an explicit and very concrete policy prescribing how to produce and deliver products. Such production and delivery must be based on transparent and developed procedures and protocols in the whole production chain, from soil to shelf or from seed to meat.

Principles like the best techno-ecological means may be adopted and internalised in the companies. Their development may be promoted and further developed by the contribution of the public sector. A continuous updating and upgrading of the processes in production terms and a more conscious way of producing could and should be stimulated by the NGOs and other groups that comprise the civil society. They shall not only criticise but also stimulate dialogues, promote strict guidelines, strengthen research oriented towards the continuous upgrading of production processes and confront consumers with the consequences of their behaviour.

Both production structures and consumption patterns have to be continuously upgraded to reach a more sustainable agriculture system, food production and nutrition security. Applying highly productive systems with an optimal use of external inputs will minimize environmental side effects and create opportunities and space for safe-guarding bio-diversity.

The role of non-state actors is crucial in the movement towards a more sustainable development. Generally, the attitude of the private sector is positive. The momentum for change is impressive and the opportunities for the development of sustainable agriculture systems are huge. The synergy between public sector, private sector and non-state actors is essential in the transformation needed in the agricultural and food sector towards sustainable practices, and

reduced poverty and hunger. The road for sustainable development may start with the change in agriculture and pave the way for other sectors to follow.

ACTIONS AND RECOMMENDATIONS

- Securing food for all at global and regional level is possible. There are various opportunities to increase agricultural yields and to reduce environmental side effects. However, in order to realise the latter, optimisation of land use, integration in production chains and mutual interactions through lateral strengthening between chains are needed, requiring an enormous change in policies at all levels.
- The optimisation of living production systems is typical for agriculture. It requires continuous upgrading and updating of such systems based on intensified knowledge and innovation. Investment in knowledge systems and the strengthening of competitive power is crucial.
- The further development of best ecological means requires a strong biological basis of the various components of agricultural systems. Better understanding of the primary production processes, and fine-tuning breeding with the most sophisticated means will lead to the redesign and further optimisation of plant and animal production systems that are resilient, productive and environmentally friendly.
- Government policies that promote unsustainable development such as input subsidies for marginal or less-endowed lands, stimulation of bio-fuels and the elimination of sound restructuring for reasons of self-interest should be eliminated.
- Regional policies and responsibilities can be stimulated by the decentralisation of policy making. Optimisation on the regional level enables the appropriate use of land, water and external inputs and may further strengthen the appropriate stimulation of particularly powerful and characteristic supply chains such as in the vegetable sector etc.
- Spatial and environmental planning can be strengthened in a way that metropolitan agriculture is stimulated and not hindered by outdated and obsolete convictions of romantic ways of producing and multi-functionality.
- Non-state actors have a crucial role to play in the further development of sustainable agriculture. They must take up this responsibility.

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Fair Trade and Food Security

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EXECUTIVE SUMMARY: THE NEXUS BETWEEN FOOD SECURITY AND FAIR TRADE

We live in an interdependent world. The agriculture sector in general and the debate on fair trade in particular illustrate that point well. This inter-dependency often creates, at the same time, both problems and the accompanying solutions, as this article shall demonstrate.

This article explains how the Western-based concept of fair trade may support sustainable production and consumption chains, which connect both the demand and supply-side of agricultural commodity trade. The nexus between a particular form of sustainable production and consumption in the agricultural sector and global food security is also highlighted.

Pitfalls were encountered in dealing with this topic. For example, one of the main objectives of the fair trade movement is to secure higher income for small producers in developing countries by convincing consumers in the West to pay higher, fairer prices for items they buy from supermarket shelves. In order to meet this objective and maintain consumer trust, a rigid system of certified standards has been put in place, which in fact reduces the yields a farmer can expect. The Thailand case study presented in this article demonstrates that the system fails at times to guarantee higher income from increased sales prices in Western retail markets. Why these issues occur and how the European Union can help to remedy the negative impacts and help fair trade live up to its full potential in poverty alleviation will be discussed.

This article thus further deals with the question of whether and how fair trade products may revolutionise the way we consume foodstuff. In the context of this question, explanations on what fair trade is, how it works and what benefits it brings to society are offered, with supporting results of a study carried out by the authors. The study was commissioned by the Thailand Research Fund, one of the major funding bodies of higher education research in Thailand. The study highlights the specific barriers to fair trade and other factors that may

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not work favourably in a fair trade context. The article concludes with a discussion on how EU policies on fair trade should be modified in order to provide more support for fair trade.

WHY DO WE NEED FAIR TRADE?

Major Challenges in Global Agriculture Sector

The global agriculture sector is confronted with a paradigm change. In the past, particularly during the so-called “Green Revolution”, which began in the 1960s and lasted until the 1980s, the main emphasis was on producing significantly higher quantities of agricultural commodities in order to feed the fast-increasing global population, and elevate the poor out of poverty. The Green Revolution was partially successful in that respect, but in the last decades, we learnt that increasing agricultural production comes at a price. For example, unsustainable agriculture causes soil and water pollution, soil erosion, and major health hazards to farmers and consumers from the use of chemicals, such as fertilisers, pesticides, herbicides and fungicides, to name just a few. Moreover, the use of genetically modified organisms (GMO), much hailed initially, comes with some significant risks for natural habitats and human health that are not fully understood. We have to acknowledge that the current agricultural practices accounts for 10-12 per cent of the annual global greenhouse gas emissions.³ There are further challenges faced by agriculture today. This kind of conventional system of agricultural commodities trade has its particularities, which often do not work to the advantage of smallholding farmers in developing countries. A major issue concerns the way agricultural commodities are traded. On both bilateral and multilateral levels, one may notice a fast-growing grid of overlapping free trade agreements, which seek to reduce trade barriers and enhance market access. The system ranges from bilateral agreements between two countries to regional or global agreements like the EU or the World Trade Organization (WTO). Free trade is often described by economists as a way to generate wealth and reduce poverty. Unfortunately, the current system of trade agreements demonstrates that it fails to contribute to the attainment of the universal goals of *free* trade. Viable and tangible solutions are explored to address these challenges and *fair* trade may contribute to the solutions.

Global Food Prices and Income of Farmers in the Developing World

This section examines one of the aforementioned major issues of conventional high-yield agricultural practices. The main issue in terms of social development is that the actual agricultural producers in developing countries often receive just a tiny percentage of the final sales price.

Coffee, one of the major export commodities and one of the most successfully fair trade-certified products, is a good example. The farmers receive an income of far less than 10 per

³ Landwirtschaft 2009: Der Kritische Agrarbericht – Hintergründe und Positionen zur Agrardebatte – Schwerpunkt Landwirtschaft im Klimawandel, 2009, p. 9.

cent of the price paid by the retailer — the point of purchase of end consumers. The lion's share of revenue goes to middlemen distributors, exporters at supply-side market, importers at demand market, and processors (e.g., coffee roasters) etc. Between the harvest of commodities and consumption, there is a huge gap in distribution time and distance to be bridged and as indicated, many actors are involved. The prices are determined at marketplaces in the West far away from the beginning of the supply chain: that is, farmers in developing countries. The livelihood of producers is of least concern to market participants who negotiate the price. Prices are very volatile and often offered to producers at below the subsistence level.

Natural hazards and speculative bubbles cause prices to skyrocket but small farmers do not actually benefit from the price hikes. In recent years, dramatic price hikes were experienced in 2007 and 2008 when global food prices rose by 57 per cent between March 2007 and March 2008.⁴ For example, the price index of wheat increased by 135 per cent and that of rice, the most important staple food in Asia, spiked as high as 98 per cent. More recently in 2012, raw material and food prices have risen by 35 per cent.

In an interview with the weekly newspaper *Die Zeit*, Hubert Weber⁵, who is in charge of the European coffee business of *Kraft Foods*, blamed the price hike on the massive inflows of speculative investment capital into the food market. Investments in properties, shares and bonds appeared to be less attractive during the current economic crisis and new investment opportunities were sought and partially found in investments in the food market. Speculators expecting a fast and high return created a new dynamic by buying large quantities of foodstuff and then reducing the supply in the market. Unfortunately, farmers in developing countries do not benefit from the price frenzy and struggle even in times of high global commodity prices to eke out a decent living.

The major issue remains that the lion's share of the sales prices goes into the pockets of various middlemen, exporters in supply-side markets and consumption importers, while only a tiny share of the retail price ends up in the hands of the actual producers. In fact, the prices for important staples are so low that various Thai governments in the recent decade have run various price guarantee schemes for Asia's main staple rice and other commodities, such as cassava. For the 2012/2013 harvest season, the Thai government recently approved in March 2013 a 105 billion-baht (more than 2.5 billion euros) scheme to purchase up to seven million tons of rice from Thai farmers.⁶ Instead of selling in the free market, farmers sell their rice to the government, which stores the harvest in the government's facilities, thereby reducing global supply in anticipation of future higher sales prices in the global commodity markets. This may shield Thai rice farmers from current low global prices, which do not even cover production costs. This is however not sustainable in the long run. Only a fair price formation system can offer sustainable long-term solutions and fair trade attempts to accomplish exactly

⁴ Landwirtschaft 2009: Der Kritische Agrarbericht – Hintergrund und Positionen zur Agrardebate – Schwerpunkt Landwirtschaft im Klimawandel, 2009, p. 79.

⁵ See <http://www.zeit.de/wirtschaft/2012-04/weber-kraft-foods>

⁶ See <http://www.bangkokpost.com/news/local/343248/b105-bln-approved-for-rice-pledging>

that by reducing the actors in the supply chain and bringing producers and consumers closer together.

Since 2001, as mentioned earlier, various Thai governments have implemented a variety of price guarantee programmes, demonstrating that the problem of low global commodity prices is not simply a temporary issue for the country, which has been the largest rice exporter in recent years. It is important to highlight that small rice farmers face the problem of asymmetric knowledge distribution as shown in the Thailand case study. In 2008, rice prices reached a record high globally of up to 20 baht per kilogramme, but due to their lack of knowledge about global rice prices and financial problems, such as debt burden, farmers sold their harvest in the period of December 2007 to January 2008 at between 7 baht and 8 baht to middlemen, who have an advantage over farmers. Thus, not surprisingly, only middlemen, rice-mill owners and exporters benefited from the price fluctuations. Even worse, farmers are forced to sell their entire yield immediately after the harvest season in order to raise money and take up loans to buy fertilisers and other necessities for the next plantation. They are obliged to settle the loans and interest rates immediately after the harvest season. Moreover, most smallholder farms lack adequate storage facilities for post-harvest storage, which would otherwise allow farmers to hold the stock until future price rises when they could sell at a profit. There are also many cases whereby farmers cannot even keep an adequate amount of rice for their own family consumption and have to buy rice in the later part of the year when prices are the highest. This happened in 2008 as farmers were left with no rice in stock after selling their entire rice harvest at low prices. The farmers later had to buy rice from retailers for their domestic consumption at up to 40 baht per kilogramme.⁷ Under such conditions of being in debt, non-transparent pricing and asymmetric bargaining power, it is very difficult for small farmers to survive. The microcredit schemes and price purchase schemes launched by the Thai government have not solved the problems. However, ethical consumption, such as fair trade concepts, may fill the void, because the concept aims to establish more transparent markets, empower small farmers and guarantee them a certain level of income.

Another issue, where fair trade may contribute to a solution, concerns the quality. Franz Fischler, former EU Commissioner for Agriculture, Rural Development and Fishery, describes the paradigm change in the following words: “[T]he market wants variety and quality, it demands information about the used production methods and ways of processing, it wants freedom of constraints and exact information about used additives during processing”.⁸ With rigid systems of standards and controls in place, fair trade-certifying bodies want to ensure the mentioned points among others are adhered to. Markets make these demands because customers have an increased awareness about these issues and they are willing to pay higher prices for guaranteed better quality. Fair trade can thus deliver better living conditions for producers and better product quality for consumers in the West.

⁷ Tirannuti, V., Hassler, J., “Tackling Food Crisis in South East Asia: a Call for Actions – A Regional Perspective”, ActionAid-Report 2009, p. 10.

⁸ Gottwald, F.T., Fischler, F., Ernährung sichern – Weltweit: ökosoziale Gestaltungsperspektiven (Bericht an die Global Marshall Plan Initiative), Hamburg 2007, p. 29.

WHAT IS FAIR TRADE?

Definition of Fair Trade

Fair trade is a form of ethical consumption,⁹ which seeks to integrate social and environmental aspects into the system of commodity trade. This is achieved by enforcing standards of food production and trade as certified by globally recognised transnational non-state actors. The standards that emerged during the Green Revolution after World War II in response to the widespread use of various chemicals as well as high-yield genetically modified crops are aimed at changing conventional modes of agricultural practices.

Fair trade as a concept was developed by Christian charities in the United Kingdom shortly after World War II. It was developed as part of various concepts which aim to transform certain aspects of agriculture so as to improve the income situation of poor farmers in the Third World countries. These organisations cut out the middlemen and sell the farmers' commodities in their own shops at higher retail prices, guaranteeing higher prices and profits for farmers from whom products were sourced.

In short, fair trade is part of what some authors termed as eco-social agriculture, which includes good agricultural practices, organic food production, fair trade and other concepts. A common characteristic of these concepts is to reduce the socio-economic and environmental costs connected to agricultural intensification by high-yield agricultural methods, which have dominated the sector for a long time. The Green Revolution has introduced modern technologies in the agriculture sector of many developing countries and has in many cases led to exponential rise in yields. However, this came at a heavy price and eco-social concepts of agricultural practice aim to remedy the various negative aspects.

Fair trade is still a niche but rapidly growing market. The EU stated in May 2009 that the fair trade market is worth 1.5 billion Euros (almost USD2 billion) in trade transactions.¹⁰ Two peer-reviewed academic journal articles published in 2012 quote the value of yearly sold fair trade products at USD 4.8 billion¹¹ and USD6 billion¹² for the time before the year 2011. If the numbers hold true, an exceptionally fast growth will be expected in coming years.¹³ In the UK, for example, the turnover of fair trade products soared from approximately GBP17 million to GBP800 million during the period 1998 to 2009.¹⁴

⁹ Zander, K. et. al., "Promising ethical arguments for product differentiation in the organic food sector. A mixed methods research approach", in *Appetite* 62 (2013), p. 133.

¹⁰ See http://trade.ec.europa.eu/doclib/docs/2009/may/tradoc_143089.pdf, p. 3.

¹¹ Elder, S. D. et al., "Effects of Fair Trade Certification on Social Capital: The Case of Rwandan Coffee Producers", *World Development* Vol. 40, No. 11, p. 2355

¹² Reynolds, L. T., "Fair Trade: Social regulation in global food markets", *Journal of Rural Studies* 28 (2012), p. 276.

¹³ Reynolds, L. T., "Fair Trade: Social regulation in global food markets", *Journal of Rural Studies* 28 (2012), p. 276.

¹⁴ Zander, K. et. al., "Promising ethical arguments for product differentiation in the organic food sector. A mixed methods research approach", in *Appetite* 62 (2013), p. 133.

The Structure of the Fair Trade Concept

Harriet Lamb, one of the foremost fair trade campaigners in the UK, described fair trade in one of her books as “perfectly ordinary people in their everyday lives reaching for the quite extraordinary ambition of transforming trade and beginning, just beginning, to win”.¹⁵ The quote implies that fair trade is about changing people’s life in both developed and developing countries. Consumers in developed countries learn more about the underpinning of modern globalised production chain which contains prevailing injustice that affect small producers in developed countries, who struggle to sustain their livelihoods and living conditions despite the hard toil in farms. Consumers in the West are asked to make conscious decisions in accepting higher prices for fair trade products, compared to conventional products on supermarket shelves, in support of small producer groups. How does that work? Basically, as discussed above, fair trade, on ethical grounds, is an intervention in the usual price-fixing mechanisms on the global commodities markets. It is an institutionalisation process that leads to the existence of transnational non-state actors which control the ethical, social and environmental aspects of economic activity. These transnational organisations, such as the Fairtrade Labelling Organizations International (FLO), regulate who can make use of the globally recognised fair trade label for marketing of products. The organisation meticulously scrutinises the criteria of circumstances under which the use of the fair trade label is allowed. Products without the fair trade label will be very difficult to market as fairly trade products.

The concept of fair trade certification embraces various aspects of social life, such as:

- economic aspect (e.g., guarantee of a good minimum price to cover production cost however low prices in international market fall; a 10 per cent premium for investments in local communities; and an availability of prepayment for farmers)
- environmental aspect (e.g., protection of natural resources, water, soil, biodiversity or climate as well as conservation and enhancement of landscapes)
- social and political aspects (e.g., creating inclusive and participatory bodies and processes of decision-making within certified producers’ groups; safe and equitable working conditions, ban on child labour and exploitation of foreign workers, employment of disabled people, and reintegration of drug addicts or delinquents)
- educational aspect (e.g., training for farmers in sustainable farming practices)
- cultural aspect (e.g., keeping local wisdom and preservation of natural landscapes and habitats which are not affected by large-scale agribusiness practices)
- health aspect (e.g., mitigation of health hazards by reducing usage of chemicals, such as non-natural fertilisers, herbicides, insecticides, fungicides, among others)
- ethical aspect (e.g., more transparent trading practices and shorter supply chains, thus creating direct links between consumers and producers and also raising consumer awareness of the process of and value put into food production; and preserving traditional livelihoods).

¹⁵ Lamb, H., *Fighting The Banana Wars and other Fairtrade Battles*, Rider 2009 , p. 1.

More consumers in the West have heard about the fair trade system and understand the fair trade concept. It is basically still a niche market, which exists in parallel to the food chain markets. It aims at offering producers higher prices. Fair trade has started with food commodities, but has moved on to include other product groups, such as handicrafts and textiles.

The System of Fair Trade Certification

The formal system of fair trade certification — the actual meaning if one speaks about fair trade — was created in 1988 when a Dutch organisation called Solidaridad attempted to help coffee farmers severely affected by price volatility in developing countries. Two years later, the European Fair Trade Association (EFTA) was established¹⁶, and in 1997, the Fairtrade Labelling Organization International (FLO) started to coordinate fair trade for the entire Europe, Canada, Japan and the US, and began fair trade certification. Today, the core fair trade organisations network in Europe consists of four main organisations covering both agricultural and handicraft products. These organisations are:

- Fairtrade Labelling Organization (FLO) — the certifier of fair trade agricultural commodities;
- World Fair Trade Organization (WFTO, formerly the International Fair Trade Association (IFAT)) — the certifier of mainly handicraft products;
- Network of European World Shops (NEWS) — coordinator of over 2,500 World Shops in 13 European countries; and
- European Fair Trade Association (EFTA) — coordinator of 11 main fair trade importers in nine European countries.

FLO is the most widely known out of the four fair trade organisations due to its role as a certification body for agricultural products, as sales of fair trade agricultural commodities far exceed those of handicrafts. Today, FLO's "fair trade logo" is the most recognisable trademark to European consumers on supermarket shelves. Most fair trade initiatives aim at empowering farmers and strengthening participatory decisions-making. For example, FLO certifies both producers' groups and traders. The organisation requires farmers to set up cooperatives with specifically prescribed structures, which ensure joint participatory and inclusive decision-making. Such agricultural cooperatives encourage the application of local wisdom and knowledge, which are being substituted in many places by wide application of modern industrial agricultural practices. Fair trade advocates environmental education and the preservation and passing down of traditional knowledge.

Fair trade certifiers, like the FLO, have a long list of criteria, which will be regularly checked for every new certification period, during which certain environmental standards have to be applied, for example, enforced usage reduction of chemical fertilisers and pesticides/insecticides. As a result, water and soil pollution has been reduced and health of farmers is improved. The various chemicals used in modern-day agriculture are known to pose severe

¹⁶ See <http://european-fair-trade-association.org/efta/>

health risks and are sold to farmers in developing countries. In fact, agricultural chemicals are already banned in most of the more industrialised countries.

It is important to note that the Fairtrade label is not a “Type I” environmental label. Type I labels — the so-called eco-labels such as Blue Angel and Green Seal — refer to the environmental quality of the product compared to the rest of the products and are meant to encourage consumer to make switches towards more friendly consumption habits. These are voluntary third-party certification programmes, but nonetheless, the certifying bodies stringently enforce the standards on farmers who wish to take part in fair trade schemes. Unfortunately, the system contains several serious shortcomings as highlighted in a 2009 field study conducted by the authors of this article.

FINDINGS OF CASE STUDY ON FAIR TRADE SITUATION IN THAILAND

Rice is the main staple crop in Thailand and is grown on 10.2 million hectares of land, accounting for more than half of the total farmland in the country. Thailand is the world’s largest rice exporter in the recent decade with an annual yield of 30 million tons of rice-paddy in various species¹⁷.

The backbone of Thai agriculture has always been and still is the smallholding farms. The average area of a farmland is 3.60 hectare per family. In 1997, out of a total population of 22.8 million, there were 5.79 million households living on agriculture.¹⁸

The following section discusses the issues of fair trade in Thailand.

Insufficient Monitoring System over Fair Trade Rules Enforcement

Several Fairtrade-certified cooperatives which were drawn to the system because of the price incentive had difficulty convincing their members to continue selling their crops to the fair trade system during the food crisis. Their lack of commitment to fair trade stems from several problems they faced with the system. From the interviews conducted from May to September 2009 with 10 Fairtrade-certified agricultural cooperatives and three handicraft organisations situated in the north, north-east and the central region of Thailand, it was found that many farmer groups claimed that lack of support from fair trade organisations, mainly FLO, had left them to fend for themselves.

Pre-financing payment to producers, and predetermined purchase orders, which are requirements in the fair trade system, are often not complied with by fair trade importers, since these translate to additional costs incurred on the importers. Unable to forecast the sales orders, the cooperatives are unable to plan their production in advance and to allocate orders to their members. Many cooperatives are unable to include all of their members in the fair

¹⁷ Panyakul, V., “Climate Change Adaptation Through Agro-Social Enterprise: Green-Net’s Experiences in Thailand”, *Asian Journal of Environment and Disaster Management*, Vol. 4, Nr. 4.(2013), p. 3.

¹⁸ Panyakul, V., “Climate Change Adaptation Through Agro-Social Enterprise: Green-Net’s Experiences in Thailand”, *Asian Journal of Environment and Disaster Management*, Vol. 4, Nr. 4.(2013), p. 3.

trade membership due to high certification fees, the amount of which depends also on the number of cooperative members to be included for fair trade inspection. As for the premium price – an additional amount to be paid to farmer groups on top of the minimum fair trade guaranteed prices – many farmers expressed their disappointment that they had not received the amount from local fair trade buyers as set out in the fair trade principles and standards. Neither does the FLO have in place a system that monitors the actual payment of the premium to farmer groups. The lack of secured orders from fair trade buyers abroad, orders in small quantities at sporadic intervals, as well as the non-fulfilment of fair trade benefits to the producers had spawned disillusionment with the fair trade system among cooperatives, who are therefore reluctant to commit to it.

Lack of Support on Accessing Fair Trade Markets

The difficulty in accessing the fair trade market is also another great concern expressed by several Fairtrade-certified cooperatives in Thailand. Contrary to what has been commonly thought, farmers who became Fairtrade-certified received no assistance from the fair trade certifying body (e.g., FLO) to help them access information on fair trade markets abroad or to help them establish commercial links with potential fair trade buyers. Many farmer groups explained that they had to follow the conventional marketing channels in order to access this alternative market by attending trade fairs abroad or by trying to contact fair trade buyer organisations themselves to secure orders for their fair trade produce.

Communication Problems

The language barrier has become a major communication problem between FLO and Thai farmers. The documents on fair trade rules and regulations are all written in English and translated into several European languages, namely French, German, Portuguese and Spanish. While this variety of language choices certainly helps enhance the understanding of fair trade rules by farmers in former European colonies, such as those in Windward Islands, Africa, Latin America, and South Asia, where the aforementioned European languages are spoken as official languages, Thai farmers do not enjoy such privileges as their foreign language skills are normally at a dissatisfactory level, considering the poor literacy level of many small farmers in Thailand – the very groups for which the fair trade movement was created to help alleviate poverty. Not only is it difficult for the majority of Thai fair trade farmers to understand FLO documents in English, they also have to translate all of their cooperatives' documents into English for inspection by FLO. Applications must also be completed in English. All communications with FLO must also be done via the Internet. This is problematic to many small cooperatives in Thailand, as the majority of the members are not adequately well-versed in English to be able to communicate with FLO in a foreign language, and especially when the content of the communication is highly technical. Nor are many farmers computer-literate. In addition, the prohibition of telephone calls to FLO means that making a follow-up on the FLO's application approval progress is time-consuming.

This point is crucial particularly for some farmer groups, such as the Doi Chaang coffee producers, who were able to export large quantity of coffee to Canada and other Western

countries previously, but discovered that all of their exports have been abruptly blocked since their buyers were obliged to respond to Western consumers' demand for the FLO logo on their coffee. A delay in the FLO's response to their fair trade certification application meant that Doi Chaang producers were unable to export their coffee for nearly three years, resulting in major losses in revenues for the farmers, who in turn took risks to cultivate illicit crops. These factors have become major communication problems to many Thai farmer groups wishing to participate in the fair trade market.

High Certification Fees

FLO has various fee structures for different organizations which would like to be Fairtrade-certified. Small producer groups are divided into three subcategories, namely the first, second and third grades. The first grade category refers to farmer organisations whose members are not structurally dependent on permanent hired labour, managing their farm mainly on their own with their family workforce and “which is able to contribute to the social and economic development of its members and its communities and is democratically controlled by its direct members. The majority of members of the organisation are small farmers”. “A second or third grade organisation is a small farmer organisation formed by small farmer organisations (members) which are legally affiliated to the 2nd or 3rd grade organisation.”¹⁹ This means for FLO-certified groups that a large cooperative consisting of two or more smaller cooperatives as members would be required to pay additional fees on top of the fees paid by its two member cooperatives. In addition, if the cooperative is able to export its produce on its own without any reliance on other exporters, as is the ultimate wish of the fair trade movement – to help small farmers become independent – it will be required to pay an additional fee, as applicable, to traders of fair trade. This repetitive fee structure implies higher costs incurred to farmer groups, especially as they become increasingly independent and self-reliant in trade transactions. Such a practice is considered to dilute the purpose of fair trade, which in essence is to strengthen farming communities to enable them to become independent and in control of their own trade.

Rigid Rules?

FLO e.V. — an arm of the Fairtrade Labelling Organization — is responsible for creating fair trade standards and coordinating with farmers from developing countries interested in certification. Although the rules created by FLO e.V. concern the livelihoods of small farmers in the developing world, most Thai farmers commented that they were not consulted when the rules were set and the end results were sometimes inapplicable to the situation of Thai farmers. A large non-organic agricultural cooperative in Ayutthaya province, which discontinued its fair trade membership, commented that to become Fairtrade-certified, the cooperative must have a substantial percentage of small farmers as its members. However, FLO's definition of small farmers, according to the mentioned cooperative, qualifies only farmers that use their own labour rather than large machinery in farming. To the cooperative manager, this

¹⁹ See <http://www.flo-cert.net/flo-cert/65.html?&L=0%29>

definition was not realistic, considering that the practice of rice farming in central Thailand has mostly transformed from subsistence agriculture to market-oriented mass production; hence this explains the disappearance of labour-intensive rice production in central Thailand and the heavy use of machinery for cultivation. Even small rice farmers in Ayutthaya now rely on rented tractors and hired labour to harvest their crops. Unfortunately, this definition does not fit the FLO's "romantic" definition of small farmers.

Fair Trade and Child Labour

Another concern over fair trade rules voiced by some Fairtrade-certified farmer groups is the ban on the use of child labour. According to fair trade standards, children are not allowed to work on farms or in the production process. However, many farmers disagreed, citing that making children work in farms is a way to pass down traditional knowledge on farming practices to the next generation.

In the case of handicraft production, many hill tribe villagers normally require their children to help them with the weaving and sewing of crafts as they consider this the way to impart their cultural tribal heritage and skills to their children. However, fair trade organisations regard the use of child labour as a banned practice according to fair trade standards. An organic agriculture cooperative in Chiang Mai province, however, held a differing view, citing that child labour does not pose a problem to them since children from farming families today are no longer willing to work on the farm and help out their parents. As development spreads to rural communities, children and the younger generation yearn for urban lifestyles and are no longer interested in continuing their parents' farming businesses.

Another development organisation supported by one of the Thai Royal family's foundations, which is not yet Fairtrade-certified but has started to explore this possibility, views the strict fair trade rules on child labour ban as too restrictive. The organisation hires local hill tribe children to work on their tourism projects, such as dressing up in their local tribal costumes and performing songs and dances for tourists who wish to see and experience hill tribe culture. The organisation views this practice as offering the children exposure to different experiences beyond their classrooms, and more opportunities to learn social skills, to appreciate their fast-disappearing tribal heritage, and to spend time productively while earning some income which can be saved for their future education. Prohibiting the children to work may drive them away from their hometowns in search of employment in large cities such as Bangkok, rendering them vulnerable to exploitation.

Citing the above argument does not imply that child labour should be endorsed. However, fair trade rule makers may need to understand the special geographical situation and take into account the conditions of farmers in different countries. Close consultation with farmer groups to understand their circumstances may lead to better relationships between fair trade organisations and the farmer groups whom they are trying to help.

THE EU AND FAIR TRADE

The EU Position on Fair Trade and Existing support

The EU has recognised the importance of fair trade, to which it provides technical and financial support. The EU policy guidance documents on fair trade highlight the necessity of raising awareness among consumers of the risk of possible abusive practices by companies that enter the fair trade market without complying with the certification criteria. The EU views fair trade as an essentially voluntary, private sector phenomenon, and asserts that excessive heavy regulation could prove to be more damaging than beneficial to producers — a view which may have a grain of truth considering the aforementioned negative experiences of certified Thai farmers. However, it should not be forgotten that possible abuse as acknowledged by the EU may destroy the fragile trust of modern-day consumers.

Financial support for fair trade and other sustainable trade practices has been provided by non-governmental organisations (NGOs) through co-financing by the European Union. For example, between 2007 and 2008, 19.466 million euros²⁰ were allocated to various NGOs. The implementations are initiated mainly to create awareness within the EU. The financed initiatives include Multiannual Country Strategy Papers and Multiannual Indicative Programme, covering agricultural and rural sectors, including activities that contribute to facilitating fair trade and helping farmers to sell in the fair trade niche market. For the same budget period in 2008 and 2009, additional credits of one million euros were made available. These credits were used to top up the financing instruments for sustainable development through supporting the idea of fair trade. Other initiatives supported by EU funding include impact assessments, assessment of market transparency efforts and assessment of difficulty in implementation of schemes and obtaining certification.

CONCLUSIONS AND RECOMMENDATIONS FOR EU'S FUTURE SUPPORT OF FAIR TRADE BASED ON THE FINDINGS IN THE THAILAND CASE STUDY

Fair trade is fast growing, but nonetheless still a niche market. It is probably difficult to predict when fair trade can become part of the mainstream trading practices. Signs are however positive given the growing demand for ethically produced commodities on markets in Western countries as well as many developing countries. Fair trade also embraces innovation and addresses various global challenges, such as food security, poverty alleviation, mitigation of environmental degradation and resource depletion, and improvement to global health conditions.

²⁰ Communication from the Commission to the Council, the European Parliament and the European Economic and Social Committee - Contributing to Sustainable Development: the role of Fair Trade and non-governmental trade-related sustainability assurance schemes /* COM/2009/0215 final */ , <http://eurlex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0215:FIN:EN:HTML>

Despite the potential of the fair trade system, many farmers have not been able to enjoy the benefits due to various shortcomings of the system. The EU should play a major role to remedy the system lapses. For example, fair trade organisations should consider setting up local agencies that are dedicated to assisting farmer groups in obtaining fair trade certification. To be included as one of its mandates, the agency should attempt to unify the voices of fair trade producers in various developing countries in the context of the growing fair trade movement worldwide. This mandate will empower the agencies to engage more productively with fair trade organisations in Europe, offer inputs in the formulation of new fair trade standards, represent the interests of fair trade farmers in Southeast Asia in global fair trade fora, and jointly promote fair trade products from the Southeast Asia region to the Western markets.

As discussed, a key problem is maintaining the fragile trust of consumers in fair trade certifying bodies on the rigour of the certification process. There is a lack of transparency over how the standards are achieved by farmers during the certification process. As rural populations in the Third World countries have limited access to education, farmers face difficulty in handling and understanding convoluted heaps of written guidance documents and regulations, which are highly technical and sometimes incomprehensible even for the experts. EU institutions should discuss how a structural framework of advisory bodies can be set up at low costs in order to provide farmers in the Third World countries with technical help and expertise in their application submissions for fair trade certification.

Another major issue is that some fair trade importers are of the view that fair trade commodities are at a disadvantage when entering the EU market compared to conventional agricultural products, and thus this stigma gives little incentives for conventional importers to enter the fair trade market. In addition, high taxation in the EU translates to smaller profit margins for conventional importers. The main challenge faced by the EU will be the advancement of debates on how market access rules can be modified in order to better support fair trade commodities becoming a mainstream market segment, which will significantly help raise the social and environmental standards of commodities consumed by European consumers. Fair trade has already begun and will continue to transform the way consumers in the West consume agricultural products in the future, and this will need further legislative support in the context.

As discussed, there are a host of problems faced by small farm producers — the FLO's complicated rules and regulations for certification and maintenance of membership; high inspection and membership fees; the lack of support for FLO-certified farmer groups, including the lack of inspection mechanisms to monitor the actual payment of the premium prices from fair trade importers/buyers to producers; the lack of marketing initiatives to enhance the sales of non-traditional fair trade products such as rice; and the lack of facilities and network to link fair trade producers to potential buyers. However, with its great potential, the fair trade system should not be ignored. Governments in developing countries should look into tapping into this alternative market, and try to understand the fair trade trends and its regulations, rather than simply consider the system as yet another form of trade barriers introduced by advanced countries as in the case of Thai government officials. Here the EU has a major role to play by extending a set of its already existing policies and instruments.

Food Security and Sustainable Agriculture in Asia: Exploring the Implications of the Cooperation between the EU and Asia via Technology Transfer

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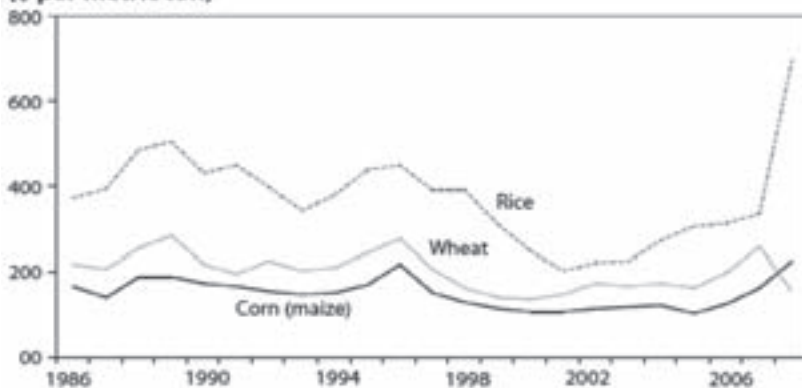
FOOD SECURITY ISSUES AND THE DEBATE: A MACRO LENS VIEW

The problems of food perils and global food insecurity caused by upwards-spiralling world food prices have tipped the world into an agricultural catastrophe, which has pushed millions of people into poverty and made those who spend a large proportion of their income on food vulnerable. “This is a silent Tsunami”, Josette Sheeran of the World Food Programme (*The Economist*, April 19, 2008) states. As the Millennium Development Goals (MDGs) approach their deadline in 2015 and the world food system remains vulnerable, the introduction of sound policies to balance nutritional sustainability is crucial in order to translate promises and commitments into feasible actions without any feet of clay. These actions are important for economic development and political stability. The volatility and vulnerability of the “poor” in the global South brings into limelight the role of national and international policy coordination for addressing such issues. The impact the recent development of world food prices has had on developed and developing countries differs. In emerging markets the price escalation has triggered inflation and translated into social costs such as riots, political upheavals or land grab. For example, in 2010 the developing world faced 20% higher food prices than in 2009 as compared to the US, which experienced a 2% rise in retail food prices (Pooley and Revzin 2011). Global unrest and upheavals over food and feed prices have called for attention on the debate surrounding the food-feed-fuel trinity. Prices of rice, wheat, maize, corn, and edible oils remain well above the level that is sustainable for households whose Consumer Price Index (CPI) basket has a larger weight of food and a larger share of food and fuel in household expenditures. This fact especially affects households in Asia and Africa.

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In order to formulate appropriate policy questions and evaluate policy responses, it is worthwhile to look at the causes underlying the skyrocketing food prices since 2007/08 that have had substantial impact on world inflation (see Figure 1 below).² The prime drivers inducing the surge in food prices are: climate change causing global warming, biofuels mandates, food commodity speculation and hoarding, insufficient investment in sustainable small-holder agriculture, lack of adequate grain reserve, burgeoning demand from emerging economies, bad harvests, escalating input costs triggered by the oil price hike, and export restrictions. Emerging economies, especially China and India, are mostly affected by increasing food prices despite being unaffected by credit crunches. The surge in world demand spurred by a growing world population, higher incomes, diet changes, and asymmetric global expansion has fuelled the price hike to such an extent that, due to the inadequacy in food supply, the impending crisis worsens for people with little income, hunger and undernourishment in Asia, Latin America, and Africa. At the same time, growth in incomes has led to increasing imports and restrictions or export bans, and taxes or ceilings/quotas from net exporters, which restricts the availability of grain supplies on international markets, tightens the supply conditions and, consequently, triggers further rises in food prices. Also, net importers of food face tariffs and suffer from price distortions. However, the increase in the price of rice, wheat, or edible oils was led by crop-specific causes (Figure 1, Timmer 2008).

Figure 1: Short-Run Movements in Real Prices of World Grains
(\$ per metric ton)



Note: 2008 represents data for the first 5 months. The world prices of corn (maize), rice, and wheat are based on US No. 2 Yellow, free on board Gulf of Mexico; Thailand white milled 5% broken, free on board Bangkok; and No. 1 Hard Red Winter, ordinary protein, free on board Gulf of Mexico, respectively. Prices were deflated by the US consumer price index, with 2007 prices as the base.

Source: International Monetary Fund website (imf.org/external/np/res/commod/index.asp), downloaded 15 August 2008.

Source: Timmer 2008

As Timmer (2008) points out, higher energy prices increase input costs and, therefore, make a decrease in food prices unlikely. At the same time, rising oil prices coupled with a growing

² Detailed factors underlying the food inflation is not a subject matter of this paper and, hence, not analyzed in detail here.

demand for fertilizers have caused an increase in the price of fertilizers. However, the supply of fertilizers has not picked up due to an increase of oil prices. Instead, fertilizer shortage is another factor underlying the proximate cause of a dwindling supply for the latest rise in food prices. Similarly, the increasing prices of pesticides and fuel are factors behind soaring food prices. On top of the latter, the speculative bubble in commodity markets has, to some extent, also had an impact on food prices.

Apart from these conventional supply and demand factors, the underlying causes feeding into them are the concern for environmental factors, especially greenhouse gas emissions, global warming and environmental degradation. Subsidizing and enforcing the usage of bio-fuels has led to a widespread use of these resources as motor fuels. In fact, the diversion of food crops to fuels and the shifting of acreage from food to non-food usage have contributed to food perils (Singh et al. 2011). The mandates for renewable fuel in both the EU and in the US have caused land-diversion from food crops. They have increased the share of agricultural crops in the biofuel sector and altered the agriculture-energy price relationship in the same direction (Hertel and Beckman, 2009; Hertel, Tyner, and Birur 2008). Using a multimarket model, Sexton et al. (2009a&b) show the adverse effects of first- and second-generation biofuel on food security and environmental degradation via land-use if no appropriate technologies are developed and researched. They demonstrate that the production of biofuel led to a rise in price of soy by 10% and caused the price of corn to inflate by 13%. In general, the production resulted in food-price inflations averaging 25% in 2007 and 2008. Further, Das (2009) shows that state-of-the-art third-generation biofuel can ameliorate the food-fuel trade-off for the benefit of consumers. Table 1 summarizes these facts.

Table 1: External Drivers of Food Prices

	Supply	Demand
Low variance	Seed technology	Population growth
	Irrigation	Income growth
	Total harvested area	Dietary changes and tastes
	Climate change	Meat and livestock economy
	Knowledge and management skills	
High variance	Weather	Exchange rates
	Diseases	Speculation
	Crop-specific harvested area	Biofuels (but predictable from mandates; not predictable from oil prices)
	Fuel costs	Panic or hoarding
	Fertilizer costs	Government trade and inventory policies

Source: Timmer (2008)

The grave food situation has, since 2008, caused havoc for global citizens in both rich and poor nations alike. The impact has, however, been more severe on poor and developing economies, thus reversing the poverty-reduction effect under the first MDG. As the world population has increased to 6 billion in 2000 and is projected to reach 9 billion in 2050, meeting the MDG of halving poverty and malnutrition seems to be a difficult challenge. For Asia, home to two-thirds of the world's population, this is a formidable challenge as price

volatility and instability persist. According to Reardon et al. (p. xi, 2012), “ensuring food security in this region requires urgent actions to improve the productivity and climate resilience of agriculture and to upgrade the food value chains to ensure adequate and affordable food supplies”. For sustainable and inclusive growth and development, the transformation of staple food value chains as well as other measures is necessary. The challenges facing us are the following: Provide food to the most vulnerable and poorest nations, reduce poverty and hunger, ensure quality of life for better human capital by eliminating undernourishment and easing the heavy spectre of food price hikes, limit effects of external price shocks on general inflation, introduce well-targeted safety nets, support frameworks and food for work programs, provide subsidies for the poor, design social measures for inclusive development, and develop capability for effective functioning such as, education or technology for sustainable development. Thus, resolving food security on a sustainable basis requires balancing the problems of food availability, food access, and nutritional adequacy as well as protection of the natural resource base (i.e., land, water and forests).

According to the International Food Policy Research Institute (IFPRI, 2013), about 870 million people are undernourished and more than 2 billion people suffer from severe deficiencies in macronutrients. The rising food prices and resultant food insecurity have pernicious effect on human development via health damage and exacerbating inequality leading to socio-economic disturbances. The MDGs’ target of halving the number of people suffering from hunger and extreme poverty elimination is extremely important for Asia. Here, food security is of central importance because the crisis has slowed down the progress for achieving some of the targets. According to the World Bank (2010), 45 out of 84 countries are on track to achieve the target of halving poverty. Yet, the amount of people expected to be living in poverty in 2015 will only decrease by 27% and merely 25 countries have been able to cut down malnutrition by half. Food security and reducing malnutrition is instrumental for achieving the second goal of universal primary education. Without adequate food, future human capital for economic growth cannot be nurtured. It is important to understand that three MDGs – poverty and hunger eradication, environmental sustainability, and global partnership – are based on the objective of long-term sustainability and, hence, are interrelated. Therefore, the entire issue of agricultural productivity, agricultural biotechnology, and absorptive capability needs to be discussed simultaneously.

The whole debate on food security revolves around several issues such as global warming, land-use changes, biofuel, water use, nutritional requirements, yield per hectare, and agricultural productivity like the Green Revolution etc. (see *The Economist* Feb 26, 2011). Sexton et al. (2009) emphasize the role of technology in the Green Revolution based on “hybridization” and other non-farm inputs for agricultural productivity growth via “gene transfer across plant species” in, for example, soybeans, corn, and cotton. According to Sexton et al. (2009), such technology could feed 9 billion people by 2050, even with energy-crop production in traditional farmland. The EU has also launched a four-year regional programme

to transfer appropriate technology to Asia’s poorest, smallholder farmers who are the backbone of the region’s economies. The programme, ‘Technology Transfer for Food

Security in Asia (TTFSAs)', seeks to improve the food security, nutrition and livelihood of the poorest and most vulnerable people in South and Southeast Asia by increasing productivity through the transfer of appropriate and effective technologies, as well as enhanced access to markets. Encouraging regional cooperation is a priority (Dirk Meganck, EC, 2012 in TTFSAs).

Besides, the OECD (2013) clearly spells out the "twin-track agenda of national and international cooperation" for green growth for long-run sustainable development. However, input-intensive or resource-intensive technologies can be environmentally damaging. Addressing such trade-offs is necessary for averting the adverse human impact on health. This is also linked to the sustainable management of natural resources and the aspect of sustainable growth and development of green growth as environmental risks pose serious development challenges for long-term effects such as poverty reduction, food sufficiency, and unsustainable exploitation of natural resources. One cannot ignore the multi-dimensional nature of the debate and the importance of North-South cooperation in order to cope with the situation and to meet the MDG targets.

As the TTFSAs program of the European Commission proclaims, technology transfer may be a source of "empowerment" for people in Asia. This human side of the EU-Asia cooperation needs to be emphasized. Not surprisingly, focusing on the role of basic education, health undernourishment, food production, and public policy and action, Sen (June 15, 2013) reiterates: "These different influences, which operate together, demand that we do not isolate just one of those factors, and simply concentrate on that. We have to do many different things – together." Therefore, the debate on the prospect of EU-Asia technology dissemination needs to be considered in a wider context. A development framework that incorporates the three-dimensional features of sustainable development – food, nutrition and environmental security – is essential for scaling the policy for global cooperation as envisaged and pledged under the MDGs. As stated by the IFPRI (2013), it is necessary to adopt a "nexus approach in policy planning and implementation", taking the interplay between agriculture, nutrition, health and food-water-energy so as to strike synergies between important segments and build "resilience of global and national food systems".

In order to comprehend the food insecurity conundrum, the following section offers a brief sketch of various factors that have caused the current food mayhem. Subsequently, an overview of the following aspects will be given: challenges of food security, policy responses and potential for international cooperation with regard to sustainable solutions to terminate the curse of hunger, famine, malnutrition, or deprivation in the wake of food insecurity. Subsequently, section two offers a synoptic picture of the extent of the food insecurity problem, challenges, and preventive responses to such disruptive effects. Section three discusses challenges from the Asian experience and the scope of North-South cooperation with special reference to the EU. Section four addresses the prospect for technological dissemination from the angle of capability-development by framing it within an eclectic conceptual framework and extending such a framework beyond the conventional domain of the food availability problem. In section five a conclusion is given.

NATURE OF FOOD INSECURITY, CHALLENGES AND RESPONSES: SEEDS OF SUCCESS OR FEET OF CLAY?

Literature abounds with empirical evidence that supports the food-feed-fuel “trilemma”. Without reproducing previous literature and in order to avoid repetition, the following section lists the central findings of previous literature to offer a succinct view of the systemic nature, to link facets and to seek plausible solutions.

- a) **Economic Growth and Demography:** The surge in the world’s food demand has been spurred by a growing world population, higher incomes, diet changes, and an asymmetric global expansion. In fact, these aspects have fuelled the price hike to such an extent that the impending crisis worsens, particularly for people with low incomes. The growing demand from emerging economies, especially China and India with their rapidly burgeoning middle classes, has culminated in an increasing food-feed demand and a rapid pace of industrialization causing industrial pollution and an increasing demand in biofuel. A shift in the production structure and exports (processed food exports as opposed to previously unprocessed food exports) has led to growing demand in food crops.
- b) **Climate Crisis, Biofuel Mandates and Carbon Emissions:** The conventional supply and demand factors are influenced by environmental factors, especially greenhouse gas emissions, global warming and environmental degradation. Agricultural crops like soybeans, sugar and corn are increasingly used to produce biofuels (Biodiesel and Ethanol). Subsidizing and enforcing the usage of biofuels has led to widespread use of these resources as motor fuels. The possibility of diverting food crops to fuels has also been discussed. In fact, according to Iqbal and Merwe (2009) a moratorium on biofuels would lower corn prices by 20% and wheat prices by 10% in 2009-2010.
- c) **Trade:** Without any solution in mind, the current crisis leads to deprivation, starvation, and famine. Growth in incomes has led to increasing imports and export restrictions or bans, taxes or ceilings/quotas on the net exporter, restricting the availability of grain supplies on international markets, tightening supply conditions and triggering a further increase. Also, net importers of food that are facing tariffs, e.g., Africa, suffer from price distortions. Export controls/bans on rice, e.g., introduced by India, Thailand and Vietnam, as well as import tariffs have turned out to be international transmission mechanisms leading to the current food crisis (Timmer 2008).
- d) **Oil Price Rise and Biofuel Mandate:** The unexpected escalation in oil prices has led to an increasing demand for alternative fuels. Presumably, the demand for biofuel has two originators, namely the climate crisis tackled by the greenhouse gas control and the substitute alternate for oil in times of a price rise. Oil is an input to fertilizer and, hence, it leads to an increase in costs of fertilizer inputs. Such an increase in production costs leads to food price inflation.
- e) **Technological Factors and Productivity:** There has been a decline in yield and productivity as well as a lack of research funds and “Grilichesian breakthrough” (Evenson 2003, Borlaug 2008). The productivity decline results from a lack of rural infrastructure and farmers’ incompetence in laggard countries. Land use for the production

of fuel and food compete with other opportunities for land use such as tropical land conversion, deforestation or agroforestry practices.

- f) **Economic Crisis and Financial Debacle:** As Shiller (2008) mentions, “speculative enthusiasm” led to a collapse in the housing market, which resulted in the bursting of the stock market bubble and thereby contributed to the increase in the oil price to astronomically high levels. This development led to an escalating demand for ethanol as well as agro-fuel (biomass-based) and biodiesel (both extracted from crops and vegetable oil) causing a reduction in the supply of grains for food. This caused a price spiral in the food market and has resulted in hunger in Africa and other desperately poor regions. Thus, the speculative thinking that caused the subprime crisis in the stock and housing market transmitted to the food market. As a result, some emerging economies responded by imposing export controls/bans on food grains so as to meet domestic demand. Besides, speculative hoarding within developing nations has caused withdrawals of supply from local home markets leading to an increase in the price of grains within the national borders.

In brief, the following aspects have contributed to the systemic crisis: biofuel production, demand for bio-energy to curtail fossil fuel and avoid oil-dependence, poor harvest because of drought, lack of research, surging demand (especially from Asia) resulting from improved living standards, higher transport costs and trade barriers. The G8 leaders have recently pledged USD20 billion to help farmers boost their agricultural production, resource management, adaptation and price stabilization in order to curb hunger and fight food shortage.

In the following section the focus will be narrowed down to one set of factors, namely those related to the development of technology and its diffusion “as part of a global deal” (Stern 2009), namely the development of [1] biotechnology and [2] better technology for biofuel controlling for damaging by-products. Amidst the plethora of policy responses (e.g., trade policy, food aid, rationing), the technological solution has gained attention from a cross-disciplinary perspective bridging scientists, policy-makers, and international organizations (e.g., the UN Food and Agriculture Organization [henceforth FAO] 2008; the World Bank 2008a&b; Stern 2009). In fact, this is “glocal” in nature, i.e., open global cooperation in research and its diffusion as well as growing requirement for acquisition via local knowledge, innovation, institutional changes, adaptation and embedment in least developed countries (Soete 2008; David 2009).

Stern (2009, p.172) makes a strong case for both [1] and [2] as well as for adaptation. He discusses the role of the Consultative Group for International Agricultural Research for the Green Revolution in the 1960s onwards “in developing agricultural crops and techniques suitable for environmental, social and economic conditions”. With regard to [2] he claims that better technology demands serious attention as “first generation” biofuels have led to socio-economic problems via the escalating demand for staple crop and well-watered land. Further, Stern (2009) discusses alternative “second” generation biofuels based on non-food wastes for ameliorating the problem of hunger that especially afflicts poor nations. Stern (2009) states that the “land displacement” effect on food prices arises due to agro-fuels. At the same time, Sachs (2008) is concerned about the competition of biofuels with food crops. He hopes for

the creation of an alternative technology to replace traditional food-feed-based ones without causing any pressure on land. The advent of biotechnological innovations and its potential impact for sustained productivity growth in agriculture has gained much attention. In this context, the role of agricultural productivity in investing more in supply-side factors in order to solve food insecurity will be discussed (Trwavas 2008, Kahn and Zaks 2009, Evenson 2003). Modern biotechnological research leading to the invention of transgenic varieties (e.g., herbicide and insect tolerant Bt pest, improved fibre properties or genetically engineered BT-seed varieties preventing or minimizing the use of chemicals such as herbicides, pesticides with potential contamination effects) causes productivity escalation via the dissemination of technological improvements. Typically, agricultural biotechnology encompasses sophisticated technologies like tissue culture. This technology has immense potentials for benefits in developing countries where access to transgenic or genetically improved crop varieties can be used as a solution for addressing the difference between abject poverty, hunger, malnutrition and a sustainable livelihood with appropriate calorie intake. Developing genetically altered new crop varieties with more micronutrients and essential nutritional value will compensate for deficient diets in poor nations. Borlaug (2008) has reiterated the necessity for global cooperation and a collaborative system of international biotechnology research for developing stem-rust-resistant varieties in the line of the Green Revolution to meet the MDG of halving hunger by 2015. Recently, the development of New Rice for Africa (NERICA) by cross-breeding African and Asian species in Benin (West Africa) has delivered high-quality seeds resistant to pests, diseases and acid soils so that Benin can be a net exporter with income gains by 2011 (FAO, July 15 2009).³

Besides, the sustained rate of the absorption of genetically modified (GM) technologies and local usability of transgenic varieties is a critical process for the development of such cutting-edge research. If modern technological development by-passes its targets such as the reduction of food insecurity, poverty and hunger, the productivity gap widens, undermining the initial objective (Pinstrup-Andersen and Cohen, 2000). The adoption and diffusion of modern plant varieties depend on the constellation of technical, economic, and social factors. In the context of Africa, Scoones (2006) shows that the Green Revolution of the Asian types in the 1960s cannot be replicated in the context of all African countries. Instead, an appropriate policy response to address famines, undernourishment, and food insecurity requires circumspection in terms of technology design and implementation. In particular, technological development for high yield growth cannot be dissociated from multi-faceted complexities involving the social, economic, institutional, and ecological context of the developing economies with ample diversities. These include governance, social capital, human capacity, technological acquisition, and agronomic management, etc.⁴ It calls for support of

³ See FAO Newsroom: Benin at <http://www.fao.org/news/story/en/item/28612/icode/>

⁴ Cases differ across individual nations. For example, in the case of Malawi and Ethiopia, supply responses (via technology) might work as these regions reflect the Malthusian case. However, for resource-rich countries like Nigeria the problem lies in the lack of governance and infrastructure. However, supply-oriented responses do not work in a vacuum (Pinstrup-Anderson and Schioler, 2001; Scoones, 2006; Pingali and Traxler 2002).

agricultural research that serves the needs of poor farmers. If governments subsidize biotechnology research or inputs, the technological change can help net food importers to become net producers and suppliers in the medium or long run.

ASIA'S FOOD SECURITY CHALLENGE: WHITHER NORTH-SOUTH DEVELOPMENT COOPERATION?

EU Intervention Strategy for Sustainable Agriculture and Food Production

In a related context of green growth and environmentally sustainable agricultural productivity, the OECD (2013, p. 15) emphasizes: "Successfully shifting to a model of growth that sustains natural assets over time will require the engagement of all countries. The international community can play a crucial role in helping developing countries make the shift, especially by providing assistance to manage short-term trade-offs of going 'green'." Thus, the "three pillars" of fruitful international cooperation that are mentioned here are: (i) access to external sources of finance and investment via well-targeted official development assistance (ODA) and private investment; (ii) "endogenous green innovation and adoption" and technology transfer via facilitating enablers such as capacity building, cooperation-based green innovation or conducive institutional ambience like property rights; and (iii) reduction of trade impediments to expand the market of developing nations for promoting more trade in green goods and services. As mentioned in sections one and two, active policies in these areas of concern are preconditions for food and nutritional security and sustainability. In fact, the sustainable development goals (SDGs) agreed at the United Nations Conference on Sustainable Development (Rio+20) in 2012 are a subset of the MDGs adopted in 2000. In a broader context, all these goals require a coherent policy framework encompassing the provisioning of basic education, health, favourable climate, and poverty elimination. Meeting the challenge of food security requires big concerted efforts on the part of both developed and developing countries. As the constraints on land, water, fertilizer and climate change get serious, feeding the people on this planet without further price spikes needs global cooperation by reducing political ramifications induced by the food crisis and resolving "geopolitical conflicts" (*The Economist*, 2011, p. 20).⁵ While the US might still continue as the world's largest food exporter, emerging economies (BRIC states) will gain a dominant position in the world food programme and on food markets while Europe faces the risk of marginalization by opposing genetic modifications necessary for boosting yields and overcoming harvest losses in Asia and Africa.

Following the recent food crisis, we observed a flurry of global activities in the developed and developing countries as well as in international institutions like the UN, the World Bank, the FAO, and the OECD. The High Level Task Force (HLTF) appointed by the UN

⁵ With regard to the integration of environmental dimension with core economic variables in typical national income accounts, the United Nations Statistical Commission adopted the System of Environmental Economic Accounting (SEEA) in 2012. This highlights the importance of viewing the problem in a broader framework.

Secretary-General in 2008 was instrumental behind forming the Committee on World Food Security (CFS) led by the FAO for assisting vulnerable sections and building resilience. Furthermore, in 2009 the G8 countries introduced the Global Agriculture and Food Security Program (GAFSP) for food aid and agricultural investment before, in 2010, the Agricultural Action Plan was presented by the World Bank. The G20 nations, too, made food security one of their priority areas for taming food price volatility and reducing hunger and poverty, and controlling land acquisition (land grab). Thus, it is important to consider the role of the US, the EU, and the above-listed international institutions in tackling the crisis and the prospective sustainable and inclusive development.

Given the focus of this chapter, the following section considers EU initiatives. Driven by the persistent food insecurity compounded by civil unrest, conflicts, political instability, land and water grab as well as HIV/AIDS pandemics the EU Food Facility Program (FFP), established in 2008, has contributed €1 billion in response to the food and financial crisis, especially for developing and least-developed economies. The EU food security policy “puts food availability, access to food, responses to food shortages and nutritional problems at the centre of poverty-reduction strategies”.⁶ Between 2009 and 2011, the initiated programme reached 49 target countries, donating to 59 million direct and 93 million indirect beneficiaries (EU 2012). The programme is managed by the European Development Fund (EDF), the Development Cooperation Instrument (DCI), the European Neighbourhood and Partnership Instrument (ENPI), and the Food Security Thematic Program (FSTP, EC 2010). The latter is concerned with food security at global, continental and regional level in places where those instruments are ineffective. However, the FFP evaluation reports that the programme operated for 3 years (2009-2011) following the subsequent objectives: “i) encourage food producers to increase supply in targeted countries and regions; ii) support activities to respond rapidly and directly to mitigate the negative effects of volatile food prices on local populations in line with global food security objectives, including UN standards for nutritional requirements; and iii) strengthen the productive capacities and governance of the agricultural sector so as to enhance the sustainability of interventions” (p. 1, EC 2012). Besides, according to the report, “investments in infrastructure and capacity-building increased the production capacity of farmers and made them less vulnerable to future shocks”. Also, interventions by the EU FFP were effective in mitigating the effects of the food price crisis (FPC). Its reach to vulnerable sections was limited in target countries and beyond direct beneficiaries. Thus, the record concludes: “The EU FFP demonstrates clearly that an increase of production by small-holders is possible by using appropriate technological packages and technical assistance, but more information concerning the financial replication of this support at a large scale will be needed” (p. 7, EU 2012). Further, it states: “An instrument that is designed to respond to a single challenge (the food price crisis) must take into account in its programming the many other external factors that affect food prices and availability. In this case, the EU FF had to work against a background of climate change, global fuel price and financial crises and many other regional and national crises such as droughts, floods and earthquakes” (p. 8,

⁶ http://ec.europa.eu/europeaid/what/development-policies/intervention-areas/ruraldev/food_intro_en.htm

EU 2012). Under the revised FSTP (EU 2010), which allocated €739 billion for 2011-2013, the prioritized three strategies for maintaining “coherence, complementarity, and continuity” of determined areas of EU interventions for addressing problems of fragility and food vulnerability are: (i) research, technology transfer and innovation for pro-poor agricultural technology and its dissemination; (ii) strengthening food security governance by policy dialogues, aid effectiveness, and timely availability of reliable information; and (iii) addressing vulnerability and fragility via resilience to shocks and protecting social and productive assets for vitality.

The following subsection concentrates on EU interventions in technology transfer areas and on the importance of developing capability for harnessing technological benefits. According to Eade (1997), capacity-building is essential for sustainable development and encompasses empowerment, change, and human-centeredness. In other words, the development is a process of vulnerability elimination and capacity acquisition and any relief for the development programme should strengthen and enhance the capacity to absorb shocks and the expansion of capabilities. For instance, in the context of biotechnology Cohen (p. 5, 2001) discusses that, although such technologies have immense potentials, they are not a panacea, and, therefore, it is necessary to develop training programmes, improve market access, and build infrastructure and appropriate institutions. He states that research must be created from the bottom up and that crops that “fit not only the agroecology of the poorest regions, but also fit into the social and economic systems” are needed. Recently, Professor Godfray emphasized the idea of sustainable intensification of food production as part of a policy portfolio in which not only food production, but also dietary changes, efficiency and resilience in the food system are important aspects.⁷

Strategy of EU-Asia Cooperation: Perspectives from Technology Transfer

During the implementation of the Food Security Thematic Programme (FSTP) from 2007 until 2013, the EU has focused on three strategic priorities: “research, technology transfer and innovation to enhance food security; strengthened governance approaches; addressing food security for the poor and vulnerable”. The EU has invested €22 million in the 4-year TTFSA regional programme for Asia with an eye on transferring the appropriate technology to smallholder farmers. Focus is particularly placed on North-South and South-South networking. Geographical scope target countries are Afghanistan, Bangladesh, Pakistan, Myanmar, Cambodia, Laos, Nepal and some vulnerable Indian states. The focus has been on the impact of adoption of sustainable agricultural technologies and effective market linkages within the target group as well as access to technologies such as improved cropping systems, irrigation and pest control for livelihood-enhancement. Regional cooperation based on optimal usage of complementarities is also a priority, especially for agro-ecological zones in neighbouring nations.

⁷ http://www.ox.ac.uk/media/news_stories/2013/130705.html. Also in *Science* (2010).

According to the OECD (2001), five conditions must be fulfilled “to achieve a major change of a technological paradigm [...]: (1) introduction of a new range of technically improved products and processes; (2) cost reductions for these products; (3) social and political acceptability; (4) environmental acceptability; (5) pervasive effects throughout the economic system.” With respect to the first two points, there is enough scope for the accrual of substantial benefits via agro-biotech inventions and its applications in various fields. Trans-border and inter-sectoral diffusion of such cutting-edge research and technologies is not perfect but contingent on input and trade intensity. In order to make biotechnological inventions and its diffusion effective, it is argued that these inventions must be accompanied by concomitant development in other areas such as “automation of testing processes, instrumentation, and management of systems for processing, interpretation, transmission and retrieval of large numbers of analytic data” (see OECD [2001]). Therefore, “the critical success factor in this new industrial challenge is the capacity to run complex systems rather than biotechnological knowledge in itself” (ibid.). This aspect of cross-disciplinary research and infusion is important for the evolution of major technologies such as biotechnology. According to the OECD (2003), the statistical definition of biotechnology is “the application of Science & Technology to living organisms as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services.” This includes both scientific, advanced, research-related biotechnology such as genomics, pharmaco-genomics, DNA sequencing, genetic engineering, the functional blocks of proteins and molecules, cell and tissue culture as well as process biotechnologies, namely bioreactors, bioprocessing, biopulping and fermentation. Typically, agricultural biotechnology encompasses sophisticated technologies like tissue culture, DNA-based genetic markers, DNA-chips and other DNA-based diagnostic techniques to identify and create new varieties of traits in crops. Typically, most research in biotechnology is carried by life science companies and diversified chemical and pharmaceutical multinationals (MNC). There are substantial horizontal and vertical linkages in the biotechnology industry, for example in the pharmaceutical and chemical industry via New Biotechnology Firms (NBTFs), which sometimes act as intermediaries between MNCs and academia. It is, therefore, pertinent to assume that the knowledge about producing MVs and GM-varieties is embedded in chemicals as intermediate inputs.

This research has immense potentials for benefits in developing countries where access to transgenic or genetically improved crop varieties can be used as a solution for addressing the difference between abject poverty, hunger, malnutrition and a sustainable livelihood with an appropriate calorie intake. Developing genetically altered crop varieties with more micro-nutrients and essential nutritional elements are of paramount importance as they compensate for the deficient diets in poor nations.

Given the definitional coverage for scientific advancement it is necessary to have rich information on the functioning and evolution of gene, its sequencing and to identify the homologues. For example, the National Centre for Biotechnology Information maintains a wide pool of data on gene and protein sequencing. It links to a browsing system named MEDLINE via the internet. In the same vein, the Genome Sequence Data Base (GSDB), the European Molecular Biology Laboratory and the DNA data bank of Japan are major

databases for biotechnology researchers to pursue their research leading to advancement of knowledge capital and supporting growth in productivity in the biotechnology sector.⁸ Needless to say, advances in genetic engineering techniques are built on the development of cutting-edge research and technological progress in IT so that we find concomitant development in both the info-tech and the biotech sector (Meyer and Davis [2003]). According to Linstone (2004), “the convergence of information and molecular technologies may well revolutionize the innovation process and transform not only the role of forecasting, but also the process of foresight and planning. Indeed, directed technological evolution can take on a whole new meaning.” Also, the development of new technological capabilities depends on the existing level of the technological base, human resources and infrastructure. In that regard, information technology provides the foundation on which the biotechnology sector can thrive for further cutting-edge research (Griliches 1957). In fact, Evenson (December 2003) points out that “India has exploited its capacity to produce software and has benefited greatly from this capacity.” It is envisaged that economic reforms in the 1990s placing India on a “science-push” growth path will facilitate the realization of agro-biotech potential by channelling the resource into plant or animal biotech sectors. However, the North-South technology transfer or even triangular mode of technology transfer involving the North, Southern Engines of Growth (rapidly emerging economies or dynamic economies), and comparatively laggard least-developed economies at the lower rung of the socio-economic ladder are ways of international cooperation. In fact, North-South-South technological cooperation and its provided conditions are “right” (Das 2007, 2012).

The subsequent section explores the cooperation between Europe and Asia as well as opportunities and benefits from technical cooperation, contingent on a “right” constellation of enabling factors. Further, the following section touches upon the expanded role adaptive capability might play in harnessing technology for tackling food security issues.

The economic impacts of inventions and their inter-cluster, inter-country diffusion are best evaluated in a framework of “social system agent-based simulation models” under different technology scenarios. Recently, plant-biotechnology (i.e., the development and use of genetically modified (GM) plants) has grown into a USD4.5 billion-a-year sector with most of the developments centred on food crops, particularly soybeans and oilseeds, maize grains, corn and canola. In an empirical paper, Johnson and Evenson (2000) argue about the applicability of industrial research and development to agriculture in the context of different groups of least-developed countries in different geographical regions. Based on the Yale Technology Concordance (YTC), they argue that, although different industries of manufacture have diverse agricultural applicability, the use of inventions developed in machinery (tractors or harvesters), chemicals (fertilizer) and other sectors are crucial inputs in the production process. In the context of new biotechnology based on gene splicing, this type of technology intensity (via inventions in sectors like IT) in production techniques is crucially important for

⁸ For a detailed study and information on the maintenance and building of databases, readers can get a vast array of information in the websites of the OECD and the respective biotechnology research centres. However, given the present focus, we do not report such essentially bio-scientific issues in our paper.

productivity gains. There are several technological, socio-institutional and economic factors that influence the successful adoption of “Modern Varieties (MV)”. It has been emphasized that, in order to improve productivity, the information network and exposure to new technologies via, for example, extension programmes, matter for the adoption of “open pollinated varieties (OPVs)” (see Ransom et al. [2003]). In almost the same vein, information deficits conjoint with infrastructural bottlenecks and the varietal production characteristics in seeds pose constraints on the rate of adoption of MVs in Honduras. In another study, Gerpacio (2003) considers the role of public and private sector R&D in the maize sector in Asia in the generation and successful dissemination of productivity benefits of new technologies. Using a multi-market model, Karanja et al. (2003) find a welfare-augmenting effect of potential improvement in maize technologies and its adoption in Kenya. It has been emphasized that education is a key factor for the acquisition and adoption of chemical fertiliser (see Schultz [1981], Evenson [1974], Feder et al. [1985], Rogers [1962]—to name a few). In particular, Evenson and Johnson (2000) find that developing countries that are similar in terms of their choice of output, climate or soil type, educational attainment and market size tend to register a higher total factor productivity (TFP) from the pool of foreign agricultural research and development and domestic spillovers. This productivity is due to relatively stronger institutional frameworks guaranteeing stricter patent protection as opposed to incongruous countries such as Africa. Needless to say, it is through familiarity with other countries’ institutional factors (e.g., the protection of intellectual property rights (IPRs), habits and even languages) that a geographically close country becomes culturally congruent leading to social cohesion. Evenson (2003) stresses the role of *conflicting politics* and political sentiment in India as well as the “political hysteria and hostility to GMOs” in Europe as factors inhibiting the momentum of spread of such state-of-the-art technology and, hence, the success of International Agricultural Research Centres (IARCs) and National Agricultural Research Centers (NARS) in “providing leadership in the Gene Revolution.” According to Rao, Hurley and Pardey (2012), despite a higher rate of return on agricultural research and development, the worldwide investment in these areas has been insufficient, especially in the developed world. This might push the problem of reducing global hunger into a darker phase and “undercuts” economic growth in many countries that depend on agriculture and food crops. Consequently, it is recommended to promote public and private research and development in agriculture for solving the food and nutritional insecurity problem. In a related vein, Fuglie and Rada (2013) show that investment in agricultural research has been low in Sub-Saharan Africa (SSA). Here, the productivity is low despite the fact that the TFP (an index of technological progress) depends on research, adoption, and capability expansion along with resource expansion. The authors state that “increases in research capacity will likely be necessary to significantly accelerate agricultural growth in the region. Other constraints to agricultural productivity include government policies that reduce earnings in the farm sector, the spread of the HIV/AIDS virus, and armed conflict within and between countries.”

The relation between the EU and Asia is multidimensional as it involves integration among the world’s largest, most distinct and “adjacent geographical regions on the continental scale” (Fung et al. 2013). According to Fung et al. (2013), China and the Association of

Southeast Asian Nations (ASEAN) are the second- and third-largest trading partners of the EU after the United States. Japan is a major investor in the EU. While an EU-Korea Free Trade Agreement (FTA) entered into force in July 2011, FTA negotiations with Malaysia, Vietnam, Thailand, and Japan have been launched. After the European Commission started moving towards a New Asian Strategy in 1994, the first Asian Europe Meeting (ASEM) took place in 1996 laying the groundwork for future trade and investment relations. According to Kubo (2013), the ASEM process included “informal”, “multidimensional”, “equal”, and “multilayered” partnerships with Asia, aiming at strengthening the economic ties between the EU and Asia. The “spaghetti bowl” criss-cross Regional Trade Arrangements (RTAs) between ASEAN plus three, ASAN plus Six, Transpacific Partnership (TPP) and APEC, EU-Korea FTA all showed the intensity of economic integration with the EU. However, EU-Asia relations are unfolding in many directions. Recently, based on the Multilateral Research Group and funded by the EU’s Jean Monnet Programme, Christiansen, Kirchner, and Murray (2013) documented researches on the economic, political, and social relations between the EU and Asia. The authors claim that, “in the context of an emerging multipolar world, [the two continents] are often seen as key players, thereby rendering their relations increasingly crucial for the understanding of international politics and the role of major powers in global governance (ibid., p. 1).”⁹ Also, according to Cameron (p. 30, 2013), the EU set out a comprehensive strategic framework governing EU-Asia relations for the “objective of strengthening the EU’s political and economic presence across the region, and raising this to a level commensurate with the growing global weight of an enlarged EU”. However, “with the establishment of the European External Action Service (EEAS) in 2010-2011, the development of a new over-arching Asia strategy could be an indispensable instrument to enhance policy coherence, promote the image of the EU as a strategic player in the entire region, ensure its own interests and expectations are clearly defined” (ibid., p. 42). Moreover, Cameron (p. 39, 2013) adds: “[The] 2001 communication set three goals for contributing to Asia’s development: ‘the reduction of poverty in the poorest countries, strengthening dialogues on social policy issues and increasing the effectiveness of EU aid.’” Other areas of alliance are the promotion of peace, security, trade and investment, the augmentation of the trade capacity of Asia’s developing regions, the granting of duty-free and quota-free market access in the EU, the strengthening of partnerships via strategic partnership (PCA); the promotion of democracy and human rights despite the EU’s limitations and the improvement of global partnerships as well as awareness of Europe in Asia. Gillespie (2013) compares the regional integration process of these two regions since the 1997-98 financial crises. He concludes that: “the changing balance between states and markets in both regions are more similar than different. Overcoming the design defects in the Anglo-American variety of globalised capitalism pushed European and Asian sales towards stronger financial regulation and a greater emphasis on the real economy” (Gillespie, p. 138, 2013). According to Kubo (2013), the dual issue of economic development and a declining population with an ageing society, which will affect

⁹ Christiansen, T., Kirchner, E., and Murray, P. (2013). *The Palgrave Handbook of EU-Asia Relations*. Palgrave Macmillan.

China in the near future, is crucial. Here, the EU can provide aid for Asia based on its own experiences. Food insecurity will particularly affect the aged society, their health, and, hence, economic development might slow down in some emerging Asian countries with the exception of India and China for the time being. As Wissenbach and Kim (p. 437 and 447, 2013) argue: “The G20 focus on a development agenda in 2010 and the High-Level Forum on Aid effectiveness (HLF-4) in 2001 provided opportunities to build a new consensus on development which includes (more effective ODA), development results due to economic growth, South-South cooperation and the achievements of emerging economies—in particular in Asia—with the Millennium Declaration as a moral compass.” Further, the authors argue that

the obvious attraction of the growth-based approach exemplified by China and Korea for developing countries has helped the EU and other traditional donors to change their own ideas and to re-focus on fundamental issues such as economic growth, agriculture, and the promotion of infrastructure and a wider perspective on development results rather than just aid. Although concessions were made to have the endorsement of China and India, it is significant that they agreed to the global discourse on development cooperation for the first time, which highlights the dual achievement of economic development and democratisation. South Korea—strongly supported by the EU—became an effective bridge between the West and Asian donors, civil society and private sector actors.

Thus, the concern for the “bottom billion” is a matter of mutual interest and, hence, a discourse for promoting the wealth of developing nations as pursued by advanced emerging economies and the Western development consensus, in which the EU has a dominant position.

Under the Technology Transfer for Food Security in Asia (TTFSA) programme, there are six projects with a total budget of €23 million. The Network for Knowledge Transfer on Sustainable Agricultural Technologies and Improved Market Linkages in South and Southeast Asia (SATNET Asia) aims at facilitating knowledge transfer via a technology bank of agricultural know-how by strengthening the South-South cooperation of ten Asian nations by forming partnerships between research organizations, NGOs, private sectors, and agricultural foundations, etc. (€2.6 million EU funding). STEP-UP is another project for sustainable technology transfer for enhanced productivity of the ultra-poor, which targets the poorest population in Bangladesh with €4 million EU funding. In another project for Cambodia and Laos, EU funding of €2 million aims to help local people by utilising sustainable water management technologies for averting the uncertainties of drought and rainfall. In the Annadya project, the EU invests €3.11 million for promoting appropriate technology for small marginalised farmers in order to ensure food security and reduce malnutrition. The Agriculture and Nutrition extension project (ANEP) with €3.6 million EU funding helps farmers in Bangladesh and Nepal to introduce new, environmentally sustainable technologies for drip irrigation, water-management, micro-irrigation, and wet-dry devices to gauge water requirements, pest management and cross-border technological collaboration to improve agricultural yields in the Indo-Gangetic Plain. Furthermore, there is a three-year project under which €3 million are invested for cross-border agricultural technology transfer and

development of market and institutions targeting 20,000 smallholder farmers in Bangladesh and India. This investment aims at boosting yield and incomes and enhancing food security. In the above context, the following points need careful consideration:

- i. The 2012 edition of the Food and Agricultural Organization's annual State of Food and Agriculture Report (SOFA) emphasizes the need for eradicating malnutrition by modifying food systems, health, and education. It asks for improvements in the supply chain and a boost in the agricultural productivity by investing in supply-side factors. How can biotechnology be useful in food and agriculture? For example, herbicide resistant crops (HRC) and glyphosate resistant crops (GRC) improves productivity and yields.
- ii. There is a need for effective social and political processes to assure a wise and wide usage of biotechnology to develop products available publicly so that the benefits of adaptation and adoption accrue to all, especially developing countries.
- iii. The role of public-private partnerships for effective research as well as the role of Consultative Group on International Agricultural Research (CGIAR) and public research systems (national innovation systems and policy) are of central importance in promoting the use of technologies to produce new crop varieties.
- iv. Despite the rise in agricultural research and development spending, low-income countries in Africa and Asia lag behind with a declining or stagnating spending trend averaging 2% per annum during 2000-2008. Moreover, these countries lack significant requisites such as human, physical and infrastructural capital for the dissemination and adoption of science and technology innovations. Overall, the investment in research capacity is low in some Asian countries, particularly in South and Southeast Asia. It needs to be augmented in order to achieve an increase in agricultural research possible.
- v. In order to enhance productivity and output growth, collaboration with advanced research centres and universities for capacity building and technology transfer requires improvement.
- vi. Science, technology, research, and capacity-building must be promoted for a sustainable intensification of production and human development around the world.
- vii. For Asia, home to more than two-third of the world's undernourished population, improved productivity and climate resilience of agriculture is needed along with the upgrading of food value chains so that it becomes responsive to supply-demand fluctuations and receptive to new technologies.
- viii. Agricultural innovation in low-income countries should harp on interaction between research, teaching, extension, commercialization, and agricultural entrepreneurs as well as interactions between academia, government, businesses, and farmers.

A THEORETICAL PERSPECTIVE ON TECHNOLOGY DISSEMINATION AND ITS EFFECTIVENESS

Aspects of Capacity-Building: Why is it Necessary for Food Insecurity?

In economics, technological progress plays a pivotal role for economic growth. Endogenous growth literature has shifted the paradigm from an excessively technological focus to a more human-centric view. Here, the role of human capital, knowledge-sharing, and ideas is vitally important. No doubt, innovation has been instrumental in raising living standards and poverty reduction (Das 2008 & 2012, Lucas 2009). Since the industrial revolution, the per capita growth rate has increased manifold. However, with more than one billion people living in poverty it has not yet been possible to harness and share prosperity for the benefit of these people. Suffering from food insecurity, undernourishment, nutritional deficiencies or unsustainable environment hinders human development and, hence, the assimilation of technological progress. The alleviation of poverty and food entitlement enhances the human capability to harness superior technologies such as the Green Revolution or biotechnological progress and to improve the conditions for adopting diffused agricultural innovations and even nano-biotechnology or information and communication technologies (ICT).

Agricultural research can also benefit from productivity and its spill-over across users. Agricultural technology such as the Green Revolution package introduced in Asia in the 1960s, has benefited those with the skills to adopt or absorb. Thus, the diffusion of agricultural technology depends on human capital, schooling, and physical and economic access to food.

The nexus between technological capability, social and economic well-being and reduction in income inequality is complex both in theory and in practice. Poverty entails economic “unfreedom” (Sen 2002). Economic empowerment by investing in technology and socio-institutional foundations confers freedom as a means to the end of emancipating people from economic “unfreedom” or poverty. For holistic growth and development, the appropriate technology is important (Dyke 2001). A plethora of models has developed frameworks for the analysis of such a link. From the stylized evidences presented above it can be construed that technology and its osmosis via trade and socio-institutional factors is not fiction, but rather a stark fact of reality. According to Dyke (2001), “poverty can be eliminated within the next 50 years if a broad range of technology—not only information technology—is used as a tool to spark and enhance a comprehensive development strategy that encompasses economic, political, social, and environmental elements”. For Food and Nutritional Security (FNS), the aspect of entitlement on food is important and related to food sovereignty, implying the rights of people, communities, and countries to define ecologically, socially, economically, and culturally appropriate policies for food, agriculture, land and also the right to have access to safe, nutritious food with proper dietary needs. It has been shown that different determinants of FNS affect labour productivity and growth. Following Sen (1981), food supply and starvation statements need to be judged in terms of entitlement relations and exchange relationships.

Starvation, famine or hunger are not to be approached from a partial food availability-centred view but rather from a wider angle of capability and entitlement where an individual's command over food (or any other commodity) will be determined by one's ability to command or acquire the totality of entitlement grounded in human capability and functioning ability.

A Theoretical Angle on Food, Poverty and Entitlement

Technology is not a solution in itself but it can facilitate poverty reduction. In addition, it is important to focus on the role of regional and international institutions and governments in the elimination of poverty. Technology can ameliorate the problems of bad governance, economic distance factors and productivity. It can also enable a nation to move ahead by leap-frogging. Keynes (1930) stressed the role of technological advancement in fostering economic growth as a means to end the problem of poverty in industrialized nations like Britain. In fact, the reduction of poverty does not merely depend on the creation of new technology but also on scaling up successes so that it reaches comparably less-skilled or poor segments. For cohesive and all-round development, this scaling up encompasses, *inter alia*, education, literacy, better infrastructure, governance, socio-cultural acceptance, human development, and technological congruence. There is an absolute need for "collective action, through effective government provision of health, education and infrastructure, as well as foreign assistance" to supplant the market-led engines for development (Sachs 2005). The questions posed are not isolated and need to be seen in a broader perspective. The debate essentially harps on the roles and efficacy of external as well as internal factors in a world where two antithetical issues are present: global integration of economies and geographical disintegration of production where the trade of intermediates (especially hi-tech or technology-intensive products) is significant. Nowadays, technology flows via several channels. Globalization has a growth channel, which transports technology from leader to follower as is typical for North-South frameworks (literature abounds with papers and evidences). At this point, the role of adoption is important for laggard recipients to be able to move to a higher growth trajectory. In this context, education, skill and training are key elements as well as the lead to innovation or imitation. Thus, states have to promote the development of these enabling factors and their resilience. Given the fact that emerging economies are now the locus of technological dynamism, their experiences are eye-openers for development and growth practitioners. For example, regarding the case of South Korea and the Asian Tigers, education and human resource development has played a crucial role in making a growth miracle as opposed to the growth failure in the case of least-developed countries. Meanwhile, the resilience and dynamism of emerging economies such as China, India and South Africa demonstrate that the discussion needs a re-focus or modification. It is, in fact, true that wealthy nations are the source of technology creation while comparably poor nations are lagging behind. However, the unfolding of the economic crisis and the performances of these nations show that the South is leaping forward. ICT and other technologies are being absorbed well. Hence, keeping the present scenario and the role of complementary factors in mind, research needs to redefine (or reformulate) the question. Looking at, *inter alia*, the Spence Committee Report (2008), the role of the factors related to assimilation is emphasized and the emergence of these dynamic economies is discussed. With

regard to the developing world, one must focus on agricultural innovations (especially due to biotech and bio-nano) and the development of high value-added activities where skilled personnel are employed. Agricultural extension programmes are well-known for educating, and training, etc. Qualitative enumeration is necessary for closing the education and technology gap as well as for identifying the priority sectors in countries, and idiosyncratic features, etc. It informs the policy debate on a solid base, on which quantification can lean on. Thus, policy issues pertaining to industry, intellectual property rights, education and indigenous technology development are closely intertwined.

Also, domestication of foreign technology depends on indigenous inventive capabilities and own research and development efforts for building a technology infrastructure. According to the Human Development Report (p. 2, 2001), “the 20th Century’s unprecedented gains in advancing human development and eradicating poverty came largely from technological breakthroughs.” The report further stresses that, although market pressure yields technology, it is not as powerful for the creation and diffusion of technology for poverty alleviation. Technology achievements differ across nations due to uneven diffusion, inequalities in access to innovation as well as inequality in education and skills. Technology and human development are intimately related via the enhancement of human capabilities and via productivity gains transformed into economic growth (Das 2008).

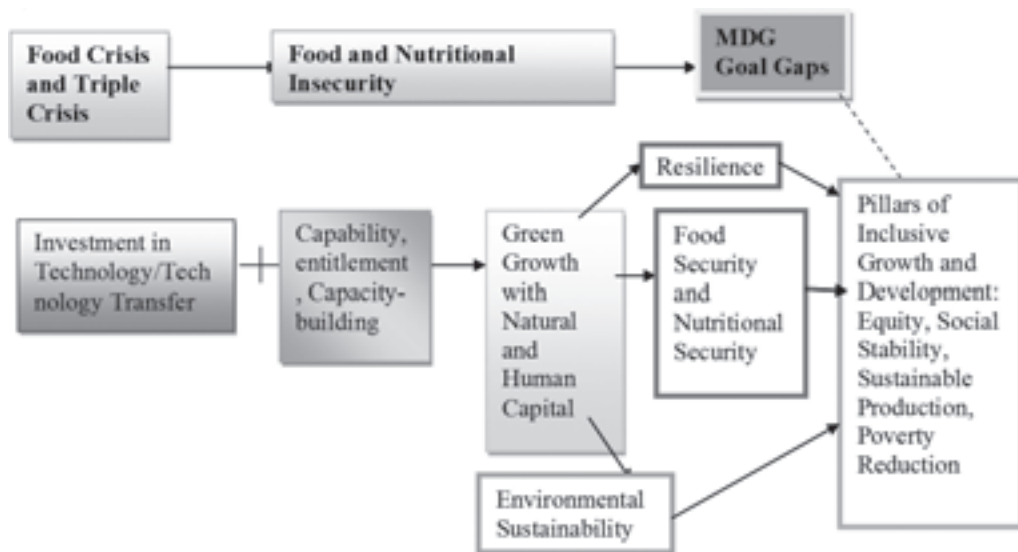
As reported by Perera (2002), challenges for the elimination of poverty and inequality exist as billions of people have no access to energy and clean water, live under inadequate shelter, subsist on less than USD1.25 a day and suffer from insecure employment. Moreover, the author mentions that, for technological capabilities, the following dimensions are crucial: “(i) to analyse problems and obstacles for technological achievement; (ii) to identify and evaluate potential technological solution; (iii) to select, adapt and apply new technologies; (iv) to evaluate effects of new technologies”. Perera (p. 182, 2002) further mentions that poor people will invest in technology choices that are accessible, affordable and appropriate for them. Building poor people’s capacity to make choices does not only bring new technologies to their doorstep, it also addresses their organisational management and marketing skills. It opens new channels for information and knowledge and makes credits and markets more accessible. Thus, the question posed is (p. 183, *ibid.*): “[Which] mechanisms, actors and institutions can mediate effectively between the global and local levels – bringing technology choice, knowledge and skills to poor women and men and enabling them to operate above the local level to help determine the choices and the policy frameworks made higher up?” Quite appropriately, the author answers that (p. 185, *ibid.*)

technology is clearly a critical factor in poverty reduction. Seen holistically, in the complexity of a dynamic social, economic, cultural, and political context, the effective management of technology change is a question of capabilities. The poor must be enabled or empowered to access improved technologies and to make their own technical choices through the development of their capabilities. This would enable them to respond to changing needs and the opportunities as they arise, leading to sustainable development of their livelihoods. In order to achieve this, the importance of an appropriate policy

framework for the management of technology change by the resource-poor should be recognised.

Hence, building innovative local and global partnerships with the EU is of central importance for Asia and Africa. The effectiveness of these partnerships requires: (a) building capabilities for the technological competence of people; (b) providing public and private partnerships for marginalised users or smallholders; (c) enabling civil society organizations for capacity building; (d) protecting the vulnerable, backwards and laggards; and (e) providing resources from bilateral and multilateral donors and raising the profile of technology and capabilities for Food-Nutrition-Environmental Sustainability (FNES).

Figure 1: Flow chart of an eclectic paradigm showing interrelatedness of FNES system



Based on the preceding discussion, a new angle on the EU-Asia technology transfer for solving food insecurity must be envisaged. Figure 1 offers an eclectic conceptual framework incorporating approaches to solve the world’s food problem at large.

The definition of food security should be broadened to include aspects of distribution, entitlement, capability, functioning, public policy and affirmative action (Sen, 2004). Food insecurity or nutritional deficiencies inhibit the individual from freely expanding her or his domain of action and achieving basic functioning. As it limits economic activities, economic agents may suffer from not being able to achieve the full realization of their productive potential. Therefore, food insecurity and undernourishment are sources of economic and social “unfreedom”. This causes a lack of appropriation of technological benefits and causes distancing from the technology frontier via biotechnological inventions. It leads productivity to fall and, hence, results in a triple crisis – food, feed, and financial contagion – which are breeding grounds for economic bondage and poverty. The technological solution cannot be harnessed unless the above aspects are taken into consideration. As experience shows, despite technological benefits and productivity growth, in some emerging developing economies in Asia or

Africa or Latin America crises have unfolded (for example in China, India, Brazil, Mexico and some African countries). As Norman Borlaug states: “cultivating justice, peace is equally important or even more important than ‘cultivating fields’”. For the demand side, an emphasis on the solution to prevent food insecurity, poverty eradication, or famine prevention should be considered beyond purchasing power. For expenditures on technology investments as well as research and development for agriculture, green growth is necessary, but it is not a sufficient condition. Demand stimulation is necessary, but also not a sufficient condition for FNES. An eclectic approach or policy paradigm covering these multi-dimensional preconditions for a solution to food shortage problems needs to be developed. The seeds of success for public action lie underneath the facilitation of the five aspects presented above. Otherwise, the fundamental policy pillars will have feet of clay. The capacity-building aspect of technology should try to harness science and technology skills or inventions for solving not only productivity deficiencies, but also malnutrition, hunger, deprivation, as well as drought prevention, and climate change (causing famine), for a long-term sustainable and stable outcome. As examples abound, conflicts, war and malnutrition are also responsible for food shortage and, hence, food insecurity via mal-distribution or bad governance. For example, civil unrest after the land grab in some African and Asian countries caused civil unrest and political instability (Das 2013). All these aspects cause food diversion and ultimately induce hunger, famine and starvation. Access and entitlement to food are preconditions for an effective assimilation of advanced plant technologies. Besides, institutional technology for a functional system is important before new technology is introduced in least-developed countries.

CONCLUSIONS

To formulate an appropriate policy question it is necessary to look at the causes underlying it:

1. In short, higher food prices have been fuelled by dry weather in critical growing regions (like droughts in Australia). In addition, natural disasters like cyclone Nargis hitting Myanmar in 2008-09 and poor yields in countries like Bangladesh cause further price spiralling.
2. There has been a growing demand from emerging economies such as China and India. These countries are mostly affected by higher food prices despite being unaffected by credit crunches.
3. Economic growth-led energy demand has led to a shift to biofuels, causing competition. Rising oil prices coupled with a growing demand for fertilizer has caused a rise in fertilizer prices.
4. Export bans, taxes or ceilings/quotas implemented by exporters restrict the availability of grain supplies on global markets, which tightens the supply conditions and triggers a further increase in prices.
5. Fertilizer shortage is another factor underlying the proximate cause of dwindling supply factors for the latest rise in food prices.

Policy responses of a broader agenda for the EU-Asia cooperation framework could be: Remove export bans to the extent that they do not pose additional constraints on the global food supply; subsidize agricultural inputs such as fertilizers, irrigation and pesticides to boost production; invest in agricultural research to shift to higher yields via engineered crops (i.e., improve chemical fertilizers and use seed varieties to prevent agricultural runoffs that cause environmental damage to the ecosystem); improve productivity to ease the constraint for both net food importers and exporter; and build capabilities of those in need.

For a pro-poor technological change, to increase their access to the fruits of modern science and cutting-edge technologies, an adequate socio-institutional set up and a constellation of macroeconomic fundamentals such as human capital, governance, education, and infrastructure is imperative. Given the entitlements to these endowments, they facilitate the development of functional capabilities in poor economies (Sen 2004). According to Bussolo and O'Connor (2002), the effect of growth on the direction of change in inequality (widening or shrinking) depends on various "initial conditions, like human capital endowments, access to credit by low-income households, and policies that may influence the distribution of benefits from growth (p. 17)". According to the UN Millennium Project (2005) report,

Millennium Development Goal-based poverty reduction strategies should anchor the scaling up of public investments, capacity building, domestic resource mobilization, and official development assistance. [Also,] international donors should identify at least a dozen "fast-track" countries for a rapid scale-up of official development assistance (ODA) in 2005, recognizing that many countries are already in a position for a massive scale-up on the basis of their good governance and absorptive capacity.

In the context of tropical Sub-Saharan Africa, achieving poverty reduction entails removing the obstacles of bad health, low level of education, dearth of foreign aid and poor governance. Good governance, growth and development are intricately related because bad governance leads to misuse of foreign aid by creating fragility at the expense of utilizing resources for training individuals by giving proper education and skills. Real resources and good governance go hand in hand to ensure the stopping of "corruption of poverty". The flow chart captures the effect of natural, physical and human capital on reduction in deprivation via human resource development and improvement in living standards. The important function of reducing incidences of poverty depends on the factors constituting the socio-institutional parameters shaping its capture. These factors determine the capabilities to overcome the obstacles of poverty and to convert the expanded sets of entitlements or access to technological improvement to well-defined action, namely productivity enhancement and inequality convergence. Thus, even with accessibility to foreign technology, without these parameters, there is scope for capability failure, which might translate into a failure of achievement of important functioning. Consequently, this results in poverty (Das 2008 & 2012).

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EU-ASIA DIALOGUE

*Shaping a Common Future for Europe and Asia –
Sharing Policy Innovation and Best Practices in Addressing Common Challenges*

The “EU-Asia Dialogue”-project is a joint project by the European Commission and the Konrad-Adenauer-Stiftung of Germany.

It aims to foster exchange and understanding between policy-makers, non-governmental organizations and researchers from Europe and Asia. The stakeholders shall be provided with a platform to discuss regional and cross-regional developments in order to identify both short- and long-term challenges, to prevent their emergence and solve them at an early stage. This informal exchange shall help to enhance bi-regional cooperation across sectors and disciplines.

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