



# AGRICULTURAL TRANSFORMATION & FOOD SECURITY 2040

*ASEAN Region with a Focus on  
Vietnam, Indonesia, and Philippines*

*Overview Report*



January 2013



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# **AGRICULTURAL TRANSFORMATION & FOOD SECURITY 2040**

## **ASEAN REGION WITH A FOCUS ON VIETNAM, INDONESIA, AND PHILIPPINES**

### **OVERVIEW REPORT**



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# ABBREVIATIONS

AERR	ASEAN Emergency Rice Reserve
AFTA	ASEAN Free Trade Area
AMIS	Agricultural Market Information System
AMPLE	Agriculture Multi-Market Model for Policy Evaluation
APTERR	ASEAN Plus Three Emergency Rice Reserve
ASEAN	Association of Southeast Asian Nations
ATIGA	ASEAN Trade in Goods Agreement
BULOG	Bureau of Logistics
EAERR	East Asia Emergency Rice Reserve
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization of the United Nations Statistics
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GHG	Greenhouse Gases
IEFR	International Emergency Food Reserve
IFPRI	International Food Policy Research Institute
IMPACT	International Model for Policy Analysis of Agricultural Commodities and Trade
IPCC	Intergovernmental Panel on Climate Change
KKP-E	Kredit Ketahanan Pangan dan Energi
KPEN-RP	Kredit Pengembangan Energi Nabati & Revitalisasi Perkebunan
KUPS	Kredit Usaha Pembibitan Sapi
KUR	Kredit Usaha Rakyat
PPP	Private-public Sector Partnership
TFP	Total Factor Productivity
VIP	Vietnam, Indonesia, Philippines
WDI	World Development Indicators
WTO	World Trade Organization



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# EXECUTIVE SUMMARY

## INTRODUCTION

The study assesses performance of the agricultural sector in Vietnam, Indonesia, and the Philippines (VIP countries) during the period 1980–2011, future prospects up to 2040 and food security in these countries and in the ASEAN region. Specific objectives of the study include:

- Review trends in agricultural production over the past 30 years in VIP countries, with emphasis on food security policies.
- Examine the implications of current and future ASEAN initiatives, particularly on food security, to the agricultural sector of VIP countries
- Generate analyses and suggestions that will contribute to consensus building among ASEAN countries and development partners on agricultural transformation and food security strategies in the region; and
- Outline a vision for agriculture in VIP countries in 2040 and related strategies to take advantage of opportunities to transform agriculture sector performance, reduce rural poverty, and meet the expected increased food demand in the period up to 2040.

Analysis of the past performance and likely future scenarios was carried out with the aid of the Centennial Group's Global Growth Model after introducing several modifications to address the needs of the agricultural sector. Our modeling efforts were divided into two parts. The first part comprised a macro-economic analysis of future scenarios at the global level and for VIP countries. The second part included analysis at the country level of future Total Factor Productivity (TFP), agricultural production and changes in national

food consumption habits. As a countercheck use was also made of IFPRI's updated IMPACT Model, and in the case of the Philippines, the AMPLE model.

## HISTORIC MACRO PERFORMANCE: 1980–2011

The eight developing ASEAN countries (Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Thailand, and Vietnam) grew at an average annual rate of 5 percent during the thirty-one year period 1980–2011. Their GDP combined grew from US\$380<sup>1</sup> billion in 1980 to US\$1.7 trillion in 2011. The VIP countries account for about 60 percent of total GDP of developing ASEAN.

As a result of this rapid growth, per capita incomes in developing ASEAN have risen impressively from US\$1,067 in 1980 to US\$2,877 in 2011. In parallel, incidence of absolute poverty (incomes below US\$1.25 per day) has dropped from around 175 million (42 percent of total population) in the early 1990s to around 80 million (15 percent of total population) in 2011.

The region's dramatic progress during the past thirty plus years, however, must not mask the remaining large number of absolute poor, with many more millions living just above the poverty line (between US\$1.25 and US\$2.00 per capita per day). Most of the poor live in rural areas. Robust agricultural development is thus not only critical to the food security of the population but key to achieving the goal of inclusive growth.

Vietnam was one of the fastest growing economies in the world between 1980 and 2011, when it exhibited an average annual growth rate of 6.9 percent. Its total GDP grew eight-fold from US\$14 billion to US\$110 billion. A dynamic agricultural sector has fueled growth in rural incomes and

<sup>1</sup> Unless otherwise noted, all dollar figures are in constant 2010 US dollars.

made the country a net exporter of agricultural products. At the same time, with declining population growth rate, its per capita income rose from US\$259 per year to US\$1,235 per year. Its poverty rate (again at the international poverty line of US\$1.25/day) fell even more dramatically from 64 percent in 1993 to only 17 percent in 2008, one of the most impressive reductions in the world.

Indonesia too has made enviable economic and social advances during 1980–2011, during which GDP increased from US\$170 billion to US\$754 billion, an average annual growth rate of 4.9 percent. Declining population growth rate has allowed per capita income to rise impressively from US\$1,125 per year in 1980 to US\$3,112 per year in 2011. The poverty rate fell from 63 percent in 1984 to 18 percent in 2011.

The Philippines has been less dynamic relative to its neighbors. Periods of high growth have been punctuated by periods of low growth or stagnation. Its GDP has grown from US\$80 billion in 1980 to US\$207 billion in 2011, an average annual growth rate of only 3.1 percent; the average per capita income has risen only marginally from US\$1,699 in 1980 to US\$2,182 in 2011. The poverty rate has declined from 35 percent of the population in 1985 to 18.4 percent in 2009, measured at a poverty line of US\$1.25 per day per capita.

### **MACRO-ECONOMIC SCENARIOS FOR 2012–2040**

The study team developed optimistic and pessimistic macro-economic scenarios for the ASEAN countries and for each of the three countries of focus—Vietnam, Indonesia, and the Philippines. Under the optimistic scenario, developing ASEAN countries would continue to exhibit impressive growth both in GDP and per capita income, while their total population would rise from 593 million to 732 million in 2040 according to the UN medium scenario for population growth. Their combined GDP would total US\$9,825 billion (6.4 percent of global GDP), growing at an average annual rate of 6.2 percent. Equally impressive, GDP per capita would rise from US\$2,877 to US\$13,428, with 87 percent of the population attaining middle class status (per capita

income of between \$10.80–\$100 per day at constant 2010 PPP international dollars).

Under the optimistic scenario, Vietnam would continue its rapid growth, with per capita income in 2040 of around US\$7,800, a more than six-fold increase over the 2011 figures. The share of agriculture in national GDP would drop from 21 percent in 2011 to only 7 percent in 2040, similar to agriculture's share in developed economies. Ninety-six percent of the Vietnamese population would be classified as middle class, and absolute poverty would have been practically eradicated. The country's population growth rate would slow down to 0.1 percent, leading to selective signs of agricultural labor shortages. Economic and agricultural growth would be increasingly driven by productivity growth, and the country will have completed the transition to a modern society and competitive economy by 2040.

Under the optimistic scenario, Indonesia too would sustain a high average annual growth rate during the next thirty years. At US\$5 trillion, Indonesia would rank as one of the top ten economies in the world by 2040, with its per capita income rising more than six-fold to exceed US\$17,000 (more than twice that of Vietnam in the same year). Its robust GDP growth rate would keep it amongst the fastest growing economies in the world, as it reaps the benefits of the demographic dividend, high investment rates, and impressive productivity growth. Almost all Indonesians would be classified as middle class.

If the Philippines can overcome its many daunting structural, policy, and institutional hurdles, it could also move into a sustained higher growth path. Under such an optimistic scenario, its productivity growth rate would accelerate to 2.8 percent and overall investment rate rise up to 24 percent, increasing average annual GDP growth to 5.9 percent. By 2040, the GDP of the Philippines could reach US\$1.1 trillion and its per capita GDP to almost US\$7,900, nearly a four-fold increase from 2010, but well below Vietnam. But the country must simultaneously tackle the current large gap between rural and urban incomes.



## AGRICULTURAL SECTOR PERFORMANCE 1980–2011

The ASEAN countries enjoyed a robust growth of 2.7 percent per annum in agriculture between 1985–2010. ASEAN compared favorably with the global agricultural growth rate (2.4 percent) during 1980–2011; however, this growth rate lagged that of China (4.3 percent) and India (3.1 percent). The region's rich resource endowment (arable land and water) combined with relatively low wage rates have allowed most countries to benefit from robust global demand for agriculture products. As the overall GDP growth rate (5.0 percent) was even higher than agriculture, the share of agriculture declined from 22 to 12 percent.

Presently five out of the eight developing ASEAN countries have a surplus trade balance in agricultural products; the rest are net food importers and must rely on international trade to feed their population. Indonesia enjoys a buoyant and rising overall agricultural trade surplus largely generated by the phenomenally rapid increase in oil palm exports; Vietnam has gradually increased its exports largely due to rice, fisheries and coffee; but the Philippines is facing a rising deficit.

Rice is an important agricultural product in ASEAN trade. According to the US Department of Agriculture 2012 estimates, the top ten rice exporting countries include four ASEAN members: Thailand (8.0 million tons), Vietnam (7.0 million tons), Cambodia (0.95 million tons), and Myanmar (0.75 million tons). By comparison, ASEAN rice importers in 2010 were: Philippines (2.6 million tons), Malaysia (1.0 million tons), and Indonesia (0.8 million tons). Overall, ASEAN countries enjoy a large and even rising surplus of rice that is exported around the world.

**Vietnam:** In the past thirty years, the country's agricultural sector has undergone a dramatic change both on the demand and supply side. As per capita income rose steadily and the incidence of poverty dropped rapidly, the average Vietnamese's diet has undergone a major shift. Rice consumption per capita has declined while the consumption of meats, fish, horticultural products, etc. has risen. On the supply side, Vietnam has gone from a net importer of food

in 1980 to a major exporter of rice and fish products. Its average annual growth rate of agricultural GDP has been 3.6 percent, a level surpassed only by China, out of the other major agriculture producers. This impressive growth was driven by agriculture TFP growth of 2.3 percent. In addition to enhancing food security, this healthy agricultural growth has led to a sharp reduction in rural poverty.

**Indonesia:** The country has also had impressive, though less stellar, agricultural growth of 3.0 percent in the past thirty years. After a relative slowdown in the 1990s, growth picked up sharply since the 1997–98 financial crisis as relative prices became more favorable to agricultural production. Rice yields and TFP have shown only moderate improvements in Java; between 1990 and 2006 rice production increased slowly at about 1.3% p.a. but in the subsequent four years production increased by 5.5% p.a., largely, it would appear, due to inaccurate statistics. The slow growth of rice production in Java has kept Indonesia as a net importer of rice, despite heavy government interventions designed to achieve the political goal of self-sufficiency. On the other hand, tree crops—particularly palm oil—achieved spectacular growth in the Outer Islands. The difference in TFP growth in Java (1 percent) and Indonesia as a whole (1.8 percent) is truly dramatic.

**Philippines:** At 2.0 percent, agricultural growth in the Philippines has been below the ASEAN average. On the demand side, reliance on rice as the main staple food remains as high as ever. On the supply side, the country has moved from being a net exporter of agricultural products in 1980 to a major importer of rice and other foods, as domestic production was outstripped by population growth. There have only been limited improvements in agriculture TFP (1.3 percent per annum). Despite many policy interventions, the country has been unable to achieve its proclaimed goal of food self-sufficiency so far.

## STRATEGIC AND POLICY CONSTRAINTS TO AGRICULTURE GROWTH

### AGRICULTURAL RESEARCH AND EXTENSION

In the search for food security and a more sustainable path to rapid agricultural transformation, improvements in technology and innovation are the key drivers. Despite ample evidence of high returns on investments in agricultural research, current funding levels in VIP countries are inadequate. There is also excessive reliance on the public sector to conduct research and to disseminate results to farmers. These conditions are further exacerbated by declining research capacity, a low level of basic and applied research, the failure to engage all the interested stakeholders in determining research priorities, and the lack of a clear dissemination strategy. Overall, shortcomings in research are particularly acute in Indonesia and the Philippines, and to a lesser extent, in Vietnam. The weaknesses in the decentralization of extension activities to local governments in Indonesia and the Philippines should be corrected urgently in order to significantly enhance the government's capacity to deliver such services.

While globally private funding for basic research is commonplace, particularly in high-income countries, only the tree crop sector of Indonesia and a few fruit export crops in the Philippines have managed to take advantage of such opportunities.

### LAND RELATED ISSUES

Over the past thirty years, per capita arable land availability has declined by 17 percent in Indonesia, 34 percent in Vietnam, and a dramatic 47 percent in the Philippines. Indonesia, and Vietnam have been losing some prime food croplands to industry, urbanization, and infrastructure, and have few viable options for opening up new lands for food crops (except for the Outer Islands in Indonesia). Increased food crop production in the recent past has resulted primarily from productivity increases (cropping intensification and yield increases).

Another land related issue constraining growth is the absence of secure land ownership titles and the slow rate at which land titles are extended to farmers. In the case of Indonesia, previous efforts to extend land titles have progressed slowly. The Philippines is facing the added uncertainties about the future of agrarian reform, while in Vietnam, the current agriculture land 'ownership' pattern makes it difficult for many farming families to make a living income because farm sizes are small and consist of many tiny parcels. The lack of titles is constraining long-term investments in agriculture and preventing farmers from using land as collateral to obtain credit. Widespread titling of land is also likely to accelerate land consolidation.

In the case of the Philippines, the restrictions on farm size, leasing, selling, and foreign ownership of land are further serious constraints. Additional issues in Vietnam pertain to land leasing arrangements between the government and farmers, which in turn prevents them from applying new technologies and expanding their production areas.

### IRRIGATION

Irrigation is crucial for increased production through double cropping and for achieving much higher yields. Throughout VIP countries there are negative trends in the performances of their irrigation systems, largely due to inadequate maintenance, improper initial designs, failure to complete the construction of some systems, inadequate storage capacity, failure to effectively engage farmers in operation and maintenance, and management and regulatory issues. Many of the systems have deteriorated just as changing monsoon patterns make the dependence on irrigation more vital. With climate change expected to create a premium on water availability, there is also an urgent need to introduce water-saving techniques.

Conditions in Vietnam help illustrate this point. There is some evidence that around one-quarter of the irrigation schemes developed during the 1960s cannot be used today because they need to be completed or because of the deterioration of water control structures or other technical

problems. A large and costly program of upgrading and rehabilitation is required.

The irrigation budget in Indonesia and the Philippines falls far short of the funding required for remedying existing shortcomings. Indonesia provides a vivid example of the decline in the allocation of resources to irrigation. While in 2003 the share of irrigation in national agricultural spending amounted to 32 percent, this total declined to 16 percent in 2008 and does not seem to have increased since. Compounding these shortcomings are problems of land fragmentation, loss of the irrigation cadre of field staff, disinterest of many local governments in this field, and the conversion of agricultural land to other uses. In the Philippines, recent studies show that the total irrigated area in national, communal, and private systems that is in good operational status today is similar to that in the late 1980s, reflecting years of under-investment in maintenance and limited success in transferring management to water users associations.

Possible steps that the governments of Indonesia and Vietnam could take to rectify the situation include: recentralization of major irrigation planning and management functions, intensification of efforts to establish and strengthen water users associations; and provision of a larger budget for the operation and maintenance of the systems. Possible steps that the Philippines could take include: revisiting the assignment of responsibilities for maintenance and rehabilitation of the communal irrigation system, where the greatest losses in irrigation capacity have occurred; intensification of efforts to establish and strengthen water users' associations and improve their participation both in financing and discharging operations and maintenance (O&M) responsibilities; another fundamental review of water balances in all regions to update knowledge on potential for expansion—or likely contraction—of irrigation command areas; and sustained investments by the national government.

### **ROLE AND EFFECTIVENESS OF GOVERNMENT**

An efficient and effective public sector is a critical pre-requisite to rapid agriculture growth, as it fundamentally affects

the performance of much of the agricultural sector. VIP countries encounter difficulties, though to a varying degree, in providing appropriate public services and formulating the required government policies and strategies.

Before 1990 most government structures of ASEAN countries were highly centralized, but since then, considerable political and economic responsibilities and authority have been devolved to sub-national units. With its 'big bang' decentralization program of 1991, the Philippines spearheaded these changes. A decade later, in 2001, Indonesia embarked upon an even more ambitious decentralization process. Vietnam has also been undergoing a decentralization process since the late 1990s, albeit with a more incremental process than in the other countries. Initially the decentralization process in the Philippines and Indonesia was encouraging. However, decentralization has not been an overall success for the agricultural sector. Of particular relevance to the sector is the management of extension. Research and extension agencies continue to suffer from incomplete reform agendas, persistent confusion over lines of responsibilities between central and local governments, and inadequate capacity and budgetary support.

### **APPROACH TO FOOD SECURITY**

From primary concentration on the volume and stability of food supplies in the 1970s, the concept of food security has gradually evolved to include food access by the poor. This study adopts FAO's widely accepted formulation of food security that defines it as a *"condition that exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life."*

In most ASEAN countries—including VIP countries—food security is an important plank of national agricultural policy and is often equated with self-sufficiency. The focus of food security and self-sufficiency is primarily on rice. The countries have a much more open policy towards other food commodities, such as corn and wheat.

An interventionist food policy regime in grain markets was firmly entrenched in Asia during the 1970s, with the direct involvement of the governments. This involvement often included the following: accumulation and release of buffer stocks to stabilize prices; monopoly controls over international trade; restrictions on domestic movements of grain; cheap credit and access to transportation for the parastatals; and limits on private storage. Such a regime may have been necessary in the 1970s owing to initial conditions of grain markets, but these conditions no longer hold in VIP countries.

### ***RICE SELF-SUFFICIENCY***

Although the role of rice in the daily diet of people in VIP countries is gradually declining, it still remains an important component. This, combined with disruptions in rice exports from countries such as Thailand, Vietnam, and India during the 2007–08 food crisis, has led to the current preoccupation of VIP country governments with ensuring a steady supply of rice and avoiding price spikes.

Policies in Indonesia and the Philippines aimed at achieving rice self-sufficiency are economically and financially costly. A restrictive import policy managed by a state enterprise has resulted in Indonesian domestic prices in 2011 being some 60 percent above comparable international prices. These policies also complicate efforts to arrive at an ASEAN free trade zone. In addition, massive subsidies to producers have limited the funding allocation to other needs in the sector. Rough estimates of the costs to Indonesian consumers in 2011 amount to about US\$6.0 billion (4.2 percent of agricultural GDP); this is before accounting for the substantial costs of subsidies to producers. In the Philippines, a World Bank study shows the economic cost of the subsidies in 2011 is even higher in relative terms at about US\$2 billion per year (6.8 percent of agricultural GDP) and rising. On the positive side, Indonesia and the Philippines have experienced less volatility in domestic rice prices than many other countries. In Vietnam the policy of compelling farmers to grow rice also has considerable costs as it prevents them from cultivating more remunerative crops; rough estimates put the difference between rice growing and high-value

crops production at more than US\$2.0 billion annually (as much as eight percent of agricultural GDP).

ASEAN per capita consumption of rice is beginning to decline. Scenarios from the Centennial model suggest that ASEAN total rice consumption is likely to peak well before 2040. Scenarios developed for VIP countries indicate a similar outlook for Vietnam and Indonesia, though demand for rice in the Philippines in both per capita and absolute terms is expected to remain high through 2040.

The two largest regular exporters of rice in the world (Thailand and Vietnam) are members of ASEAN. With the recent opening of Myanmar, it is possible that Myanmar will again become a major rice exporter over time. It is most likely, then, that ASEAN will continue to enjoy a net surplus of rice supplies and remain the main exporter to the rest of the world well beyond 2040. These developments in the demand and supply of rice should ease the countries' concerns about rice availability, provided they can develop greater confidence in the robustness of rice trade within ASEAN. Such confidence would in turn allow governments to aim at less than 100 percent self-sufficiency, permitting them to focus instead on insurance against temporary shortages of supplies through mechanisms such as domestic and regional stockpiles.

### ***RELATIVE IMPORTANCE OF KEY CONSTRAINTS ACROSS COUNTRIES***

The relative importance and seriousness of the major constraints to agriculture development are summarized below (Table 1).

### ***REGIONAL COOPERATION TO ENHANCE FOOD SECURITY***

For some years now, ASEAN countries have experimented with several regional food security frameworks that correctly focus on emergency relief, sustainable and conducive food trade, and early warning and information, as focal elements in maintaining the smooth and stable functioning of the food production and distribution system. This study has found, however, that governance problems afflict the operation of the different systems. These problems arise from fun-

TABLE 1: KEY CONSTRAINTS FOR AGRICULTURE, 2012

	Vietnam	Indonesia	Philippines
land	▲	▲	▲
research and extension	▲	▲	▲
water constraints	▲	▲	▲
irrigation	▲	▲	▲
labor shortages	▲	▲	▲
farm mechanization	▲	▲	▲
investment capital	▲	▲	▲
credit	▲	▲	▲
climate change & natural disasters	▲	▲	▲

▲ = serious concern    ▲ = intermediate concern    ▲ = no concern

Source: Centennial Group.

damental tensions between unilateral versus cooperative approaches, as well as tensions due to competing domestic interests.

The tensions between inward-oriented versus outward-oriented approaches raise formidable challenges in operating the latest of these schemes, the ASEAN Plus Three Emergency Rice Reserve (APTERR), and in ensuring coordination of trade policies in the region.

### DRIVERS OF AGRICULTURAL TRANSFORMATION

During the past thirty years, the role and structure of agriculture in ASEAN economies has changed significantly. Future transformation will be determined by five main drivers:

- **Demographics and urbanization:** While Vietnam's population will grow by 17 percent (from 89 million to 104 million) and Indonesia's by 20 percent (from 242 million to 290 million<sup>2</sup>), the Philippines' population will jump by nearly 50 percent (from 95 million to 142 million) due to its much higher birth rate. Within these totals, there will be two additional developments affecting labor supply for agriculture as well as food consumption patterns. First, in all three countries, the majority of people will live

in urban areas. Second, a steady and significant rise in rural wages as a result of three mutually reinforcing factors: (i) rural to urban migration and the gradual ageing of the rural population; (ii) availability of higher paying off-farm jobs (services, agribusiness) in rural areas; and (iii) overall higher income and wage levels in the countries as a result of higher economic growth and higher productivity. The only way agriculture can remain profitable at these higher wage levels will be through sharply increased productivity and a shift to higher-value crops.

- **Changing demand/higher value crops:** The dietary importance of rice and other staple foods has been declining in all countries. This trend is expected to accelerate with rising affluence in ASEAN as more consumers enter middle class status. They will move towards a more balanced and nutritious diet—with less rice and greater amounts of proteins (meats, fish, and poultry), fruits and vegetables, and processed foods. As a result, farmers can and will cultivate higher-value crops.
- **Increasing competition for resources:** Even as total populations and size of GDP grow, the basic factors of agricultural production (land, water, and labor) would remain constrained or even decline due to competition from urbanization, industrialization, and

<sup>2</sup> These projections are based on UN statistics; a more conservative estimate of the decline in the population growth rate developed by Indonesian Central Bureau of Statistics would result in a total population of 344 million in 2040.

higher living standards of consumers. As a result, resource costs are expected to continue to rise. Agriculture producers will thus have to pay higher costs for most inputs, increasing the premium on productivity improvements.

- **Technological changes:** On the positive side, technological changes (crop intensification; mechanization; hybrid seeds; more efficient use of water, energy, fertilizers; and crops capable of withstanding climate changes, etc.) would present new opportunities to improve productivity and offset higher input costs (including labor and energy), while producing higher-value products demanded by consumers.
- **Climate change:** Until 2050 climate change already underway is unlikely to adversely affect global food security. But, even before 2050, climate change will certainly lead to an adverse impact on VIP countries agriculture and thus their national food security. Although contribution of VIP countries agriculture to global GHG emissions is small, that of their forestry sector is important and VIP countries can contribute to slowing down the accumulation of greenhouse gases by stopping deforestation, especially in Indonesia, and better managing changes in the use of forest lands.

The transformation and modernization of the agricultural sector to respond to the above drivers would be essential to sustain viable agriculture throughout ASEAN. Successful transformation, in turn, would mean that agriculture in 2040 would look dramatically different and much more prosperous than today.

It is possible to paint a bold and optimistic vision of what ASEAN agriculture and that of VIP countries could look like based on successfully mastering the transformational trends discussed above. The next section presents such a vision for each country and for ASEAN. It should be noted that these are by no means projections, but rather scenarios depicting what could be accomplished. The Visions are followed by an articulation of the strategies that must be adopted to realize

them. In considering the Visions and reviewing the strategies, three important points must be kept in mind. First, the needed transformation would not happen suddenly, but would be a gradual process. Countries will need to adopt carefully designed transitional steps. Second, given the very large gains to both farmers and consumers of realizing the Visions, countries should adopt policies and strategies needed as soon as possible. And third, the exact nature, scope and timing of the medium and long-term strategies will have to be country specific, taking into account country circumstances.

## VISION 2040

While the general direction of transformation in all countries will be similar, the specifics will vary significantly. The nature, pattern, and magnitude of the transformation will be country-specific, as progress to date and the natural resource endowment of the three countries differ. Country-specific visions developed under the study are portrayed below.

### VIETNAM

Sound policies and effective management would have enabled the economy to continue its stellar performance from an earlier period—including a brisk investment rate, and convergence beyond the current middle income status towards a developed industrial economy. By 2040, over 90 percent of the population will have reached middle class status. With rising incomes, Vietnamese consumers will eat less rice, and farmers will adapt cropping patterns to better meet the changing consumption patterns and industrial demands for higher-value crops.

Agriculture and fisheries have transformed into a more dynamic sector of the economy due to improved productivity arising from the use of advanced technologies, more widespread mechanization, and improved quality of production. Food security (and safety) would be more robust because of the technology adapted from both national and international sources. Agriculture exports would continue to be significant

as farmers diversify into higher-value crops, while maintaining rice and fish exports.

Average farm size has increased as commercial farming becomes more important and many farmers take advantage of government land consolidation programs. With more efficient farming units, farm incomes have improved, allowing rural wages to more closely match urban levels. A considerable number of older farmers are resorting to part-time farming as a food security endeavor. Other key changes in the sector include:

- **Shift to animal feed-crops:** Some 1.5–2.0 million ha of farmland is producing crops used as feed-grains (mainly maize) in response to the substantial increase in animal feed needed to support the growth in demand for meat.
- **Aquaculture development:** The high rate of growth of aquaculture has been maintained by a shift towards marine aquaculture.
- **Industrial crops:** Rubber and coffee remain popular industrial crops, adding to farmers' incomes. A major investment in replanting rubber and coffee plantations with high quality cultivars would successfully upgrade production and safeguard Vietnam's export prospects.
- **Value chains:** The private sector has greatly expanded investments in the different elements of the value chain (storage, warehousing, refrigeration, transport, packaging, branding supermarkets, advertising and so on), processing a greater percentage of domestic production thereby adding value to Vietnamese agriculture.
- **Research:** Major reforms in the national agricultural research system have stabilized and upgraded staffing and technical capacity and redirected the focus of research so that it is more geared towards solving technical and financial problems at the farm level.

- **Disease control:** While crop and livestock diseases remain a concern, the upgrading of research and of the capacity of veterinary and technical services has greatly improved early disease identification and management and reduced losses.
- **Food safety:** An effective first class food safety agency (and associated mechanisms) is in place, with modern laboratories and a strong professional cadre capable of ensuring quality and consistency for all agricultural products—both for the domestic market and exports.

### **INDONESIA**

The vision of Indonesian agriculture in 2040 includes a smaller agricultural labor force than at present, perhaps involving 15 percent of the total labor force, and of older age than in the urban areas. Given major simplification, improvement, and coverage of the national land service, consolidation in ownership and operation has taken place through market transactions, but smallholdings remain the dominant ownership pattern.

Agricultural growth in the Outer Islands has been largely sustained by tree crops for export, dominated by oil palm, with over 12 million ha producing more than 70 million tons of crude palm and kernel oil (about 40% of the world's edible oil). Investments by the private sector continue to generate growth in oil palm. In the smallholder sector continued production and improved productivity is assured by an effective government-managed replanting program based on grants to planters at appropriate stages of tree life, and financed by an export cess. By 2040, some of this land would be devoted to intercropping, including leguminous forage for cattle, as would also be occurring in some of the 11 million ha under rubber, coconuts, and smaller trees like coffee and cocoa.

Agriculture on Java has been transformed in response to continued evolution in food tastes of the population. Rice consumption has declined to about 87 kg per capita. Employing Centennial's pessimistic per capita consumption in 2040 (i.e., a slower decline in per capita consumption), the

required crop area will be 13.97 million hectares (assuming no change in yields or cropping intensity) based on the UN population projections (290 million) and 16.56 million hectares based on GOI's population projections.<sup>3</sup> Indonesia should have no difficulties in meeting its requirements from local production at the lower population projections. However, even assuming that yield increases and intensified cropping intensities will offset the diminishing land on Java, converting some 3.3 million additional cropping areas to rice cultivation may not be feasible. Thus Indonesia may have no option but to rely on imports for part of the domestic demand; fortunately current global projections imply this would be feasible. The goal of self-sufficiency was, however, abandoned early on in this period, and with it, the high domestic prices that caused considerable welfare loss. Other key changes include:

- The management (and possibly ownership) of small scale irrigation schemes (less than 100 ha), that total about 500,000 ha has been turned over to water user associations. As many of the farms on these schemes are too small to provide adequate income to a household focusing on rice production, they have been converted to the production of high-value crops by village based cooperatives.
- Fish production and consumption would be considerably greater than today, and constitute the major source of animal protein, averaging about 36 kg per capita. With careful conservation management of various coastal resources, marine catches have leveled off at 2010 levels and much of the increased demand is being met by aquaculture. Further protein diversity is being provided by rapid development of both industrial and advanced village poultry production systems. In response to a rise in beef consumption from the very low 1–2 kg per capita level in 2011, the production which was earlier focused mainly on finishing imported weaners is now focused more on increasing the local breeding herd.

- The rice import monopoly currently being managed by BULOG, a government agency, would be eliminated, as dozens of certified private importers would have been franchised to import rice to every port in Indonesia in any quantity. This reduced prices to consumers throughout the country and improved true food security in more remote locations (e.g., the Eastern Islands). A smaller BULOG will have become mainly a buffer stock agency holding 1–2 million tons as an emergency reserve. The stocks would be well distributed around the country and effectively guard against any hoarding by market players.

This vision would result in positive welfare outcomes for the general population and the rural community. It could be achieved at a much lower cost to the government than that of today's policies.

### *PHILIPPINES*

Although the last 30 years have not been particularly impressive for the Philippines in terms of overall economic performance and poverty reduction, this vision foresees the country shifting into a higher growth trajectory. Convergence would occur in the next five years, as the current leadership sustains reform momentum needed to do so by the end of its mandate—it would then be succeeded by several like-minded administrations that further develop and consolidate the reforms. The rate of TFP growth would be comparable to that achieved by other Asian convergers in recent decades. On this basis, the Philippines would not only become the world's 9th most populous country by 2040, but also it would move into the ranks of the 20 largest economies. Salient features of this vision include the following.

Real agricultural GDP growth would average about 3.5 percent and, although the sector share of total GDP would decrease to about 5 percent, the multiplier effects of downstream and agribusiness activities would drive a much larger proportion of the national economy. Agricultural sector growth rate would be somewhat higher in Mindanao.

<sup>3</sup> The figure of 344 million used here is from government projections; the figure of 290 million cited previously is from the UN Population Division.



The country would enjoy a substantial expansion of tree crops, particularly rubber, coffee, cocoa, and oil palm, driven mainly by foreign and private investment using modern technology and management. The Philippines would retain global leadership in the coconuts sector, but with increasingly heavy reliance on 'new' coconut products both for the domestic and export markets. This has been central to eliminating acute rural poverty, which in 2010 was concentrated among households depending on coconut production and fisheries. The country would retain a slightly smaller but highly competitive sugar industry. The trade regime would be open to global competition and in some years, this would also allow the Philippines to export.

Food consumption patterns would change, though more gradually than those in Indonesia and Vietnam. Rice would remain an important component of the population's diet. The Philippines would employ a mixed domestic production and trade strategy to meet rice demand, importing about 25 percent of requirements for food and other uses, entirely through the private sector. Average rice yields would improve by about 50 percent (to 6 MT/ha), through a combination of a strong seeds improvement program and further expansion of irrigated rice areas. An important element of this transition would be the Philippines' participation in an ASEAN regional stock arrangement; it would also maintain a significant domestic stock of rice for emergencies.

Other key features of this vision are:

- While aggregate agricultural employment would decline, the trend would be accompanied by an important shift to higher paying jobs. The rural-urban wage differential for unskilled workers would narrow, and labor scarcity would emerge as an issue in selected areas. As a result, rural wages will be much higher than today.
- The land reform program will have been completed successfully, and land markets would be freed. Land consolidation and farm mechanization would become important in some areas, and land leases would be common. Small farms would continue to dominate but there would be widespread diversifi-

cation in terms of modes of operation: small farms, centralized management, contract farming, joint ventures, etc. Restrictions on foreign ownership of land would be eliminated.

- Sustained investment of about 1 percent of GDP in agricultural research and technology development would underpin higher sector TFP rates, and a friendlier environment for biotechnology and innovation. The key commodity research programs would be privately managed, and adaptation to climate change would be a central theme across research programs. Most agricultural extension services would be provided by the private sector.
- Strong institutions would emerge to manage and enforce food quality standards, protect the interests of Filipino consumers and facilitate penetration of export markets.
- Private equity, banking, and other financial institutions such as insurance companies and pension funds would be active in agricultural, downstream, and agribusiness project finance.
- The public sector would continue to play an important role in ensuring access to rural financial services, but mainly through regulation and risk management instruments, rather than direct financing.
- After investments in physical and communications infrastructure of 5-7 percent of GDP for several decades, there would be good connectivity across the islands and countryside.

### **ASEAN REGIONAL COOPERATION**

Under the aspirational vision of regional cooperation, introduction of a single market and production-based economic community (currently scheduled for 2015) would have been completed. The previously exempted items (rice and sugar) would be included well before 2040, and actions to enhance intra-regional trade would have been successful.

Integral features of these agreements would be emergency short-term food relief arrangements and humanitarian assistance, as well as effective early warning systems. By harmonizing standards and standardizing trade certifications agricultural products of ASEAN origin would be fully acceptable to consumers worldwide.

The single ASEAN market would make it possible to augment domestic food production with imports thereby enhancing food security. The guarantee of unhindered access to regional food markets would result in members moving away from their current reliance on self-sufficiency and instead rely on common regional stocks and trade to meet temporary domestic shortfalls. Finally, members would focus primarily on food accessibility with the removal of food availability as the most pressing food security issue. To institute a more predictable regime for rice trade, countries would have phased out trade monopolies and quantitative restrictions (upheld by the special protocol on rice and sugar), and phased-in tariffs; this would still permit some level of protection for domestic producers, but on a rule-oriented basis.

As discussed earlier, the current situation is much different than this aspirational vision. Although free trade negotiations have taken place for years, progress has been slow. However, as the economies continue to grow and the countries become more prosperous, there may be greater political willingness to rely on trade and to forego special exemptions for agricultural commodities. Realizing the ASEAN vision outlined above will largely depend on the political will of the leaders of the ASEAN member countries and their ability to forge a viable ASEAN common market.

### **STRATEGIES FOR REALIZING THE VISION**

Laser like focus on increasing productivity and enhancing value-added—on farm and in the value chain between the farm and consumers—should be the centerpiece of country strategies for realizing the above Visions. Specific challenges faced by each country would be different. While for Indonesia and Vietnam the challenge is how to sustain the past rapid growth in TFP and avoid the middle-income

trap, the Philippines must first endeavor to move to a much higher growth trajectory and then sustain higher agricultural growth. Despite such differences, the following elements would be common to all country strategies, though the emphasis on individual elements would vary.

#### ***DIVERSIFICATION TO HIGHER-VALUE CROPS, AGRO-PROCESSING, AND VALUE CHAINS***

Aforementioned changes in demand will require a fundamental transformation at the farm level: introduction of more intensive and specialized farming activities; higher productivity; and the development of effective value chains. Farmers will require considerable technical advice to make the switch from traditional to high-value crops as well as sound marketing information and linkages to actors further up the value chain. This calls for more effective extension services combining inputs from the public and private sectors as well as encouragement to agro-industries and retailers to enter into contract farming arrangements with (small) farmers.

Demands associated with storing, processing, and distributing the growing volume of perishable goods will require considerable investment in physical and managerial resources throughout the value chain. This is best undertaken by the private sector, but improved governance and predictability of the rule of law will be needed to attract private investment. It will be necessary to relax constraints on multinationals that are especially effective in developing such value chains. In addition to its crucial role in creating a conducive business climate, an important role remains for the government to ensure the rapid development of trade logistics and infrastructure.

Development of agro-industries will provide growing opportunities for value addition of agricultural production, with larger shares of domestic products processed locally and exports shifted from agricultural commodities to processed foods. New high paying jobs in agro-industries will become available in semi-urban and rural areas. Agricultural firms engaged in large-scale contract farming in turn will provide farmers with technical, financial and marketing assistance, all of which are unavailable through the public sector.

### **SUSTAINED PRODUCTIVITY IMPROVEMENT**

Productivity improvements will drive future growth with attention shifting to research and innovation aimed at increasing productivity. There is considerable scope for improving total factor productivity from the current relatively modest levels to a much higher plateau. In the medium-term, VIP countries should aim to achieve TFP and yields achieved by China today. This would best be achieved through closer collaboration between the public and private sectors, and the adoption of a new research approach that caters more vigorously to the need of farmers. There are already several outstanding examples of private firms playing a lead role in conducting and promoting agricultural research and extending technical know-how to farmers (e.g., the work of the private companies in the tree crop sectors of Indonesia and the Philippines). Such examples should become more widespread.

To achieve and sustain the desired levels of productivity growth, the countries need to focus on the following mutually reinforcing areas: (i) agricultural research and extension; (ii) capital investments and mechanization; (iii) land issues; (iv) irrigation; (v) greater level of private sector participation; (vi) market driven input prices; (vii) improved governance and regulatory framework; and (viii) adaptation measures to address the adverse impact of climate change.

**Agricultural research and extension:** Well before 2040 there must be a paradigm shift in the way research is conducted and disseminated, that goes well beyond allocating additional resources. Governments must come up with approaches to tackle the limited research capacity and the failure to make effective use of emerging research findings. Fragmentation of responsibilities for agricultural research and extension among a number of central agencies and provincial governments should be corrected in order to underline the crucial role of technological progress in sustainable agricultural growth and facilitate future growth of TFP. Also, VIP countries must ensure that closer links are established between research institutions, private sector actors, farmers, and extension services. And, the decentralization of extension activities to local governments must be

made much more effective in order to significantly enhance the government's capacity to deliver such services.

- **Capital investments and mechanization:** Except in the case of irrigation and rural infrastructure, most capital investments will be undertaken by the private sector. For this to happen, both on-farm and off-farm activities must be profitable; pricing and incentives will be crucial in determining profitability. Equally important will be availability of finance for on-farm and off-farm investments, easy availability of risk insurance, provision of necessary rural infrastructure, and resolution of land titling issues.
- **Land issues:** Increased food crop production in the recent past has resulted primarily from productivity increases. Land consolidation, secure land ownership and titling will be a precondition for modernizing agriculture and improving productivity, including for investing in land improvements and moving to greater mechanization.
- **Irrigation:** is crucial for increased production and yields. Changing monsoon patterns make the dependence on irrigation all the more vital. Steps the governments could take to rectify the weaknesses mentioned earlier include: recentralization of major irrigation planning and management functions, intensification of efforts to establish and strengthen water users associations; provision of adequate budget for the operation and maintenance of the systems that is far larger than it is at present; fundamental review of water balances in all regions to update knowledge on potential for expansion—or likely contraction—or irrigation command areas; and sustained investment to bring all national and communal systems back into good operational status.
- **Private sector role:** As countries make the ongoing transition from subsistence and input-driven production to mainly commercial and more capital intensive agriculture, the role of the private sector will become paramount. Most of the financing

- necessary to modernize agriculture and sustain productivity improvements (except for irrigation, rural infrastructure and basic research on staple crops) would come from the private sector. Even in areas such as development of new seeds and technical know-how needed by the farmers (extension services, etc.) that were traditionally provided by public entities, the private sector will play a bigger and bigger role. Further, the private sector will play a leading role in investing in assets and providing services throughout the value chain between the farmers and consumers. Instead of seeing these developments as a threat to the public sector entities, they should be welcomed as long as the farmers can obtain high quality and timely access to the services needed at lower cost. The enhanced role of private sector players would allow the public sector to concentrate on (remote) areas and groups of farmers (subsistence) that cannot be served by private sector players.
- **Pricing and incentives:** In the future, pricing of inputs and outputs at market rates would become all the more important, as mentioned above, given the need to attract more private capital and to make farms (including small-holder farms) more profitable. By 2040, domestic prices of most agriculture products and inputs would need to approach international prices, with conditional cash transfers becoming the main channel to provide any subsidies needed by special groups of farmers (small farmers in remote areas).
  - **Role and effectiveness of government:** As discussed above, an efficient and effective public sector is a critical pre-requisite to rapid growth of the agricultural sector. In all three countries there is an urgent need to revamp government entities responsible for providing services to all parts of agriculture. At the same time, the exact changes to be made in the institutions concerned would vary greatly between countries, and must be customized to country conditions perhaps more than any other area. Subjects requiring greater attention include an increase in public investments in rural infrastructure, adaptation of technology and agricultural research (both from domestic and global sources), and innovative ways of disseminating results (extension). In pursuing the above agenda, the role of local governments is critical. In the context of decentralization, countries must ensure that local governments have appropriate management capacity.
  - **Climate change:** In response to adverse impacts of climate changes—including a rise in average temperature, loss of coastal land due to higher sea-levels, variations in rainfall—VIP countries will need to take adaptation actions to increase productivity by about 0.25–0.4 percent per annum over and above the trend line in order to counter the effects of a 1°C rise in temperature over the study period. To counter the adverse impacts of climate change on agriculture and thus national food security, Vietnam, Indonesia, and the Philippines all need to accelerate the completion of unfinished agricultural sector reforms and implementation of well-known and already practiced adaptation measures which are good for the sector with or without climate change. Known adaptation techniques involving changes in crop varieties, cropping rotations, calendars, and improved irrigation efficiency can counter some of these negative threats. At the same time, governments need to exercise due caution in the design and implementation of major investments to counter the long-term but uncertain risk of sea level rise. To counter the long-term threat to global food security, they need to join the global community in controlling greenhouse gases, particularly by stopping deforestation and land use changes therein, while continuing to build national institutional capacity to manage increased climate risk.

## CONCLUSION

The basic conclusion of this study is that, while in the past, developing ASEAN countries have legitimately been concerned about food security, given their resource endowment and vast potential for increasing agriculture outputs through productivity improvements, the prospects are good that they could not only meet their domestic food requirements but as a group also remain net exporters to the rest of the world. But to do so, they should adopt conducive policies, make appropriate institutional reforms—including regional arrangements to have more assured trade—and facilitate a greater role for the private sector (in both on-farm and off-farm activities and services).

Other main messages are:

- The current approach to food security being followed in the VIP countries (focused mainly on rice) has high economic costs, and may be both anti-farmer and anti-poor.
- The objective of rice self-sufficiency is widely accepted in ASEAN countries, leading to active government interventions. On the other hand, the policies on other sources of calories and protein (wheat, maize, meats, fish, milk, eggs, horticulture products, etc.) are much more open and markets are being allowed to play a greater stabilizing role.
- Per capita rice consumption may have peaked in Indonesia and Vietnam, and in developing ASEAN as a whole. Over the long term (by 2040), the importance of rice in the diet and price of the food basket will steadily decline. Other food items (such as wheat, fruits, vegetables, fish, eggs, meats, etc.) will become much more important as income levels rise and people are able to afford a more balanced diet.
- The fundamental approach to food security needs be rethought. If the ASEAN countries cannot rely on each other to meet their needs for rice through trade intra ASEAN trade, then how would overall integration work? Assured and open trade in rice (together with an effective joint buffer stock) is a test case of the region's political will to become an "economic community" as already announced by the political leaders.
- The bigger issue facing the governments is how to transform their agriculture economies between now and 2040 (as consumption patterns change and rural wages rise sharply), and focus on the longer-term issues. Robust agricultural development is not only critical to the food security of the population but also key to achieving the goal of inclusive growth.
- Strategic and policy constraints to agriculture growth and transformation are:
  - Agricultural research and extension: Despite ample evidence of high returns on investments in agricultural research, current funding levels in VIP countries are inadequate. There is also excessive reliance on the public sector to conduct research and to disseminate results to farmers.
  - Land related issues: Per capita arable land availability has declined significantly in the VIP countries over the past 30 years. Secure land ownership titles are absent and land titles are extended to farmers at a slow rate with an adverse impact on the availability of credit.
  - Irrigation: Irrigation is crucial for increased production through double cropping and for achieving much higher yields.
  - Role and effectiveness of government: An efficient and effective public sector is a critical pre-requisite to rapid agriculture growth, as it fundamentally affects the performance of much of the agricultural sector.

- Future agricultural transformation will need to account for five main drivers:
  - Demographics and urbanization: Populations will grow significantly, and the majority of people will live in urban areas.
  - Changing demand/higher value crops: The dietary importance of rice and other staple foods has been declining in all countries
  - Increasing competition for resources: The basic factors of agricultural production (land, water, and labor) will remain constrained or even decline due to competition from urbanization, industrialization, and higher living standards of consumers.
  - Technological changes: Technological changes such as crop intensification, mechanization, hybrid seeds, more efficient use of water, energy and fertilizers, and crops capable of withstanding climate changes, will present new opportunities to improve productivity and offset higher input costs.
  - Climate change: Climate change will lead to an adverse impact on VIP countries agriculture and thus their national food security.
- Successful transformation, in turn, would mean that agriculture in 2040 would look dramatically different and much more prosperous than today. A bold and optimistic vision of what ASEAN agriculture and that of VIP countries could look like in 2040 is achievable though by no means preordained.
- Though the strategies for realizing the Vision in 2040 differ between countries, there are two overarching strategies that should be shared by all:
  - Changes in demand will require a fundamental transformation at the farm level, including the introduction of more intensive and specialized farming activities; higher productivity; and the development of effective value chains from the farm to consumers.
  - Sustained productivity improvement will drive future growth. There is considerable scope for improving total factor productivity from the current relatively modest levels to a much higher plateau. In order to achieve productivity improvement, VIP countries must focus on agricultural research and extension, capital investments for mechanization and adoption of new technologies, land issues, irrigation, pricing and incentives, the role of the private sector and the role and effectiveness of government.
  - While most mainstream studies suggest that, until 2050, climate change may not be a serious threat to global food production, the situation would become much more dire after 2050. VIP countries will face declining yields. Adaptation measures need to be introduced now.
  - Finally, given the large gains to both farmers and consumers by realizing the Visions, countries should adopt the related strategies and policies starting now.

# CHAPTER 1. INTRODUCTION

Agricultural transformation and food security issues pose substantial challenges to ASEAN policy makers but also present considerable opportunities over the next thirty years for improving the livelihood of their people.

Over the years concerns have been repeatedly raised about the rapidly increasing world population and the earth's ability to produce enough food to feed everybody. Thus far, despite constant increases in incomes as well as growing per capita food consumption, production has kept pace with demand. Much of the increased food production over the period 1980–2011 came about through technological changes and improved productivity, and only a small portion through an expansion of arable land. The green revolution of the 1960s and 1970s changed farming practices particularly in Asia, through the adoption of: better seeds, improved irrigation practices, the introduction of double-cropping of rice with shorter growth cycle, and increased use of pesticides, and fertilizers. The combination of these technological improvements more than doubled the outputs of rice and wheat. Concurrently, economic development, rising living standards and urbanization have resulted in increased competition for land, and water resources and considerable acreage of forest land has been destroyed.

Globally the average annual rate of growth in grain yields has declined steadily from a high of 2.9 percent in the 1960s to 1.6 percent in the 1990s. Based on current projections it is expected to decrease further to 0.8 percent in the 2040s. With grain yield growth rates slowing down and demand on the rise, some experts look to genetic engineering as the most promising option for producing more food without damaging the environment. Others see the solution for raising productivity in sustainable methods such as organic farming and smarter irrigation.<sup>1</sup> Can the farming

sector ensure sustainable resource use while accommodating the rapid shift in consumers' demand from staples like rice and wheat towards higher value food items such as meat, dairy, fish, fruits, and vegetables?

This question is explored in the report along with an effort to map a vision to the year to 2040 for the agricultural sector in Vietnam, Indonesia, and the Philippines (VIP countries). In addition, the report examines in broad terms agricultural development in the eight developing ASEAN nations (Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Thailand, and Vietnam). It also outlines requisite measures to enable the agricultural sectors of Vietnam, Indonesia and the Philippines (VIP countries) to expand and improve in response to growing demand from an ever more prosperous (and growing) population, while enhancing food security. Additionally, the study explores likely impacts of climate change on agricultural production and identifies adaptation measures.

Attaining these objectives will require a transformation of the agricultural sector to meet growth in demand for higher value food products and at the same time significantly increase productivity. This transformation would be achieved primarily through a wide range of measures. These include an improved policy and regulatory framework, more efficient and responsive public services, less reliance on low cost labor and enhanced total factor productivity, better irrigation, greater mechanization, use of new technologies, mobilization of the private sector (including FDI) to play a more pivotal role, and transforming the entire value chain from the farmer to (urban) consumer.

The major objectives of the study are:

- Review trends in agricultural production over the past 30 years in Indonesia, the Philippines, and

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<sup>1</sup> National Geographic: The End of Plenty; A special report on the global food crisis, 2009.

Vietnam, with particular emphasis on food security policies.

- Generate analyses and suggestions that will assist the governments to recognize key constraints they face as they attempt to accelerate and sustain growth in the agricultural sector.
- Outline a vision for agriculture in VIP countries in 2040 and related strategies to meet the expected increased food demand and transform agriculture.
- Examine the implications of current and future ASEAN initiatives, particularly on food security, to the agricultural sector of VIP countries.

Analysis of the past performance was supplemented with likely future scenarios developed with the aid of Centennial's Global Growth Model after introducing appropriate modifications to address the needs of the agricultural sector. The modeling effort was divided into two parts. The first part comprised of developing alternate scenarios of possible future trajectories of VIP economies. The second part included analysis at the country level of future changes in national food consumption habits, TFP and agriculture production, under the alternate macro-economic scenarios. As a countercheck we also made use of IFPRI's updated IMPACT Model and in the case of the Philippines the AMPLE model.

Following the introduction, this report presents a brief review of the performance of developing ASEAN and VIP

countries (Chapter 2), and then outlines optimistic and pessimistic macro-economic scenarios of future developments to 2040 (Chapter 3). The past performance of the agriculture sector is then discussed together with the strategies, policies and constraints that have helped to shape it (Chapter 4). The report goes on to describes past efforts to introduce a regional food security framework and available plausible options as the ASEAN countries move forward towards growing integration (Chapter 5). The major trends that will drive the transformation of agriculture in VIP countries between now and 2040 are discussed in Chapter 6. The vision of agriculture sector in the three countries and strategies that they should adopt to realize the vision are outlined in Chapter 7. The report ends with the basic conclusions and main messages of the study.

The Centennial Global Growth Model is presented in Annex 1. Findings and strategies for agricultural transformation in the VIP countries are outlined in Annexes 2–4; more comprehensive studies are available in three separate detailed country reports. In addition the study also provides in Annex 5 a summary of findings from a review of regional food security issues; again, a more detailed report is available separately as a working paper. The fisheries sector and the important issue of climate change are addressed in Annexes 6 and 7 respectively. A brief summary of global outlook for the key commodities is presented in Annex 8.



# CHAPTER 2. MACRO-ECONOMIC PERFORMANCE: 1980–2011

## ASEAN

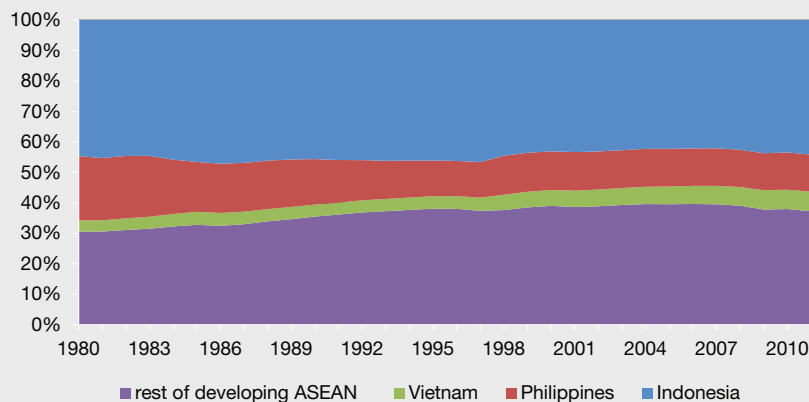
The eight developing ASEAN countries (Cambodia, Indonesia, Laos, Malaysia, Myanmar, the Philippines, Thailand and Vietnam) grew at an average annual rate of 5 percent, slightly faster than the rest of Asia during the 1980–2011 period. As a result, total GDP of these eight countries grew from US\$380 billion in 1980 to US\$1.7 trillion in 2011 (including Brunei and Singapore the total was US\$421 billion and US\$2 trillion, respectively).<sup>1</sup>

This development led to an increase in developing ASEAN's share of total Asian GDP from 8.6 percent in 1980 to 9 percent in 2000. Since 2000, the region has grown at the same rate as developing Asia as a whole. Within developing ASEAN, the three countries of focus in this study (Vietnam, Indonesia and the Philippines, or VIP countries) account for about 60 percent of total GDP and 72 percent of the population.

As a result of this rapid growth, per capita incomes in developing ASEAN have risen impressively from US\$1,067 in 1980 to US\$2,877 in 2011 as shown in Figure 2.2 below. Paralleling this development, incidence of absolute poverty<sup>2</sup> (incomes below US\$1.25 /day) has dropped from around 175 million (42 percent of total population) in the early 1990s to around 80 million (15 percent of population) in 2011. This makes the ASEAN region an example of major strides made by Asia in improving income levels and reducing incidence of absolute poverty during the past thirty years. Obviously, these numbers are average for the region as a whole and actual performance of individual countries varies considerably as discussed below.

Table 2.1 below provides the key economic and social indicators for the ASEAN region highlighting the dramatic progress made by developing ASEAN in the past thirty years, as it moved from a poverty stricken region to a middle income region:

**FIGURE 2.1: VIP COUNTRIES MAKE UP THE MAJORITY OF DEVELOPING ASEAN GDP**

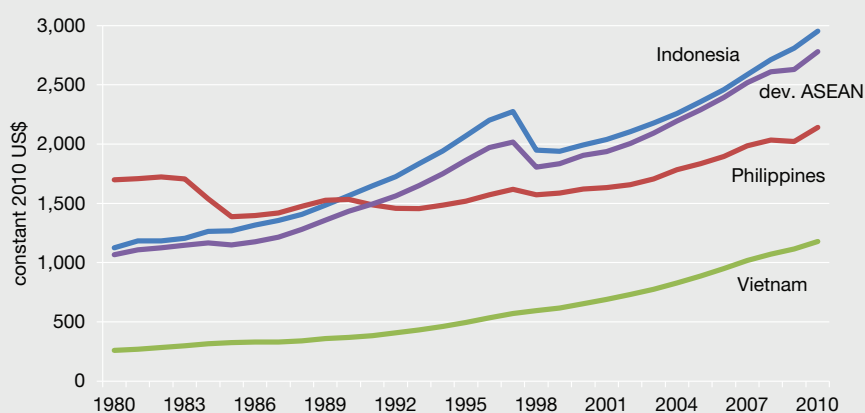


Source: IMF World Economic Outlook

<sup>1</sup> All GDP figures throughout this section are given in 2010 constant US\$.

<sup>2</sup> These poverty rates are based on World Bank data that are slightly different from those published by the VIP countries' governments.

**FIGURE 2.2: GDP PER CAPITA HAS RISEN SHARPLY IN VIETNAM AND INDONESIA SINCE 1980; GROWTH IN THE PHILIPPINES HAS LAGGED**



Source: IMF World Economic Outlook

**TABLE 2.1: ASEAN'S KEY ECONOMIC AND SOCIAL DATA**

	1980	1990	2000	2011	1980–2011 growth rate
GDP (constant 2010 billion US\$)	380	633	988	1,707	5.0%
GDP per capita (constant 2010 US\$)	1,067	1,434	1,904	2,877	3.3%
average ten-year GDP growth rate (ending in given year)		5.2%	4.6%	5.6%	--
population (millions)	356	441	519	593	1.7%
urban population (millions)	91	141	200	268	3.5%
rural population (millions)	265	301	319	326	0.7%
average ten-year population growth rate	--	2.2%	1.6%	1.4%	--

Source: IMF WEO, World Bank WDI, Centennial calculations

The region's enviable progress during the past thirty years, however, must not be allowed to mask the fact that ASEAN still is home to over 80 million absolute poor and that many more millions live just above the poverty line (between US\$1.25 and US\$2.00 per capita). Most of these poor live in rural areas; their main economic activities relate to agriculture. Their fortunes are intertwined with those of agriculture development. It is clear therefore that robust agriculture development is not only critical to the food security of the population at large but also is key to raising future incomes and overall quality of life of the rural population and thus to achieving the goal of inclusive growth.

## PERFORMANCE OF VIP COUNTRIES

### VIETNAM

Until the recent economic slowdown, Vietnam was one of the fastest growing economies in the world. Between 1980 and 2011, it exhibited average annual growth rate of 6.9 percent. Its total GDP grew eight fold from US\$14 billion to US\$110 billion during the same period. This growth was driven by Vietnam's high investment and TFP growth rates. A dynamic agriculture sector has fueled growth in rural incomes and made the country a net exporter of agriculture products. At the same time, with declining population growth rate, its per capita income rose from US\$259 per

**TABLE 2.2: VIETNAM'S KEY ECONOMIC AND SOCIAL DATA**

	1980	1990	2000	2011	1980–2011 growth rate
GDP (constant 2010 billion US\$)	14	25	51	110	6.9%
GDP per capita (constant 2010 US\$)	259	369	652	1,235	5.2%
average ten-year GDP growth rate (ending in given year)	--	5.9%	7.6%	7.2%	--
population (millions)	54	67	79	89	1.6%
urban population (millions)	10	14	19	28	3.4%
rural population (millions)	44	54	60	61	1.1%
average ten-year population growth rate	--	2.2%	1.6%	1.1%	--
% of population in poverty (below \$1.25/day)	--	64%	50%	17%	--
Gini index	--	35.7	37.6	35.6	--
agriculture as % of GDP	--	39%	25%	21%	--
agricultural employment at % of total employment	--	--	65%	52%	--

Source: IMF WEO, World Bank WDI, Centennial calculations

Note: 1990 poverty numbers are from 1993; 2000 poverty numbers are from 1998; 2010 poverty numbers are from 2008.

year to US\$1,235. Furthermore, its poverty rate fell even more dramatically from 64 percent in 1993 to 17 percent in 2011, one of the most impressive reductions in the world. This sharp dramatic reduction in poverty is partly attributed to its success in improving agriculture productivity and achieving more inclusive growth. And, yet despite the rapid development of the agriculture sector, its share of GDP has dropped by half in the past twenty years, from 39 percent in 1990 to 21 percent in 2011 as the rest of the economy grew at an even much higher rate. Key economic and social data are summarized in Table 2.2.

### INDONESIA

Indonesia too has made impressive economic and social advances during the past thirty years, despite the 1997–98 financial crisis. During the 1980–2011 period it achieved average annual GDP growth rate of 4.9 percent. Its total GDP grew from US\$170 billion to US\$754 billion. The more recent growth rate (between 2006–2011) of 5.9 percent has made it one of the fastest growing large economies, after China and India. Indonesia's growth has been driven

by its above average high investment and TFP growth rates. Like Vietnam, its declining population growth has allowed per capita income to rise impressive from US\$1,125 per year in 1980 to US\$3,112 in 2011. Its poverty rate fell from 62.8 percent in 1984 to 18 percent in 2011. Agriculture's share in GDP declined gradually from 24 percent in 1980 to 15 percent in 2011. Key economic and social data are summarized in Table 2.3.

### PHILIPPINES

While in global terms the Philippines also has made good progress during the past thirty years, the progress has been less dynamic relative to its neighbors. Periods of high growth have been punctuated by periods of stagnation or low growth. As a result, its GDP has grown from US\$80 billion in 1980 to US\$207 billion in 2011, with an average annual growth rate of 3.1 percent. This was the result of more modest investment rates that averaged 22 percent of GDP and growth in TFP at an average rate of only 0.4 percent. The country's population growth rate has also declined at a moderate rate relative to most other Asian

countries, from 2.7 percent in the 1980's to 1.9 percent in 2000–2011. As a result, the average per capita income has risen only marginally from US\$1,699 in 1980 to US\$2,182 in 2011. The poverty rate has declined from 35 percent of population in 1985 to 18.4 percent in 2009. Growth in agriculture production has not kept pace with population

growth, making the country a net importer of food products. Additionally, even though the economy as a whole grew only modestly, it exceeded growth of agriculture reducing its share of GDP from 25 percent in 1980 to 12 percent in 2011. Key economic and social indicators are summarized in Table 2.4.

**TABLE 2.3: INDONESIA'S KEY ECONOMIC AND SOCIAL DATA**

	1980	1990	2000	2011	1980–2011 growth rate
GDP (constant 2010 billion US\$)	170	289	425	754	4.9%
GDP per capita (constant 2010 US\$)	1,125	1,566	1,994	3,112	3.3%
average ten-year GDP growth rate (ending in given year)	--	5.5%	4.0%	5.5%	--
population (millions)	151	184	213	242	1.5%
urban population (millions)	33	56	90	123	4.3%
rural population (millions)	117	128	124	119	0.1%
average ten-year population growth rate	--	2.0%	1.5%	1.1%	--
% of population in poverty (below \$1.25/day)	63%	54%	48%	18%	–4.0%
Gini index	--	29.2	29.0	34.0	--
agriculture as % of GDP	24%	19%	16%	15%	–1.5%
agricultural employment at % of total employment	56%	56%	45%	38%	--

Source: IMF WEO, World Bank WDI, Centennial calculations

Note: 1990 poverty numbers are from 1984 and 2000 from 1999

**TABLE 2.4: PHILIPPINES<sup>1</sup> KEY ECONOMIC AND SOCIAL DATA**

	1980	1990	2000	2011	1980–2011 growth rate
GDP (constant 2010 billion US\$)	80	95	125	207	3.1%
GDP per capita (constant 2010 US\$)	1,699	1,534	1,621	2,182	0.8%
Average ten-year GDP growth rate (ending in given year)	--	1.7%	2.9%	4.8%	--
Population (millions)	47	62	77	95	2.3%
Urban population (millions)	18	30	37	46	3.1%
Rural population (millions)	29	32	40	49	1.7%
Average ten-year population growth rate	--	2.7%	2.3%	1.9%	--
% of population in poverty (below \$1.25/day)	--	31%	22%	18%	--
Gini index	--	43.8	46.1	43.0	--
Agriculture as % of GDP	25%	22%	14%	12%	-2.3%
Agricultural employment at % of total employment	52%	45%	37%	35%	-1.3%

Source: IMF WEO, World Bank WDI, Centennial calculations

Note: poverty numbers are from 1991; 2010 poverty numbers are from 2009



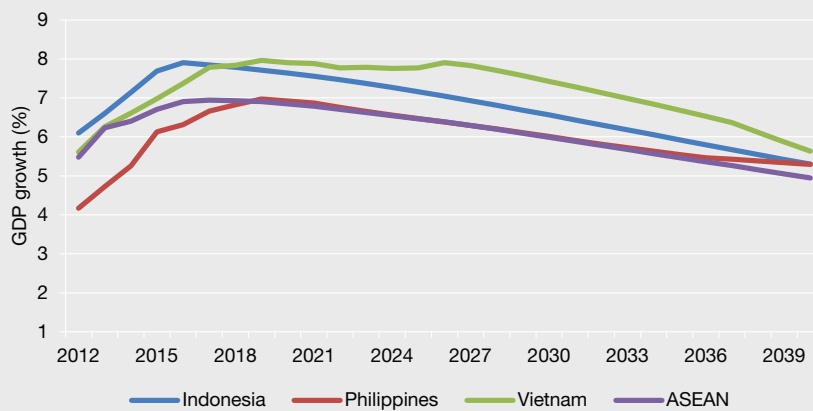
# CHAPTER 3. MACRO-ECONOMIC SCENARIOS FOR 2012–2040

## ASEAN

Under the optimistic (or desirable) scenario, developing ASEAN countries will continue to exhibit impressive growth both in GDP and per capita income, while the region's total population rises from 593 million (8.5 percent of world, and 14.8 percent of Asia) to 732 million in 2040 (8.3 percent of world and 15.5 percent of Asia). Its GDP would total 9,825 billion (6.4 percent of global GDP and 14.7 percent of Asia's GDP), growing at an average annual growth rate of 6.1 per-

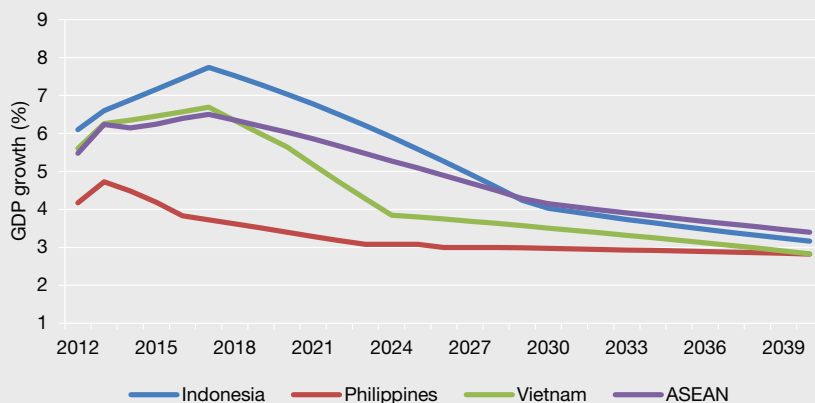
cent. Equally impressive, its GDP per capita would rise from US\$2,877 to US\$13,428. Most of these countries would enjoy living standards similar to those enjoyed today by European countries such as Spain and Portugal. By 2040, as much as 87 percent of the population would be classified as middle class under today's standards. This transformation in the economic fortunes of the region will be accompanied by a steady decline in the share of agriculture in GDP. The GDP growth that each country would experience under the optimistic scenario is shown in Figure 3.1, while the results of the pessimistic scenario are in Figure 3.2.

**FIGURE 3.1: GDP GROWTH RESULTS: OPTIMISTIC SCENARIO**



Source: Centennial Group projections

**FIGURE 3.2: GDP GROWTH RESULTS: PESSIMISTIC SCENARIO**



Source: Centennial Group projections

**TABLE 3.1: DEVELOPING ASEAN SCENARIOS**

	2011	2040 (optimistic)	2040 (pessimistic)
GDP (constant 2010 billion US\$)	1,707	9,825	6,032
GDP per capita (constant 2010 US\$)	2,877	13,428	8,244
average GDP growth rate (2011–2040)	--	6.2%	4.4%
% of population at least middle class	21%	87%	68%
poverty below \$1.25 per day <sup>1/</sup>	13%	0%	0.8%
population (millions)	593	732	732
urban population (millions)	262	444	444
rural population (millions)	331	288	288

Source: Centennial Group

Note: Poverty projections do not include Myanmar

<sup>1/</sup> WDI

Key economic and social data for developing ASEAN countries as a group under both scenarios are given in Table 3.1.

## VIP COUNTRIES

### VIETNAM

The Centennial Group model suggests that under the optimistic or desirable scenario, Vietnam would continue to achieve rapid growth of 7.1 percent p.a. between 2011 and 2040. This would totally transform the Vietnamese economy and society. In 1980, Vietnam was one of poorest countries in the world. By 2040, Vietnam could have a per capita income of about US\$7,800, a more than six fold increase over 2011 (and 29 times that of 1980). 96 percent of the Vietnamese would be classified as middle class; absolute poverty would be eradicated.

The country's economy would become one of the top thirty in the world. The country's population growth would slow down to 0.1 percent p.a. with the country's age profile beginning to mature. Instead of having abundant labor, the country will see initial signs of labor shortages particularly in rural areas and low wage sectors. About 50 percent of the population will live in urban areas. Finally, share of agriculture in national GDP would drop from 20 percent in 2011 to only 7 percent in 2040. As a result, rural wages would

be a multiple of today's level and disparities between urban and rural wages would begin to narrow. While partly fueled by the country's above average investment rates, economic growth would be driven more and more by productivity growth. In summary, by 2040 Vietnam would have completed its transition to a modern and competitive economy, and a more affluent and mainly urban society.

Obviously, under the pessimistic scenario, economic growth (4.4 percent), size of GDP (US\$380 billion) and per capita income (US\$ 3,657) would all be much lower. Only a little over half of the population would qualify as being middle class. This is because as the country gets caught in the middle-income trap its productivity growth would be significantly much lower (2.3 percent p.a., instead of 4.3 percent).

### INDONESIA

Under the desirable scenario, Indonesia too would sustain a high average annual growth rate of 6.7 percent during the next thirty years. This would dramatically transform the economy and Indonesian society. At US\$ 5 trillion, Indonesia would boast one of the top ten economies in the world, with its per capita income rising more than six fold to exceed US\$17,000. Its GDP growth rate of 6.7 percent would keep it amongst the fastest growing economies of the world, as it reaps the benefits of the demographic dividend, high



**TABLE 3.2: VIETNAM SCENARIOS**

	2011	2040 (optimistic)	2040 (pessimistic)
GDP (constant 2010 billion US\$)	110	811	380
GDP per capita (constant 2010 US\$)	1,235	7,791	3,657
average GDP growth rate (2011–2040)		7.1%	4.4%
average TFP growth rate (2011–2040)		4.3%	2.3%
% of population at least middle class	10%	96%	61%
poverty below \$1.25 per day <sup>1/</sup>	17%	0%	0%
population (millions)	89	104	104
urban population (millions)	28	52	52
rural population (millions)	61	52	52
agriculture as % of GDP (high TFP)	20%	7%	15%
agriculture as % of GDP (low TFP)	20%	5%	12%

Source: Centennial Group

Note: 2011 poverty headcount figure is for 2008

<sup>1/</sup> WDI

**TABLE 3.3: INDONESIA SCENARIOS**

	2011	2040 (optimistic)	2040 (pessimistic)
GDP (constant 2010 billion US\$)	754	5,016	3,341
GDP per capita (constant 2010 US\$)	3,112	17,283	11,513
average GDP growth rate (2011–2040)	--	6.7%	5.3%
average TFP growth rate (2011–2040)	--	3.9%	2.7%
% of population at least middle class	17%	100%	87%
poverty below \$1.25 per day <sup>1/</sup>	18%	negligible	negligible
population (millions)	242	290	290
urban population (millions)	123	197	197
rural population (millions)	119	94	94
agriculture as % of GDP (high TFP)	15%	7%	10%
agriculture as % of GDP (low TFP)	15%	5%	7%

Source: Centennial Group

Note: the 2040 population projections are based on UN statistics; however, the Indonesian Central Bureau of Statistics (Biro Pusat Statistik, BPS) projections are much higher at 344 million

<sup>1/</sup> WDI

investment rates and impressive productivity growth for an economy at its development level. Almost all Indonesians would be classified as middle income by today's standards. Agriculture's share of GDP will have fallen to 7 percent. Compared to 1980, the country will have been truly transformed in all aspects of the economy and society.

As expected, under the pessimistic scenario Indonesia would be considerably less well off. Its total GDP and its per capita income would be about half of the optimistic levels. Furthermore, only three fourths of the population would be classified as middle class. While by global standards—particularly when compared to South Asia and much of Africa,

Indonesia would be better off, given its resource base and its potential, this outcome must be considered unacceptable.

### PHILIPPINES

Its record during the past thirty years does not qualify the Philippines as a converging economy. If these long term trends were to continue and used as the base (or business as usual) case, the scenario postulated by the Centennial model would be equivalent to the pessimistic scenario in Table 3.4.

While the country would be better off by 2040, its progress under this scenario cannot be considered satisfactory. Its total GDP would increase from US\$207 billion to US\$529 billion, at an annual average growth rate of 3.3 percent. Given the country's high population growth rate (1.5 percent per year) its per capita income would not even double (compared to six to seven fold increase in Indonesia and Vietnam, and 5.8 times increase in developing ASEAN as a whole). Less than half of the population would enter middle class status. In the early 1950s, the Philippines was the most advanced developing country in Asia (even ahead of South Korea). Under this scenario, it will become one of the laggards by 2040.

On the other hand, if the country can overcome some of the structural, policy and institutional hurdles and rectify many symptoms of the middle-income trap, it could rejoin the group of dynamic Asian economies and achieve the promise of the optimistic scenario. Under this scenario, its productivity growth would accelerate rate to 2.8 percent (from 1.1 percent) and overall investment rate rise. Combined with its potential demographic dividend, they would raise its average annual GDP growth to 5.9 percent (same as Indonesia). Sustaining this higher growth through 2040, the country's GDP would rise to US\$1.1 trillion and its per capita GDP would rise to almost US\$7,900, almost a fourfold increase from 2010. In turn, some 76 percent of the Philippines population of 142 million would enter the middle class. Obviously the country must strive for this scenario. However, only a higher GDP growth will not be adequate. The country must simultaneously tackle the current large inequities and the major gap between rural and urban incomes. Robust growth of agriculture sector will be a key factor in these efforts. Moreover, a more robust growth in agriculture production will reduce the need to import food and enhance the country's food security.

**TABLE 3.4: PHILIPPINES SCENARIOS**

	2011	2040 (optimistic)	2040 (pessimistic)
GDP (constant 2010 billion US\$)	207	1,119	529
GDP per capita (constant 2010 US\$)	2,182	7,898	3,730
average GDP growth rate (2011–2040)	--	5.9%	3.3%
average TFP growth rate (2011–2040)	--	2.8%	1.1%
% of population at least middle class	25%	76%	41%
poverty below \$1.25 per day <sup>1/</sup>	18%	0%	3.8%
population (millions)	95	142	142
urban population (millions)	46	87	87
rural population (millions)	49	55	55
agriculture as % of GDP (high TFP)	12%	7%	15%
agriculture as % of GDP (low TFP)	12%	5%	12%

Source: Centennial Group

<sup>1/</sup> WDI

# CHAPTER 4. AGRICULTURAL SECTOR PERFORMANCE 1980–2011: UNDERLYING POLICIES AND STRATEGIES

## ASEAN CONTEXT

Despite a few interruptions such as the 1997–98 Asia financial crisis, ASEAN countries enjoyed an agricultural production growth averaging 2.7 percent per year during 1985–2010. Major contributing factors to this growth were decisive market policy reforms, gradual adoption of modern technologies (e.g., mechanization and more intensive use of inputs) and the embrace of globalization; robust global demand for raw materials and agricultural products were also contributing factors. However, the sector lagged behind the overall GDP growth rate (5.0 percent) and as a result its share of GDP declined from 22 percent to 12 percent, a relatively low percentage that should facilitate future trade negotiations.

Several common characteristics can be found among the agricultural sectors of ASEAN countries. The contribution of agriculture to GDP growth is declining, but a significant share of the population is still employed in farming and fishing. A majority of the poor live in rural areas and, of these, the largest proportion is engaged directly in agriculture. Non-farm activities are growing in importance as the primary pathway out of rural poverty. Value added is dominated by the crops subsector, and rice in particular. And important shares of manufacturing and services are dependent on agriculture.

Presently five out of the eight developing ASEAN member countries have a surplus trade balance in agricultural products; the rest are net food importers and rely on international trade to feed their population. Indonesia enjoys a buoyant and rising overall agricultural trade surplus largely driven by the phenomenally rapid increase in oil palm exports. Vietnam has gradually increased its exports largely due to rice, fisheries and coffee, and only the Philippines is facing a rising deficit. Rice is an important factor in ASEAN

trade. According to the US Department of Agriculture 2012 estimates, the top ten rice exporting countries include four ASEAN members: Thailand (8.0 million tons), Vietnam (7.0 million tons), Cambodia (0.95 million tons) and Myanmar (0.75 million tons). By comparison, ASEAN importers in 2010 were: Philippines (2.6 million tons), Malaysia (1.0 million tons) and Indonesia (0.8 million tons). As these figures clearly show, ASEAN countries enjoy a large surplus of rice that is being exported around the world.

During this period the share of rice production in total agricultural output has remained constant at about 20 percent, with the ASEAN group steadily maintaining its role as a rice exporter. Crops other than rice experienced an increase in value terms but their share of the total has declined slightly. The share of livestock in total output remained fairly stable at around 16 percent of the total but that of aquaculture nearly doubled to 9 percent and represented a growth pole for the ASEAN region.

Although the relative economic importance of agriculture, fisheries and livestock production has decreased steadily to about 12 percent of GDP in 2010, these figures understate the total contribution of the sector. Capturing the true importance of agricultural contribution to GDP requires going beyond the production phase of the value chains in order to include the share of manufacturing (e.g., food and beverage industries) and service sector activities directly dependent on the existence of domestic agriculture and fisheries production. A vastly different picture emerges once these activities are taken into account. Cross-country studies show that modern agribusiness (including input supply, farming, processing and marketing, including logistics, distribution and support services) accounts for a far larger share of GDP than the production phase alone. For example, in Indonesia, while agriculture accounts for only 20 percent of GDP, agribusiness (which includes agriculture) contrib-

utes 33 percent; the corresponding figures for the Philippines are 17 percent and 35–45 percent, and Vietnam 20 percent and 20–30 percent (as there are no reliable data on agro-processing these are rough estimates based on the low value added in Vietnam). Comparable figures for other ASEAN members are 11 percent and 43 percent in Thailand, and 13 percent and 36 percent in Malaysia.

### VIP COUNTRIES PERFORMANCE

Between 1980 and 2010 agricultural growth rates in VIP countries varied considerably. In Vietnam the robust growth of 3.6 percent included substantial increases in rice production, which transformed the country from a rice importer into a major rice exporter, as well as growth of aquaculture. By comparison, Indonesia's agricultural growth rate was a more modest 3.0 percent per year, still well above the population growth rate. However, this figure masks the fact that much of the increase has been in tree crops for export while food production for the local market has barely kept pace with the population growth rate. In the Philippines the agricultural production growth of 2.0 percent lagged behind

its population increase and rising domestic demand for food (Table 4.1).

The resulting agricultural GDP for the VIP countries is shown in Table 4.2.

Considering the production of rice during this period (Table 4.3), Vietnam has made spectacular progress, increasing production by some 4.2 percent per year and, in the process, transforming itself from a rice importer to a major exporter. Indonesia has also been successful in expanding production, while the Philippines with its low productivity growth rate, rapid population increase and virtually no decline in per capita consumption of rice, struggled to maintain production in line with demand. Major factors contributing to production expansion were yield increases made possible by improved and expanded irrigation systems, the introduction of high-yielding varieties, and a more intensive use of fertilizers and other farm inputs. ASEAN has been a consistent net exporter of rice, but in the absence of firm arrangements for regional trade, Indonesia and the Philippines have been reluctant to rely on the other members

**TABLE 4.1: AGRICULTURE PRODUCTION IN VIP COUNTRIES HAS GROWN STEADILY  
 BETWEEN 2–4% OVER THE PAST 30 YEARS**

	1980–1990	1990–2000	2000–2011	1980–2011
Vietnam	N/A	4.3%	3.5%	3.6%*
Indonesia	3.7%	2.0%	3.4%	3.0%
Philippines	1.2%	2.0%	2.8%	2.0%

Source: WDI

Note: \* for 1985–2011

**TABLE 4.2: INDONESIA MAKES UP ROUGHLY HALF OF VIP COUNTRIES' AGRICULTURAL PRODUCTION  
 (2000 CONSTANT US\$ BILLIONS)**

	1980	1990	2000	2011
Vietnam	N/A	5.0	7.6	11.1
Indonesia	14.8	21.2	25.7	37.4
Philippines	8.3	9.3	11.3	15.3

Source: WDI

**TABLE 4.3: PADDY PRODUCTION HAS RISEN MORE SHARPLY IN VIETNAM**

paddy production (million tons)	1980	1990	2000	2011	1980–2010 annual growth rate
Vietnam	11.6	19.2	32.5	40.0	4.2%
Indonesia*	29.7	45.2	51.9	66.4	2.7%
Philippines	7.6	9.9	12.4	15.8	2.4%
ASEAN	84.4	111.3	152.4	200.8	2.9%

Source: FAO

Note: If we rely on the official and FAO statistics, Indonesia should be exporting considerable quantities of rice when in fact it has to resort to imports most years. The team questions these production figures. A more realistic estimate of the 2011 paddy production in Indonesia is about 54 million tons.

**TABLE 4.4: AGRICULTURE TFP GROWTH RATES**

	1970–1980	1980–1990	1990–2000	2000–2009	1980–2009 annual growth (%)
Vietnam	1.9%	1.4%	2.9%	2.5%	2.3%
Indonesia	1.5%	0.8%	1.3%	3.4%	1.8%
Philippines	2.9%	0.2%	1.4%	2.5%	1.3%

Source: Data for the study countries from Keith O. Fuglie database and for SE Asia from Fuglie's Chapter 4 Total Factor Productivity in the Global Agricultural Economy: Evidence from FAO Data, 2010

(or international trade in general) to supplement domestic production shortfalls.

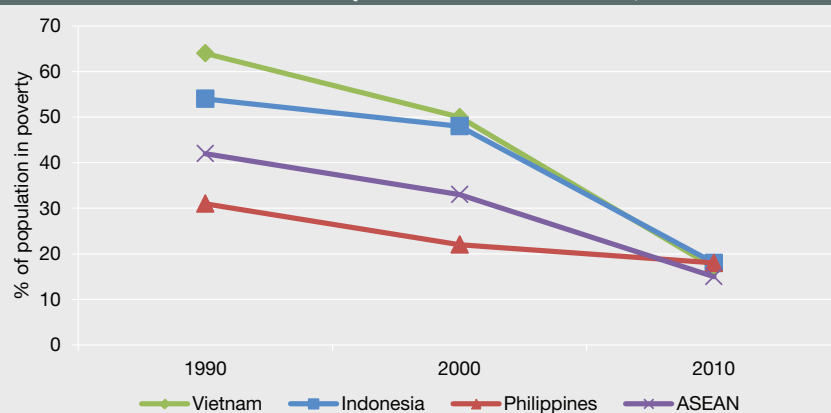
The private sector has driven a considerable increase in poultry and pork production over the last 20 years in VIP countries. Local and international agribusinesses have made large investments in feed milling, breeding stock farms and slaughter and processing facilities, with various degrees of growing animals on own account or under an out-growing system.

Higher agricultural productivity accounted for much of the agricultural growth during this period in all three countries given the constraints on the acreage of arable land available. The productivity resulted from was some expansion of irrigation systems, increased use of dwarf hybrid grain varieties, and more intensive use of fertilizers and pesticides. Expansion of croplands played a relatively minor

role, except in the case of tree crops in Indonesia. Vietnam registered the highest average annual growth rate of TFP at 2.2 percent but there is some indication that these growth rates may be slowing down. Indonesia's 1.8 percent growth in TFP was mainly due to vibrant performance of tree crops in the outer islands; on Java, the main rice producing island, average annual TFP growth over the past thirty years was a stagnant 1 percent. The Philippines with 1.3 percent TFP growth was considerably below its potential and well behind the performance of the other two countries. The analysis indicates that the three countries are presently under investing in agriculture (especially on research, irrigation and rural infrastructure) and this will have to be changed in order to accelerate the growth in TFP necessary to meet projected demand for additional food.

As incomes kept rising during this period dietary habits in VIP countries have changed. Although the actual rate of

**FIGURE 4.1: POVERTY IN VIP COUNTRIES HAS DECLINED SUBSTANTIALLY SINCE 1990, ESPECIALLY IN VIETNAM AND INDONESIA (LESS THAN \$1.25 PER DAY; % OF TOTAL POPULATION)**



Source: IMF World Bank WDI; Centennial Group estimates

change varies between the countries, the direction is unambiguous: a steady decline in the role of rice in tandem with increased consumption of high value perishable items such as fruit, vegetables, meat, milk, eggs and fish. Nevertheless, rice remains a dominant crop and is the single most important source of calories. In the Philippines and Indonesia the share of rice is nearly half of the caloric intake, while in Vietnam it still approaches 60 percent despite a steady drop in recent years. Rice also remains the biggest crop in terms of land area in all three countries. See Chapter 6 for further discussion of changing diet in VIP countries.

Rapid growth in the general economy and in the agricultural sector had significant impact on poverty. Various studies have shown the importance of the sector in poverty alleviation as well as its vulnerability to climate change. Even though much of the growth during the recent past favored skilled over unskilled labor, capital over labor, and urban and coastal areas over rural and more remote regions, the ASEAN members and VIP countries achieved remarkable success in lifting people out of poverty as can be seen in Figure 4.1. It should be noted, however, that this achievement was associated with rising income inequalities. As incomes kept rising during this period dietary habits in VIP countries have changed.

### VIP COUNTRIES: POLICIES AND STRATEGIES DRIVING AGRICULTURAL PERFORMANCE

Numerous policies have helped shape the performance of the agricultural sector. While many have been beneficial and contributed to the overall positive growth, others have been less useful and at times have resulted in unnecessary expenditures and faulty outcomes. In conducting the country reviews special attention was given to the following issues, policies and strategies that have a substantial impact on the sector's performance: food security, self-sufficiency and rice reserves; agricultural research and extension; land issues; irrigation; impact of decentralization and governance; issues related to , fisheries and livestock; and climate change. Policies on food security and rice self-sufficiency are discussed in the next chapter; all others are discussed below. A summarized review of these and other findings relevant for VIP countries is presented in Annexes 2–4, and a more comprehensive analysis can be found in the full country reports.

#### AGRICULTURAL RESEARCH AND EXTENSION

Research efforts in the 1980s and 1990s have yielded considerable returns and supported the growth in agricultural productivity in VIP countries. More recently, however, despite ample evidence of high returns on investments in

agricultural research,<sup>1</sup> funding levels have been inadequate and there is excessive reliance on the public sector to conduct research and to disseminate results to farmers. Conditions are further exacerbated by declining research capacity, the low level of basic and applied research being carried out, the failure to engage all the interested stakeholders in determining research priorities, and the conduct of considerable research activities without a clear dissemination strategy. Furthermore, while global private funding is commonplace in high-income countries, only the tree crop sectors of Indonesia and the Philippines have managed to take advantage of such opportunities. Shortcomings in research are particularly widespread in Indonesia and the Philippines and, to a lesser extent, in Vietnam.

Four other factors have undermined the effectiveness of research activities. First, a growing fragmentation of responsibilities for agricultural research and extension between a number of central agencies and provincial governments is an important weakness, impeding the crucial role of technological progress in sustainable agricultural growth and may impact future growth of TFP. Second, while many countries have undergone a shift in the management of research activities whereby closer links are being established between research institutions, private sector actors in agriculture, farmers and extension services, such a change is as yet not firmly established in VIP countries. Third, decentralization of extension activities to local governments in Indonesia and the Philippines has resulted in serious deterioration in the government's capacity to deliver such services. Fourth, inadequate use is being made of the extensive potential of private sector actors (input suppliers, processors, traders, etc.) to provide more effective extension services. These failures present a considerable challenge to the transformation required in the sector and to VIP countries' food security.<sup>2</sup>

### LAND ISSUES

Over the past thirty years, per capita arable land availability has declined by 17 percent in Indonesia, 34 percent in Vietnam, and a whopping 47 percent in the Philippines. Indonesia, and Vietnam have been losing prime food croplands to industry, urbanization, and infrastructure, and have few viable options for opening up new lands for food crops (except for the Outer Islands in Indonesia). Land availability is thus becoming a constraint.

The absence of secure land titles inhibits land consolidation and the smooth flow of agricultural credit. Another land-related issue affecting growth is the absence of secure land ownership titles and the slow rate at which land titles are extended to farmers. In the case of Indonesia, previous efforts to extend land title have progressed extremely slowly. The Philippines is facing the added uncertainties about the future of the agrarian reforms. In Vietnam the current agriculture land "ownership" pattern makes it difficult for many farming families to make a living income because farm sizes are small and consist of many parcels. Lack of titles is constraining long-term investments in agriculture and is preventing farmers from using land as collateral to obtain credit. Analysis of credit availability shows major constraints both for smallholders and small enterprises engaged in production and agro-industries. Without specific actions to address constraints in the financial sector,<sup>3</sup> simply giving farmers secure land titles may not necessarily have resulted in greater access to commercial credit; however, widespread titling of land is likely to accelerate large-scale land consolidation (potentially mainly through leasing).

In the case of the Philippines the split responsibilities for land distribution and titling across many agencies, depending on their respective target communities and areas, is a further constraint. The legislation for a Land Administration and Reform Act (LARA), which would bring together the many agencies within a Land Administration Authority, has been awaiting approval in Congress for many years. Finally, as the farming population ages and the number of part-time

<sup>1</sup> A comprehensive analysis of returns to R&E can be found in a forthcoming book: *Productivity, Growth in Agriculture: An International Perspective* (Keith O. Fuglie, Sun Ling Wang and V. Eldon Ball, eds). Oxfordshire, UK: CAB International.

<sup>2</sup> Marco Ferroni and Paul Castle: *Public-Private Partnerships and Sustainable Agricultural Development—Sustainability 2011*

<sup>3</sup> Frequently mentioned issues are insufficient financial intermediation and financial services (including financial risk management instruments) for agriculture, particularly for small farmers

farmers increases, the absence of land titles inhibits the leasing of holdings and hampers the rapid mechanization of farming activities. Additional issues in Vietnam pertain to the land leasing arrangements between government and the farmers; it would appear there are no clear policies on supporting farmers whose land leases are set to expire in 2013, which in turn prevents them from applying new technologies and expanding their production areas.

### **IRRIGATION**

Various reports prepared in the three countries point to negative trends in the conditions and performances of the overall irrigation systems largely due to inadequate maintenance, improper initial designs, failure to complete the construction of some systems, inadequate storage capacity to cover the command area during the dry season, failure to effectively engage farmers in the operation and maintenance of even small scale systems, and management and regulatory issues affecting irrigation efficiency. Many of the systems are deteriorating rapidly just as changing monsoon patterns make the dependence on irrigation all the more vital.

Conditions in Vietnam help to illustrate this point. There is evidence that around a quarter of most schemes developed during the 1960s cannot be used because they need to be completed or because of the collapse or deterioration of water control structures or other technical problems. It is likely that a large and costly program of upgrading and rehabilitation will be required to safeguard production in the future. With climate change expected to create a premium on water availability, there is a need to introduce water-saving techniques (e.g., soil moisture monitoring and drip irrigation). However, these improvements cannot be adopted without considerable further modifications of most of the existing systems; nor can they be readily used in the production of high value crops for which there is a growing demand.

In Indonesia and the Philippines, the irrigation budget falls far short of the funding required for remedying exist-

ing shortcomings.<sup>4</sup> Indonesia provides an example of the decline in the resources allocated to irrigation. While in 2003 the share of irrigation in national agricultural spending amounted to 32 percent, this total fell to 16 percent in 2008 and does not seem to have increased since.<sup>5</sup> Compounding these shortcomings are problems of land fragmentation, loss of the irrigation cadre of field staff, disinterest in many local governments in this field, and the conversion of agricultural land to other uses (estimates of this on Java range from 50,000 ha per year, to about 140,000). These conditions point to potential threats to the future of rice production, at least in irrigated lands.

### **DECENTRALIZATION**

Extremely long histories of centralized government activity, political control and social organization characterize VIP countries. The institutions that have grown out of these long histories vary radically from country to country, but all provide the context in which these societies approach the risks arising from poverty and famine.<sup>6</sup> Before 1990 most government structures of countries in Southeast Asia were highly centralized, but since then, considerable political and economic responsibilities and authority have been devolved to sub-national units. With its “big bang” decentralization program of 1991, the Philippines spearheaded these changes. A decade later, in 2001, Indonesia embarked upon an even more ambitious decentralization process. Vietnam is also undergoing a decentralization process since the late 1990s, albeit more incrementally.

Initially the result of the decentralization process in the Philippines and Indonesia was encouraging. Intergovernmental fiscal systems were institutionalized, and civil service workers were transferred from central ministries to local authorities. However, decentralization has not been an overall success and despite the importance of the agriculture sector, it has not produced effective means of dealing with the constraints faced by small farmers in the adoption

<sup>4</sup> This situation has been reversed last year in the Philippines when the government allocated substantial additional funding to the National Irrigation Administration.

<sup>5</sup> World Bank: Research Working Paper—Who is Benefiting from Fertilizers Subsidies in Indonesia?

<sup>6</sup> Timmer 2012.



of new technologies. Of particular relevance to the sector is the management of research and extension. While some improvements have been made in these areas, research and extension agencies continue to suffer from an incomplete reform agenda, continued confusion over lines of responsibility between central and local governments, and inadequate capacity and budgetary support.

### GOVERNANCE

For the purpose of this study we examined three broad dimensions of governance<sup>7</sup> that capture the following: i) government effectiveness (quality of public and civil services and the quality of policy formulation and implementation); ii) regulatory quality (formulation and implementation of sound policies and regulations governing the private sector); and iii) control of corruption (both petty and grand forms of corruption and “elite capture”). Despite some recent improvements in governance indicators, the scores for VIP countries are still relatively low, even in comparison with other ASEAN countries (see also Box 4.1). With an efficient and effective public sector being a critical pre-requisite to rapid economic growth, further improvements are imperative as they will affect the future performance of the agricultural sector.

“We have to eradicate corruption structurally and culturally . . . This country will be destroyed if we do not stop the growth of corruption.”<sup>8</sup> Despite numerous such high level pronouncements about combating corruption, much more needs to be done. For example, in 2005 Indonesia’s anti-corruption agency had a staff of only 305 and a budget of \$18 million compared with 1,194 and \$85 million in Hong Kong.<sup>9</sup> Corruption is relevant to our study since it discourages investments by the private sector and creates uncertainties in the agricultural sector and throughout the economy. Eradicating corruption admittedly is a prolonged process given the numerous entrenched vested interests. However, the failure to tackle this issue expeditiously will continue to inhibit growth. A promising start has taken place in the

Philippines in the recent past with the current regime’s emphasis on anti-corruption measures.

Government effectiveness is also reflected in its planning and related actions. In this context, unrealistic planning targets were encountered in all three countries. Further complications arose due to a high degree of planning incoherence that makes much policy and program development ineffective. Below are a few examples to illustrate this point:

- **Overly optimistic target setting:** Overly optimistic target setting: Indonesia has set an ambitious annual target of 10 million tons of rice stocks by 2014, and is looking to cut down consumption and boost domestic yields and production. In all likelihood, however, the outcome will continue to be rice imports (similar plans have been announced in the Philippines). Another official target is to be self-sufficient in beef production by 2014, when 50 percent of all beef consumed is currently imported from Australia (in 2011 annual imports exceeded 7 million tons). Comparable targets were announced for corn, soybeans, and sugar. It is unclear what such announcements and policies are expected to achieve; indeed the only fortunate aspect is that in most cases no actual steps are taken to accomplish these goals but they are likely to sap energy from actual achievable, worthwhile goals.
- **Import bans:** A major step frequently adopted as part of the target plan is an import ban, whether on the grand scale of rice, where the policy does little to enhance Indonesia’s food security, or the smaller one of beef, where one more commodity in the Indonesian market becomes highly overpriced, leading to skewed dietary choices.
- **Livestock:** The governments of VIP countries have introduced livestock developmental policies and strategies that are extremely ambitious, expensive in terms of public expenditure and in most cases overly optimistic considering the prevailing market conditions and technical results achieved by livestock farmers in the past.

<sup>7</sup> World Bank Institute—Worldwide Governance Indicators. The governance scores are based on a range of +2.5 to -2.5. [http://info.worldbank.org/governance/wgi/sc\\_country.asp](http://info.worldbank.org/governance/wgi/sc_country.asp)

<sup>8</sup> Inaugural address 2004: Susilo Bambang Yudhoyono—President of Indonesia.

<sup>9</sup> UNDP: Tackling Corruption, Transforming Lives—Accelerating Human Development in Asia and the Pacific (2008).

### Box 4.1: GOVERNANCE AND PRIVATE SECTOR COMPETITIVENESS

The Global Competitiveness Index rankings show that if Malaysia is accepted as the standard for ASEAN countries (even though Singapore's ratings are much higher), the three study countries, especially the Philippines, have considerable scope for improvement in governance. For example, VIP countries are far behind Malaysia in all of the subcategories given in the table below: public institutions, government inefficiency, wastefulness of government spending, and ethics & corruption. The same variations between the members of ASEAN exist in the rankings for "Ease of Doing Business". Singapore, Thailand and Malaysia are at the top, and the remaining six members (there are no ratings for Myanmar) are far behind.

Progress in the agricultural sector will increasingly depend on an enhanced role of the private sector and on its competitiveness. The gap between the VIP countries elsewhere within ASEAN points to the imperative of improvements in governance.

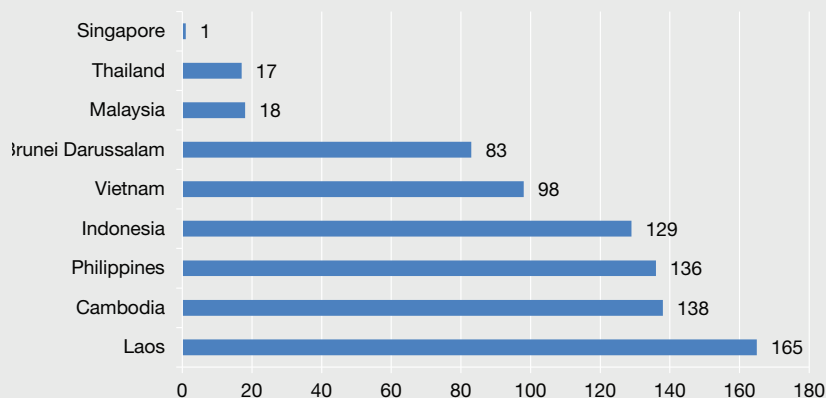
**Box 4.1 Table 1: VIP countries need to enhance competitiveness**

Global Competitiveness Index	Vietnam	Indonesia	Philippines	Malaysia	Thailand
Competitiveness index	4.24	4.38	4.08	5.08	4.52
public Institutions	3.64	3.78	3.04	4.84	3.7
government inefficiency	3.34	3.79	2.88	4.79	3.83
wastefulness of government spending	2.73	3.87	2.59	4.61	3.55
ethics & corruption	3.42	3.24	2.37	4.51	3.13

Source: World Economic Forum Global Competitiveness Index

Note: These scores are values from a weighted index; higher scores are better scores

**Box 4.1 Figure 1: VIP countries can improve in the Ease of Doing Business relative to other ASEAN countries**



Source: World Bank Doing Business Report 2012

### FISHERIES

Substantial productivity improvement in raising fish is technologically feasible; large marine areas remain available for mariculture expansion. Maintaining sustainable production growth will require a coherent set of policies and regulations to guide effective research, technology transfer and capacity building. Productivity would also benefit from an efficient transport network, a functioning land market, improved

water management and effective downstream distribution and marketing chains to minimize post-harvest losses. Research should focus on brood-stock quality and distribution of hatchery products. While disease control has improved, shrimp pandemics still occur. The environmental impact of fish culture on water quality and gene pools remains serious. Producer dependence on increasingly expensive and scarce, mostly imported, fishmeal (and local trash fish in Vietnam) remains high.

Restrained global availability of small-pelagics and expanding global demand for higher value fish will constrain the countries' ability to satisfy domestic demand through trade.

Although Vietnam is furthest along in preparing for more effective management of marine fisheries, the country faces specific issues maintaining its inland fish catches, which support a major artisanal fishery; it also needs to address pollution constraints. Indonesia and particularly Philippines face institutional constraints in developing healthy coastal fisheries.

**LIVESTOCK**

Besides government policies concerning import and export of feed components and animal products, the main challenges for agribusiness are the general consumer preference for fresh meat and how best to incorporate the smallholder livestock farmers in the formal poultry and pig value chains. Considering the high price of traditional livestock products, it would seem wise to devise options to enable smallholder farmers to remain active in the sector. The traditional sector lacks efficient value chains branding the product, guaranteeing quality and linking up with the urban markets. Assistance for developing such value chains and creating better outlets will enable many smallholder farmers to generate more income and make a living out of

a relatively small number of animals. Another issue facing the sector is an inadequate structure of veterinary services that will have to be restructured into a model that is more effective in controlling animal diseases.

With VIP country's governments restricting grazing reserves, an increase in ruminant meat availability will have to be derived from more integration of crop-ruminant production, increased forage and feed production on agricultural land, import of weaners from countries where it is cheaper to run cow-calf operations for feed-lotting and/or rely on import. Input costs and international meat prices will determine which way is the most economic. The dairy sector as a special ruminant production segment has especially in Indonesia and Vietnam seen a private sector driven development, whereas in the Philippines the role of government in this has been large, but not as successful as in the other two countries. The future of this sector will depend to a large extent on the ASEAN FTA and national governments' policies towards the import of dairy products and protection of their home dairy sector as an important contributor towards creation of rural income and job opportunities.

Country specific issues include: low self-sufficiency in animal feed in Vietnam; inadequate inter-island infrastructure to readily transport at lower costs animals from the Eastern Islands to Java in Indonesia; and high domestic meat prices

**TABLE 4.5: KEY CONSTRAINTS FOR AGRICULTURE: 2012 AND 2040**

	Vietnam		Indonesia		Philippines	
	2012	2040	2012	2040	2012	2040
land	▲	▲	▲	▲	▲	▲
research and extension	▲	▲	▲	▲	▲	▲
water constraints	▲	▲	▲	▲	▲	▲
irrigation	▲	▲	▲	▲	▲	▲
labor shortages	▲	▲	▲	▲	▲	▲
farm mechanization	▲	▲	▲	▲	▲	▲
investment capital	▲	▲	▲	▲	▲	▲
credit	▲	▲	▲	▲	▲	▲
climate change & natural disasters	▲	▲	▲	▲	▲	▲

▲ = serious concern    ▲ = intermediate concern    ▲ = no concern

are encouraging large scale smuggling that is adversely affecting the local industry and smallholder pig and poultry producers in the Philippines.

in VIP countries, and the issues are briefly summarized by country in Table 4.6.

## KEY CONSTRAINTS TO AGRICULTURAL TRANSFORMATION AND FOOD SECURITY

Table 4.5 summarizes the key constraints and their relative intensity to agricultural transformation and food security

**TABLE 4.6: KEY CONSTRAINTS FOR AGRICULTURE IN VIP COUNTRIES: 2012 AND 2040**

	Vietnam	Indonesia	Philippines
land	Most suitable land is already used; viable agricultural land is being lost at a high rate to urban and infrastructure development	No shortage for tree crops; growing constraints for food crops on Java	Most suitable land is already under cultivation; forest area that has been degraded can be used for tree crop; coconut farms can be intercropped
water constraints	60% of water flows come from neighboring countries, which requires monitoring	No immediate constraints on Java, but limited storage capacity will exert pressure on dry season water availability	Serious problems are expected to be looming in some areas, but the magnitude is unknown for lack of data
labor shortages	No immediate shortages expected; aging of the farming population may become an issue	No immediate shortages expected	The farming population is aging and shortages will develop in some areas over the next several decades
irrigation	Presently the irrigation systems are frequently incomplete, poorly maintained and in urgent need of upgrading. By 2040 we anticipate the systems to have been fully upgraded and properly maintained		
farm mechanization	There is a need for mechanization strategy involving the private sector with government to demonstrate realistic mechanization options	It is too early to advocate widespread mechanization on Java; there is limited scope of mechanization of tree crop production on the Outer Islands	There is less scope for mechanization given the relative abundance of low cost rural labor
capital	All three countries will require a substantially higher investment level in the sector as well as related infrastructure		
credit	Agricultural credit will become an increasingly important issue in Vietnam as farms are consolidated into bigger units and commercial farming becomes more prevalent	Additional credit will clearly be beneficial for the production of food crops; there is also a huge demand for financing various replanting schemes but a cess system will be more appropriate	Agriculture receives only 2.5% of all credit; credit must increase for growth of the sector
research and extension	Current programs are excessively supply driven and do not answer to the type of concerns that farmers have	Research needs to be organized under a single ministry and topics need to be prioritized by that ministry	Strength is needed at the provincial level in order to reverse negative effects from decentralization in the 1980s
climate change	Vietnam needs to accelerate the uptake of well known and currently practiced autonomous adaptation measures by farmers, to fully counter the negative combined impact of 10-15% on yields since land availability is unrelated to climate change	Indonesia needs to complete unfinished sector reforms and accelerate the uptake of known adaptation technologies to achieve an additional 10-15% increase in agricultural productivity by 2050 just to offset the impact of climate change	Emerging issues as a result of climate change matter a lot and there may be some questions whether the current forecasts of no major issue until 2040 may be too optimistic
natural disasters	In recent years there were more typhoons with higher intensity affecting Vietnam with a typhoon track that has shown a tendency to move southward	El Niño events have become more frequent and climate-related hazards have increased over the past 5 decades in Indonesia	Any increase in intensity of extreme weather events will have important implications for food production because typhoons hit some of the important agricultural areas in Luzon and the Visayas

# CHAPTER 5. FOOD SECURITY, RICE SELF-SUFFICIENCY AND RESERVES

## INTRODUCTION

“National food autarky has not been a reliable way to improve food security or broader economic welfare in the long run and this is likely to be increasingly true in the future if climate change adds to production variability, requiring greater trade to even out supplies across countries.”<sup>1</sup>

We have interpreted food security to mean more than availability by also including affordability and nutritional content. To that end, when analyzing food security we also considered the following:

- Rice is by far the foremost cereal being consumed in VIP countries.
- The rice traded on the world market represents a fairly small fraction of total production.
- ASEAN has been a consistent net exporter of rice.
- There is growing demand for rice in markets outside Asia (Sub-Saharan Africa’s rice imports increased from 0.5 million tons in 1961 to 10 million tons in 2009, and now account for a third of global rice imports).
- Considerable volatility in rice prices has been the norm in recent years.

Market interventions by governments insert substantial uncertainties in the rice trade. Although the role of rice in the daily diet of VIP countries has gradually diminished over the past 30 years, it remains an important food item. Our analysis of food security has therefore focused on this one commodity but this should not be construed to mean that other commodities (e.g., wheat), which are assuming in-

creasing importance in local diets, can be ignored. However, unlike in the case of rice there is greater willingness by VIP countries to rely on international trade to balance supply and demand for the other grains though this may be changing in Indonesia and, to a lesser extent, in the Philippines. In light of these factors, a focus on rice for this study was deemed appropriate while considering food security.

Food security issues have always been and still remain on the welfare and political agenda of VIP countries; indeed, policy actions to improve food security in these countries have the potential to radically destabilize the world rice market, and hence have an impact on global food security.<sup>2</sup> Food security issues in the ASEAN region will be greatly influenced by changes emerging from the ASEAN Trade in Goods Agreement (ATIGA), which provides for phased elimination or reduction of all import duties for all goods (with some exceptions), under the ASEAN Free Trade Area (AFTA). An explicit exception is made for rice and sugar under a Protocol for Special Consideration, which calls for bilateral agreements between an importing country, and a rice and/or sugar exporting country. The ATIGA also provides for trade facilitation and harmonization. ASEAN has also entered into various trade expansion agreements with Australia, China, India, Japan, and New Zealand.

## RICE PRODUCTION POTENTIAL IN OTHER ASEAN COUNTRIES

A quick review of potential for expanding ASEAN rice production conducted by the review team indicates considerable scope for growth.

<sup>1</sup> Peter Timmer: Behavioral Dimensions of Food Security (November 17, 2009).

<sup>2</sup> Timmer, C.P., 2011. Food security in Asia and the changing role of rice (Occasional Paper No. 4. The Asia Foundation, San Francisco).

**TABLE 5.1: SELECTED ASEAN RICE YIELDS (TON/HA)**

	1980	2010
Vietnam	2.1	5.3
Indonesia	3.3	5.0
Philippines	2.2	3.6
Cambodia	1.2	3.0
Myanmar	2.8	4.1
Thailand	1.9	2.9

Source: "Present Rice Production Situation and Future Potential in Myanmar". Ye Tint Tun - General Manager Myanmar Agriculture Service

### MYANMAR

The country was the world's largest exporter in the 1960s and has the potential to boost rice production by doubling current yield levels. Furthermore, the anticipated acceleration in GDP growth and higher per capita incomes will lead to declining per capita rice consumption, which will release additional quantities for exports. A January 31, 2012 report by Bloomberg, highlights Myanmar's potential to boost overseas trade and economic growth as its government pursues reform. The Bloomberg report also projects 2012 rice exports from Myanmar to double to 1.5 million metric tons in 2012.

### CAMBODIA

According to FAO, Cambodia has more potential arable land than both Laos and Vietnam; and yet Cambodia currently only uses less than 30 percent of its total potential arable land, which is substantially lower than other countries in the region. Furthermore, just 30 percent of the area suitable for irrigation has been developed into agricultural land. There is thus considerable potential for Cambodia to develop agriculture particularly rice through land expansion and irrigation development. These developments will, however, require considerable improvements in trade logistics (primarily roads and ports) as well as the business environment.<sup>3</sup>

<sup>3</sup> Cambodia's Agricultural Strategy: Future Development Options for the Rice Sector—A Policy Discussion Paper. IFPRI, November 2010

### THAILAND

Compared with wet season yields of 2.24 t/ha, dry season yields are 4.31 t/ha; with less than 20 percent of the rice area currently being irrigated, there is tremendous potential to further expand production. There are currently several plans to divert water from the Mekong River to irrigate rice lands in Thailand.

Currently Thai rice yields are lower than those in Vietnam, Indonesia, Philippines and Malaysia (FAOSTAT). Yet as the table above shows, in 1970 Thailand's rice yields were comparable to those of the other three countries. There is thus ample scope for increasing yields and production.

ASEAN is currently moving towards a single market and production based economic community by 2015. Among the priorities foci for integration are enhancement of trade among ASEAN member countries, and long-term competitiveness of their food and agriculture products. By harmonizing their standards and quality and by standardizing their trade certifications, their agricultural products are expected to become more globally competitive. Although the final shape of these agreements is still uncertain, they have received close scrutiny during preparation of this section of the report.

A major conclusion of our review is that the fundamental approach to food security, with its current focus on rice self-sufficiency at individual country level must be rethought. With the pronouncements regarding the coming economic

**TABLE 5.2: COMPARATIVE RICE STATISTICS IN MYANMAR AND VIETNAM (2010)**

	Myanmar	Vietnam
area harvested (million ha)	8	7.5
yield (t/ha)	4.1	5.3
production (million tons)	32.8	39.75
per capita consumption (kg/year)	200	115.9

Source: FAOSTAT

integration of ASEAN, if the member countries cannot rely on trade with each other to meet their short-term needs for rice, then how would the overall integration work? Should assured and open trade in rice (together with an effective joint buffer stock) be made a test case of the region's proclaimed political will to become an "economic community"?

### FOCUS ON RICE SELF SUFFICIENCY

Instead of relying on regional or international trade, the Indonesian and Philippine governments have instituted a policy of rice self-sufficiency in their quest to achieve food security, frequently mentioning the thinness and volatility of international markets and inability to participate in these markets as a justification. They also refer to: the heavy concentration of rice exports in just five countries (four of these are located in Asia that are particularly prone to unpredictable monsoons) that together account for about 80 percent of total exports; the 2008 spike in world rice prices when exporting countries such as Vietnam and India decided to restrict rice exports; and the more recent decision by the Thai government to set domestic prices at well above world market prices.

Another factor underpinning the rice self-sufficiency policy is the belief that shortages affecting this staple could disrupt orderly growth and disproportionately affect the poor. Equally important is the desire to enhance the income of small-scale rice producers. Subsidies designed to encourage domestic production are the main instrument used to promote the self-sufficiency objectives. Under this policy, management responsibility for practically all international trading activities is vested in a state agency (Bulog in Indonesia

and National Food Administration in the Philippines), which excludes the private sector from importing rice (the exclusion is virtually total in the case of Indonesia but only partial in the case of the Philippines), and imports are closely regulated. A crucial question when assessing these policies is their effectiveness and cost. In Vietnam the government regulates exports by assigning quotas to private firms.

However, widespread consensus exists among international economists that policies aimed at achieving self-sufficiency tend to distort investments in the sector, lead to higher prices for consumers, and can become an obstacle to regional integration. In the present instance, the costs of these policies, including various subsidy schemes, are substantial. When food security is equated with self-sufficiency, consumers in general but the poor in particular tend to suffer.

Often the domestic prices that result from efforts for self-sufficiency are higher than the import prices would be (in the case of Indonesia and the Philippines domestic prices in recent years were between 20 and 30 percent above the world market prices); the cost of these policies impacts all consumers but particularly the poor—notwithstanding the existence of programs distributing subsidized rice to poor households. Emphasis placed on self-sufficiency also tends to divert attention and resources from other priorities in the sector.

From the consumers' perspective, the cost is the excess of the actual price of rice in the local market over what would have been the equilibrium price of rice under an integrated rice marketing system plus a tariffs-only regime (this includes estimates of the policy's cost of protecting rice pro-

ducers). All of the above notwithstanding, Indonesia and the Philippines have experienced less volatility in domestic rice prices than many other countries—but the costs of avoiding price spikes have been substantive.

In the case of Vietnam the self-sufficiency policy manifests itself in compelling farmers in certain areas to produce rice, thereby depriving them from cultivating more remunerative crops. Rough estimates put the difference in net income between rice growing and high value crop production on some 2.0 million hectares at more than US\$2.0 billion annually.

Beyond the high economic costs of the present approach to food security, governments of the three countries face difficulties in providing appropriate services designed to enhance people's food security and access. An interventionist food policy regime in grain markets was firmly entrenched in Asia during the 1970s, with the direct involvement of the governments in the procuring-stocking-distribution chain. This involvement included the following (with varying degrees of application): accumulation and release of buffer stocks to stabilize prices; monopoly controls over international trade; restrictions on movements of grain; cheap credit and access to transportation for the parastatals; and limits on private storage. Such a regime may have been necessary in the 1970s owing to initial conditions of grain markets but these conditions no longer hold, rendering the interventionist regime obsolete.

### NATIONAL EMERGENCY RICE RESERVES

Sanguine assessments about the need for price stabilization through public agencies have given way to skepticism, due to past overestimation of benefits and underestimation of costs. Many ASEAN (and Asian) countries continue maintaining public buffer stocks in pursuit of price stabilization, well after they had become obsolete and inflicted an excess burden on society. The social mandate for a public stocking agency—to procure at prices favorable to producers, while selling at prices favorable to consumers—is inconsistent with profitability. In fact there are few examples of public

agencies that have profited from buffer stocking.<sup>4</sup> Lastly, even if effective in stabilizing prices, it is unclear whether public stocks are simply crowding out private storage.<sup>5</sup> Lack of commercial motive, together with a soft budget constraint, suggests weaker adherence to operational efficiency on the part of public storage. Releases may be targeted to the poor, i.e. as part of a safety net package in periods of price crisis or disaster emergency. Releases to the market (at market prices) may also be justified as an effort to restore calm, allay fears, and manage market expectations.<sup>6</sup>

Another option is to rely on the private sector to own and operate rice reserve facilities. The theory of private storage under competitive conditions is fairly well understood; however, it has some significant limitations in stabilizing prices since while it can eliminate negative price shocks (from an extremely large harvest) it is unlikely to eliminate positive price shocks (from an extremely low harvest). This provides a prima facie case for establishing public emergency reserves. The reliability of private storage is further undermined by departure of real world markets from rapid adjustment towards market fundamentals, tracking instead erratic (and persistent) market dynamics, as reviewed in Briones (2011). One common (but still largely anecdotal) narrative is that of hoarding in which traders withhold stocks from the market in anticipation of higher price. Such behaviour, if sufficiently widespread, can itself raise prices and further aggravate market instability.

### INTERNATIONAL AND REGIONAL RICE RESERVE SCHEMES

International food security cooperation has long been a preoccupation of the global community. The founding of the UN's Food and Agricultural Organization in 1943 was one of the first tangible outcomes of global concern with food security. The next turning point was the world food crisis of 1972–1974, which prompted the UN General Assembly to establish the International Emergency Food Reserve or IEFRR

4 Berck, P., and D. Bigman. 1993. Multiple dimensions of the world food problem. In P. Berck and D. Bigman, eds. *Food Security and Food Inventories in Developing Countries*, 1–35. Wallingford, UK: Centre for Agricultural Bioscience International (CABI).

5 Islam, N., and S. Thomas. 1996. *Foodgrain Price Stabilization in Developing Countries: Issues and Experiences in Asia*. Food Policy Review 3. Washington, DC: International Food Policy Research Institute.

6 Timmer, C. P. 2010. Reflections on food crises past. *Food Policy* 35 (1): 1–11.



(Shaw, 2005). After the next major food crisis in 2007–08, the World Food Summit of 2009 acknowledged that the global food crisis has catalyzed stronger international coordination and governance for food security.

Most recently the G20 declaration of 2011 tackled the issue of food price volatility by launching several specific mechanisms, namely: the Agricultural Market Information System (AMIS); a Rapid Response Forum to improve policy coordination; the development of market-based risk management tools for vulnerable countries, firms, and farms; and the piloting of an emergency humanitarian food reserve.

Cooperation on food security issues has made greater progress at the regional than the international level, probably because of far lower costs of coordinating a smaller group of neighboring countries. An initial initiative in Southeast Asia was the establishment in 1979 of an ASEAN Emergency Rice Reserve (AERR) scheme to enhance food security in the face of disruptions in the supply and production of rice. The scheme consisted of rice stocks that have been pledged or earmarked by member countries, and grew from an initial earmarking of 50,000 tons to 87,000 tons. When the AERR was established, food security was associated explicitly with the dimension of food availability (and stability), especially in instances of mass starvation scenarios, typically associated with disasters (e.g., drought) or war. It was this definition that influenced to scheme's objective of assigning the members' domestic emergency reserves as the frontline defense in case of disasters, as well as to prevent displacement of normal imports/exports of rice. An ASEAN Food Security Reserve Board was created to oversee implementation of the Agreement and to coordinate the flow of information (member countries were tasked to submit regularly to the Board information on government stockholding policies, programs, and other aspects of food supply and demand situation, with focus on rice).

After nearly 20 years of existence, no releases were made from the AERR and this prompted a review of the mechanism in 2001, and the initiation of a pilot scheme in 2003 at the level of ASEAN Plus Three (China, Japan, and Korea), called the East Asia Emergency Rice Reserve (EAERR). The new scheme expanded the regional reserves to 787,000

tons (primarily through contributions from the Plus Three countries). The EAERR was in turn replaced in October 2011 by the ASEAN Plus Three Emergency Rice Reserve (APTERR), which formalizes the EAERR earmarks as a permanent commitment but also added the concept of a stockpile (in cash or in kind); unlike the earmarked stocks, stockpiled emergency reserves are voluntary and are not subject to numerical commitment or obligation. As with other international initiatives, APTERR ascribes great significance to accurate market information and trade coordination.

Although procedural details of APTERR are still under discussion among member countries, it is safe to say that it is no panacea for regional food security; rather, it is a stop-gap measure that can provide valuable but incomplete protection against market instability. Minimum conditions imposed on emergency rice earmarked as stock for APTERR are as follows: (i) earmarked stocks must be under government ownership and/or control; (ii) the earmarking country is responsible for quality and cost of storage; (iii) stocks must be available in milled form and fit for human consumption when conditions for their release are satisfied. The scheme comprises two tiers and conditions for release depend on which tier is being applied. The pre-arrangement under Tier 1 is structured as a voluntary forward contract, which provides for delivery of 10,000 ton of rice from Vietnam to the Philippines at market price. The Philippines invoked the forward contract on February 2010, to support its domestic efforts to deal with the lingering effects of Typhoon Ketsana. This contract, which was completed in March 2010, is designed to ensure minimum negotiation and delays in delivery in the event of emergency.

Voluntarily donated stockpiled emergency rice reserves are directly owned and controlled by the APTERR Secretariat, and distributed for free as humanitarian food assistance. Earmarked stocks on the other hand are under the ownership and/or control of the earmarking country but the Secretariat provides a matching service between supplying and demanding countries involving coordination, facilitation, and technical guidance. In the private sector this service is typically provided by brokers or agents operating on commission basis. In the case of APTERR the service is provided

for free, as the Secretariat's operational costs are already fully funded by member contributions.

To reduce storage cost borne by the collective scheme, the APTERR Agreement provides for a voluntary storage, that is: a donor country donating stocks, a prospective recipient country, or other host country, may volunteer to store or “host” stocks that have been donated. In short, the earmarking system combined with host country arrangement effectively outsources the storage and release functions of APTERR; the collective scheme therefore incurs only the cost of coordinating these functions.

Despite the scheme's advantages, a more direct approach would be to address the underlying gaps in the food distribution system that make it vulnerable to shocks. APTERR may in fact be supportive of efforts to deepen specialization and interdependency in the food marketing system, if it can be seen as a credible device in (rare) cases of market failure. One advantage of the earmarking system is cost-effectiveness: it imposes no additional financial burden of procuring and storing stocks for the regional scheme. It does this by leveraging existing national rice reserves by making them available for international flows. In a practical way, such leveraging reduces the operating cost of APTERR and underpins its financial viability. Another way to view this is that international cooperation effectively increases the size of standby stocks available to meet an emergency in any member country, without actually requiring increases in total emergency reserves of the region. (The premise of course is low covariance of food emergencies across countries).

Moreover, releases from APTERR during emergencies may be quicker and more reliable than normal commercial imports partly because importers may be vulnerable to the hoarding problem. Based on APTERR procedures (particularly for Tier 1), these flows dispense with the time-consuming grind of normal commercial imports (initial contact, canvassing or tendering, negotiation, purchase order, delivery). Finally one big improvement of APTERR over its forerunner (the ASEAN Emergency Rice Reserve) is its clear multi-lateral governance structure. Releases under APTERR are subject to Council approval. Moreover negotiations

under APTERR would be facilitated by a matching service from the Secretariat.

Both benefits and costs are difficult to quantify, let alone juxtapose to compute the optimal level of earmarked reserves. Data for making evaluation of optimal stock levels are not readily available; even at a national level, setting of domestic stocks is based more on rule of thumb; FAO itself suggests setting a reasonable level of domestic reserves at about 18–19 percent of domestic utilization. Rather than attempt to estimate optimal reserves, we evaluate whether there are compelling reasons for increasing earmarked stocks, based on benefit, compared with cost and feasibility. An analysis of strengths and weaknesses of the APTERR scheme shows, somewhat paradoxically, that the scheme's strength (cost-effectiveness) also gives rise to weaknesses. Key shortcomings of the system include:

- When using earmarked stocks, the scheme becomes completely dependent on each member country's follow through on its commitment ex post.
- The scheme's governance rules requiring decision making by consensus are ill-suited in an emergency response mechanism.
- The vagueness in the conditions for defining an emergency can pose an obstacle to rapid response.
- Further enhancement of the scheme's effectiveness will require members to:
- Ensure proper food security monitoring, and governance of the reserve, to enable rapid response in case of emergency
- Back up members' commitments with action in an emergency situation, despite domestic resistance.

A more direct approach would be to address the underlying gaps in the food distribution system that make it vulnerable to shocks. APTERR may in fact be supportive of efforts to deepen specialization and interdependency in the food marketing system, if it can be seen as a credible device in (rare) cases of market failure.

Two additional points deserve mentioning. First, aside from size of the rice reserve, another aspect of the scheme is the commodity scope. In the 18th ASEAN Summit of 2011, the Chairman's Statement assigned the relevant Ministers "to study the possibility of APTERR incorporating commodities other than rice to secure the alarming risk of food price volatility." The meeting acknowledged, however, the need for adopting a step-by-step approach in considering expanding APTERR as a role model for other food commodities. This sequential approach appears to be a judicious modality in future widening of commodity scope for the emergency reserve scheme.

The second point pertains to the frequently mentioned scheme of a rice futures market, which is already part of the agenda of the Rice Trade Forum as a possible long-term strategy for developing rice trade. A futures market fundamentally serves as a hedging tool to mitigate price risks. With sufficient liquidity and depth in the futures market, the futures price may have the added function of "price discovery", i.e. a continuous process by which futures prices are reassessed by buyers and sellers as new information becomes available (Inter-Agency Report, 2011). The establishment of a "robust futures market for rice" as an instrument to address price risk figures prominently in the Asia Society and IRRI Task Force Report (2010).

The feasibility of a rice futures market for ASEAN is evaluated by Mackenzie (2011). Based on interviews of key market players and commodity exchanges, the study finds that an ASEAN rice futures contract could benefit the rice market through price discovery and price risk management. Moreover, ASEAN rice markets are opaque and a futures market would improve price transparency to all players; a liquid rice futures contract would also fill an unmet need for a hedging instrument.

Whether a rice futures market can actually be organized to meet this need is another matter. Mackenzie outlines several key features of the cash market needed for a successful futures contract, namely:

- Adequate cash price volatility;

- A large competitive and well-defined underlying cash market that lends itself to standardization;
- Minimal government intervention in the underlying cash market;
- Free flow of public information.

As the rice market in ASEAN satisfies only the first item above, a rice futures contract is unlikely to be successful under current conditions.

## CONCLUSIONS

For some years now, ASEAN countries have experimented with several regional food security frameworks that correctly focus on emergency relief, sustainable and conducive food trade, and early warning and information, as focal elements in maintaining the smooth and stable functioning of the food production and distribution system. Our study has found, however, that governance problems afflict the operation of the different systems. These problems arise from fundamental tensions between unilateral versus cooperative approaches, as well tensions due to competing domestic interests (i.e. consumers, producers, and trader-processors).

The tensions between inward-oriented versus outward-oriented approaches raise formidable challenges in operating the latest of these schemes, the ASEAN Plus Three emergency rice reserve (APTER), and in ensuring coordination of trade policies in the region. Further reforms are warranted at the regional level to institute a more predictable regime for rice trade. This entails phasing out trade monopolies, quantitative restrictions (upheld by the special protocol on rice and corn), and a phasing-in of tariffs; this would still permit some level of protection for domestic produced, but on a rule-oriented basis.

Ultimately however protection and other forms of counter-productive intervention would need to be gradually dismantled, particularly those premised (incorrectly) on the weakness of private sector operations. These include self-sufficiency policies (for importing countries), insulating policies (for exporting countries), as well as costly input and output subsidies.

Withdrawal of regional governments from their traditional role in the rice sector does not rule out all forms of government engagement. Their positive role, however, lies in facilitating private sector investment and operation of efficient supply chains. A recent World Bank study examining food security in Southeast Asia contains a set of recommendations detailing this facilitating role, including the following:

- Private-public sector partnership (PPPs)—PPPs can assume many forms, such as performance contracts, build-operate-transfer concessions, joint ventures, etc. PPPs may be undertaken for pioneering effect, demonstrating technical and financial viability of developing supply chains for food staples.
- Improving logistics and infrastructure—in addition to ports (still a constraint in VIP countries but especially in Vietnam), the major limitation is limited rural infrastructure, particularly roads in Indonesia and the Philippines, and the poor maintenance of roads in Vietnam. Aside from funding the requisite investments, governments should elicit participation from the private sector in the design of an efficient rural road network.
- Establishment of warehouse receipt system—negotiable warehouse receipts would greatly facilitate marketing by severing the link between market transaction and physical movement of stocks; at the same time, creating a system of negotiable

claims presumes a transparent, credible, and well regulated marketing system, which itself encourages market participation, financing, and investment. At least theoretically, a workable warehouse receipts system should facilitate markedly increased agricultural credit by commercial banks. To this recommendation we add the need for standardization of grades and standards for rice, especially at an international level, which should not be too difficult to implement.

In sum: food markets are prone to sporadic crisis episodes, for which short-term solutions such as a regional emergency reserve are a preliminary stop-gap measure. However such instabilities are rooted in underlying distortions and constraints on normal food trade. Hence, permanent solutions will require equally deep reforms towards improving efficiency and resiliency throughout the regional food production and distribution system.

Obstacles to reform, mainly rooted in domestic politics, are formidable. It is easy to be pessimistic about regional or multilateral cooperation, given prominent examples of failure or at least inaction (e.g., Doha Round). However past achievements are impressive in hindsight. The WTO Agreements have institutionalized restraints against protectionism. ASEAN itself has avowed a vision of a single economic community by 2015, which would have been deemed farfetched during its founding in 1967.

# CHAPTER 6. MAJOR DRIVERS OF FUTURE AGRICULTURAL TRANSFORMATION

Overall GDP growth rates in the three study countries are expected to be robust, as discussed earlier. Rapid economic growth would be accompanied by an escalating demand for food (the World Bank's projection is a 50 percent increase by 2025), especially in urban areas but also in the rural sector of the economy. As governments endeavor to improve their food security and will simultaneously have to induce the transformation of their agriculture sector in response to changing consumption patterns. Improvements in technology and productivity will be a crucial in this process. Other key aspects that will require increased emphasis are: improved nutritional values, resilience to climate change, food safety, and so forth.

During the past thirty years, the role and structure of agriculture in ASEAN economies has changed significantly. VIP countries are now at a stage of development that changes in consumer preferences and ability to afford a more balanced diet would accelerate, as would the rise in rural wages. In addition, globalization would bring VIP countries agriculture sectors in greater alignment with the global markets. The combination of these developments will accelerate the pace of transformation of agriculture during the next thirty years, resulting in the modernization of agriculture, with Indonesia and Vietnam leading the way; the pace of change in the Philippines is likely to be slower due to its much more stable diet patterns in the past. The five main drivers of this transformation are discussed below.

## DEMOGRAPHICS AND URBANIZATION

Population growth rate projections presented in Table 6.1, derived from United Nations data, will have major implications for food demand. By 2040 the total population of the ten ASEAN members is expected to reach 738 million, or roughly only 8 percent of the expected global population. As such the group is unlikely to be a major player in the world economy, though in the case of some commodities such as

rice and palm oil it will continue to dominate global production and trade.

The UN projections indicate a rapid slowdown in the growth rate of population for the ASEAN member countries and two VIP countries, with only the Philippines continuing to register a relatively high population growth rate of 1.4 percent per year. However, in the case of Indonesia the forecasts present an issue. The UN expects average annual growth rates for the next thirty years of 0.6 percent per year resulting in a total population of 290 million by 2040. By contrast, some Indonesian forecasters are considerably more pessimistic about the success of family planning and expect a decline in population growth rate to only 1.2 percent, which leads to a total of 54 million more Indonesians in 2040. Clearly such a big difference in total population will have major consequences for food demand security. Both forecasts are considered in the report.

There will be three additional developments affecting labor supply for agriculture as well as food consumption patterns. First, in all three countries, the majority of people will live in urban areas. Second, a steady and significant rise in rural wages as a result of three mutually reinforcing factors: (i) rural to urban migration and the gradual ageing of the rural population; (ii) availability of higher paying off-farm jobs (services, agribusiness) in rural areas; and (iii) overall higher income and wage levels in the countries as a result of higher economic growth and higher productivity. The only way agriculture can remain profitable at these higher wage levels will be to sharply increase productivity and shift to higher-value crops. As show in Table 6.1, large segments of the population in ASEAN countries will continue to reside in rural areas even in 2040. In each instance the migration to urban areas as more and more laborers leave their farms in search of employment in the cities will impact labor availability for farm work and exert pressure on the provision of urban services.

**TABLE 6.1: VIP COUNTRIES<sup>1</sup> POPULATIONS WILL CONTINUE TO INCREASE AND BECOME MORE URBAN**

	Vietnam			Indonesia				Philippines			ASEAN		
	2000	2011	2040	2000	2011	2040 (UN)	2040 (Alt)	2000	2011	2040	2000	2011	2040
population (millions)	79	89	104	213	242	290	344	77	95	142	523	599	738
urban population (millions)	19	28	52	90	123	197	233	37	46	87	200	268	450
rural population (millions)	60	61	52	124	119	94	111	40	49	55	232	331	288
% of population in urban areas	24%	31%	50%	42%	51%	68%	68%	48%	48%	61%	38%	45%	61%
labor force (millions)	42	53	60	100	120	161	173	31	40	70	252	308	403
ag. employment as % of total employment	65%	52%	--	45%	38%	--	--	37%	35%	--	--	--	--

Source: UN Population Division; World Bank WDI; Centennial Group estimates

Note: 2011 agricultural employment figures are actually for 2010

## CHANGING DIETS

The dietary importance of rice and other staple foods has been declining in all countries (except the Philippines). This trend is expected to accelerate with ASEAN's rising affluence as more consumers enter the middle or upper-middle income status. They will move towards a more balanced and nutritious diet—with less reliance on rice and greater consumption of proteins (meats, fish, and poultry), fruits and vegetables, and processed foods. As a result, farmers can and will cultivate higher-value crops. Both scenarios developed by the Centennial Group model suggest that the typical diet in VIP countries by 2040 is likely to be: significantly richer in protein and fat; less dependent on grain or root-based carbohydrates; and the importance of rice in peoples' diet will have diminished. However, the pace of change under the two scenarios will vary between VIP countries and there will be some variations between regions within each country, though such regional variations are not consequential when the overall national trends are being considered.

These changes offer promising opportunities for improved farm incomes, nutrition, and food security. Integral to this shift is the fact that the perishable nature of the high value

products, which entails more sophisticated and efficient value chains along with greater emphasis on quality and food safety considerations, and an increase in the amount of food consumed outside the home. One likely scenario of future food consumption (under the optimistic scenario of GDP growth) generated with the aid of the Centennial model is presented in Table 6.2. In this scenario, rice will become less important, and meats will be consumed more. Figure 6.1 displays the projected decline of rice consumption per capita, which is expected to affect Vietnam and Indonesia while the Philippines maintains a more consistent consumption level.

A comparison of rice consumption in VIP countries with that in Japan and Singapore at the same per capita income level (but at a much earlier time period) shows Indonesians cutting back on rice consumption at a much faster rate. At about \$12,000 per capita income, Indonesians are expected to consume the same amount of rice as the Singaporeans do at \$35,000. Despite these declining rates, it will be several more years before total consumption of rice in Indonesia will level off and subsequently start to decline. The driving factor here is population growth. If the UN projected decline in birth rates materializes, total rice consumption

**TABLE 6.2: IN VIP COUNTRIES, RICE WILL BECOME RELATIVELY LESS IMPORTANT, WHILE MEATS WILL BE CONSIDERED MORE**

Vietnam food consumption per capita (kg)	country average 2010	country average 2040 (pessimistic)	country average 2040 (optimistic)
rice	115.9	97.6	88.3
beef	1.9	2.6	3.2
pork	17.5	24.3	29.4
poultry	4.1	6.3	9.9
vegetables	27.4	33.6	38.7
fruit	11.8	19.2	29.1
eggs	2.2	2.8	2.9
fish	16.8	18.3	19.7
tofu	6.2	7.1	7.2
sugar	5.3	7.2	8.9
oil (liters)	4.1	5.0	6.1

Indonesia food consumption per capita (kg)	country average 2010	country average 2040 (pessimistic)	country average 2040 (optimistic)
rice	114.3	100.2	87.2
maize	1.6	0.3	0.2
fish	21.5	32.7	36.7
beef meat	0.4	1.5	2.2
poultry meat	4.2	8.2	10.0
eggs	6.7	9.9	10.1
vegetables	26.9	32.7	37.5
fruit	9.7	20.7	30.8
casava	5.4	3.4	2.1
sugar	7.7	9.1	9.5
oil (liters)	10.2	12.6	13.1

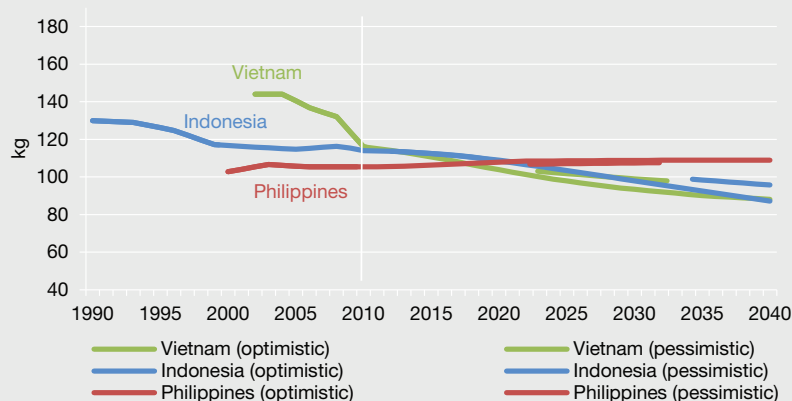
  

Philippines food consumption per capita (kg)	country average 2010	country average 2040 (pessimistic)	country average 2040 (optimistic)
rice	105.3	108.5	109.0
bread, loaf	1.6	2.7	5.3
pandesal (bread)	5.9	7.4	9.3
noodles	0.9	1.1	0.5
roots	12.1	16.7	22.0
vegetables	40.0	45.4	52.5
fruit	81.7	110.9	170.4
chicken, fresh	10.3	12.8	15.7
beef, fresh	2.6	4.1	6.7
pork, fresh	18.8	26.0	36.0
seafood, fresh	25.5	32.0	41.8
milk, fresh	0.2	0.4	1.0
chicken eggs	4.0	5.1	6.2
soda	0.8	1.3	2.3
bottled water	5.3	9.6	20.5
oil (liters)	2.8	3.4	4.3
sugar	6.9	7.4	7.9

Source: Centennial Group estimates based on adjusted results of household surveys

Note: Refer to Annex 1 for an explanation of how the projections were generated; fish projections are subject to change

\* Fish consumption in Vietnam may be substantially higher if fish catch and trade statistics are considered and the substantial consumption of fish sauce is taken into account. Fish consumption in Indonesia in 2010 may be somewhat lower if weekly consumption survey data are considered. Major efforts in Indonesia to enhance aquaculture of food fish could increase 2040 fish consumption to about 35kg/capita. Philippine fish consumption surveys suggest substantially lower consumption in 2010, while Centennial's models projects consumption rising well above the figure given in the table.

**FIGURE 6.1: PER CAPITA RICE CONSUMPTION WILL DECLINE IN VIETNAM AND INDONESIA**


Source: Centennial Group estimates

in 2040 will be about ten percent below today's level. On the other hand, should the decline in population growth be slower than these projections, total demand for rice with 54 million more Indonesians to feed by 2040 will be about 10 percent above today's level. If we combine the government's higher population projections with a slower overall economic growth, the shift from rice to other crops slows down further and the total demand for rice in Indonesia could be nearly 30 percent above the current level.

A shift to higher value crops will translate into greater opportunities for farmers to move further up the value chain and garner a bigger share of the final price being paid by consumers; this in turn will enhance the potential for raising rural incomes in tandem with the rest of the economy and slowing down the rate of rural-urban migration. Furthermore, aside from improving nutrition these changes will also generate greater emphasis on post-harvest handling, processing and storage, since these commodities are more perishable. Magnitude and rate of change in dietary habits (see Table 6.2) are expected to have a major impact on future investment requirements and the increasing role of the private sector as the major force behind development of value chains, storage and agro-processing facilities to accommodate the expansion in the production of perishables.

### INCREASED COMPETITION FOR RESOURCES

For ASEAN as a whole, and Indonesia in particular, land availability does not appear to be an issue, but it has rapidly

become a constraint in the Philippines and Vietnam. Over the past thirty years per capita arable land availability declined by 17 percent in Indonesia, 34 percent in Vietnam and a whopping 47 percent in the Philippines (Table 6.3). All three countries have been losing some prime food croplands to industry, urbanization and infrastructure and have few viable options for opening up new lands for food crops. But the main reason for a steady decline in arable land per capita is the increase in population. With declining per capita land availability, meeting the growing demand for food will increasingly depend on improved productivity. Increased food crop production over the recent past came primarily via productivity increases (cropping intensification and yield increases).

Over the past 30 years, VIP countries have been losing prime food crop land to urbanization, industry and infrastructure; although this trend is likely to continue, they have few viable options for opening up viable land for food crops. Pressures on land and water resources in VIP countries have increased in recent years along with acceleration in the destruction of forestlands and wetlands. This pattern raises questions about the countries' ability to meet economic, environmental and food security objectives in a sustainable manner unless they can achieve major technological changes and significantly enhance growth in agriculture productivity.

With regards to water resources, the Philippines is estimated to have the second lowest availability of water per



**TABLE 6.3: ARABLE LAND PER CAPITA HAS FALLEN SIGNIFICANTLY SINCE 1980**

	total arable land (million ha)		arable land per capita (ha per thousand people)						
	1980	2009	1980	1990	2000	2009	% change 1980–2009	2040	% change 2009–2040
Vietnam	5.9	6.3	111	81	80	73	–34%	60	–17%
Indonesia	18.0	23.6	119	110	96	99	–17%	105	6%
Philippines	5.2	5.4	111	89	65	59	–47%	49	–17%
developing ASEAN	42.5	53.4	138	122	106	105	–24%	111	0%

Source: World Bank WDI and Centennial Group estimates; arable land from FAOSTAT

Note: Assumes an increase of 6.9 million hectares in arable land for Indonesia and an increase of 1.6 million hectares in arable land for Philippines; land for all other countries remains constant.

capita in the region and this ratio will change (for the worse) as population continues to expand at a faster pace than in neighboring countries. Better management and conservation of available resources is therefore a priority. In Vietnam, the threat of upstream water diversions by riparian countries is a cause for concern that calls for greater regional collaboration on water sharing arrangements.

By 2040 arable land availability per capita is expected to decline gradually in Vietnam but a completely different picture emerges for the Philippines and Indonesia. In the former, there large tracts of degraded lands that were formerly forest areas. Estimates prepared by the team (based on what is there now, financing options, employment issues, timing for resolution of land issues, gestation period for the various crops, etc.), indicate that about 1.6 million ha (mainly in Mindanao) could be made available for tree crop production.

Among all the major countries in Asia, Indonesia was perhaps the only one able to consistently expand agricultural land resources, though it too has been losing food crop lands. The country still has some 18 million hectares of forest land designated to be converted into agricultural use, but while these lands have proven suitable for tree crops, there is considerable uncertainty about their suitability for field crops; furthermore, as experience has shown, farmers have chosen overwhelmingly to convert these lands to tree

crop cultivation. Although many of these areas are degraded forestlands, others are still prime forest and so it will be important to consider the environmental consequences before releasing these lands for agricultural use. However, even in Indonesia, land availability per capita in Java, the main rice producing area, would decline. While in theory it is possible to expand area devoted to rice in the Outer Islands, such land can be put to more profitable uses through tree crop plantations.

Two additional factors deserve mention. First, as outlined in detail in the Fisheries Report (Annex 6), marine resources have been overexploited and are being depleted. Furthermore, without more effective domestic marine resources management, fish production from most coastal fisheries, which is already exceeding sustainable exploitation levels, will continue to decline. Second, although outside the scope of the present review, the rapid rate of forest resource degradation is a major concern.

In sum, future agricultural growth prospects in VIP countries are going to be affected by rapid loss of prime agricultural land, few options for opening up new lands for food crops, growing competition for water resources from other users, reductions in labor availability in rural areas and aging of the farming population. To counterweigh these developments farmers will have to learn to produce more crops with less water, less land, and less labor. Responding to these con-

straints will necessitate steady improvements in productivity through better husbandry practices and more efficient water management; critically, there will also be a need to accelerate the growth in agricultural productivity.

### TECHNOLOGICAL CHANGES

Rapid diffusion of technological changes (crop intensification; mechanization; hybrid seeds; more efficient use of water, energy, fertilizers; and crops capable of withstanding climate changes, etc.) would be the fulcrum for improving productivity and offsetting higher input costs (including labor and energy), while producing higher-value products demanded by consumers.

To ensure such technological changes at the pace necessary for the desired agriculture transformation six complementary aspects would be decisive: i) development of new technologies (seeds for hybrid varieties, new draught and flood resistance plants); ii) irrigation techniques and investments to improve efficiency of water use and expand crop area under irrigation; iii) more efficient use of fertilizers and pesticides; iv) openness to importing technologies to complement results of domestic research outfits; v) more effective and farmer friendly extension services, with greater involvement of private sector; and vi) pricing policies and incentives to make farming profitable and facilitate private investment both on-farm and off farm throughout the value chain between the farmers and consumers.

### CLIMATE CHANGE

Climate Change has been occurring at a faster rate for the last century or more in the VIP countries and it is projected to accelerate further in the 21st century. Currently climate projections are based on modeling of complex natural phenomena and alternative scenarios about future paths of economic and technological developments and of greenhouse gases (GHG) emissions. There is a high degree of uncertainty in climate projections, the uncertainty increasing as the focus shifts from temperature to rainfall, sea level rise, sea surface temperature rise and to extreme events, and as projections extend to the longer-term beyond 2050. The largest consensus among various models and sce-

narios is that global mean surface temperature will increase by about 1°C by 2050 and could, according to IPCC 4th Assessment Report, increase by 2–4°C by 2100, depending upon the pace of economic, social and technology changes, in the absence of urgent global efforts to reduce GHG. On the basis of these projections it is safe to assume a 10-15% decline in yields compared to conditions where temperatures remain at today's level.

Climate related natural hazards have intensified in recent years. Indonesia has experienced an increase from an average of 1 major event in 1950s to 8 per year by 2005. The average number of cyclones entering the Philippines has increased from 20 overall to 24.2 over the period from 1990 to 2003; and in Vietnam, the typhoon season has moved to later in the year and the primary landing area has moved southward. Vietnam has also experienced more typhoons with higher intensity in recent years, with a typhoon track that has shown a tendency to move southward. Although these observations do not provide a statistically sound basis to project long-term trends in SE Asia, at the global level, extreme weather events such as cyclones and typhoons are projected to increase as a consequence of higher sea levels and sea surface temperatures. For the Philippines, any increase in intensity of typhoons may have important but not yet quantified implications for food production because these typhoons hit some of the important agricultural areas in Luzon and the Visayas. Vietnam and Indonesia are also likely to experience increased flooding and landslides. Finally, droughts are expected to become more frequent phenomena. At present there are no reliable models to predict the intensity and frequency of these events but there is no doubt they will have an impact on food production and food security; these factors will need to be incorporated in the planning of food reserves and emergency stockpiles in the longer-term beyond 2040.

In VIP countries, projected climate change even to 2040–2050 is most likely to be a setback in potential agricultural productivity and to lead to a loss of some land for agriculture due to sea level rise. VIP countries would need to achieve a 10–15 percent increase in agricultural productivity above current trends over the next 3–4 decades to fully

counter these threats. This is entirely feasible through accelerated completion of unfinished sector reforms and further intensifying well known adaptation measures. Autonomous adaptation measures taken by farmers or firms in response to market signals typically are of the “no-regrets” type; they are good for the sector with or without climate change. They revolve around changes in cropping patterns, varieties and farm management and are already being practiced in parts of VIP countries.

Attempts made to estimate the potential costs of adaptation still have serious limitations in methodology. They typically amount to 0.1 to 0.3 percent of GDP. With high social vulnerability, food insecurity at the household level can increase with climate change despite availability of food in the country since the lowest 20 percent of households will face disproportionate decline in real standards of living. Enhancing the food security of poor people affected by climate change is best achieved by facilitating diversification to higher value crops and by generating non-farm incomes opportunities. Ensuring global or domestic payments for environment services provided by rural communities can add to their resilience.

With virtually no progress to reduce Green House Gas (GHG) emissions since Kyoto, projections done in 2009 for the Copenhagen Conference to update IPCC 4th Assessment Report raised the possibility that the world may well be on way to a 4–7°C warming by 2100 unless immediate actions are taken to reduce GHG emissions. Not only have the Kyoto commitments failed to reduce GHG, which in fact increased by 36 percent since 1990, but even the softer Copenhagen 2009 agreements are already showing a slippage. In the higher latitude regions, all major crops including pasture are projected to show decline in yields of 16–29 percent. In the lower latitudes, yield declines would be of the order of 20–40 percent. Even if an allowance is made for not yet fully researched carbon fertilization effect, given the likelihood of increased prevalence of pest and disease as temperature rise and increased loss of agricultural land to sea level rise, the global food security situation once temperature rise exceeds 3°C looks quite unmanageable.

Global and VIP countries food security in the second half of the twenty first century is linked to actions taken now to reduce global GHG emissions, given the long residence time of GHGs in the climate system. The contribution of VIP countries agriculture to global GHG emissions is less than 1 percent. However, the forest sector in VIP countries is far more critical to global GHG emissions as it accounts for nearly 8 percent of total emissions. Stopping deforestation and land use changes is critical to long term global food security.

VIP countries are steadily building their institutional architecture to deal with climate change; included therein is a system to prioritize the range of adaptation options taking into account the severity, immediacy and probability of climate threats as well as the costs, scope for cost recovery and social impacts of the response. This emerging institutional architecture can benefit from further strengthening of the capacity for inter-sector analysis and decision-making especially in areas of coastal zone management and regional collaboration in the area of shared water resources.

### GLOBAL AND REGIONAL TRADE

With all ASEAN countries except for Laos being members of WTO, trade between members should be able to move freely provided it complies with existing health safety regulations. Any further development of trade will thus depend on either further global agreements under WTO or regional specific agreements under ASEAN. Even though the economies of the ASEAN member countries are fairly similar, there is considerable scope for increasing intra-regional trade. However, years of negotiations aimed at a free trade area have only yielded limited results. It would seem that there is concern among some members that without tariff and non-tariff barriers' to protect local producers, they will not be able to compete with the internationally traded goods on price, product quality and safety standards.

A study by the World Bank shows that, in the case of VIP countries, hidden trade barriers (mostly import restrictions) and extra payments or bribes are major issues (Table 6.4) are significant; this is likely to be a challenge to closer trade integration. At the country level, traders in Vietnam

**TABLE 6.4: TRADE BARRIERS AND BRIBES ARE SIGNIFICANT ISSUES IN VIP COUNTRIES**

	trade barriers	irregular payments
Vietnam	1.00	0.78
Indonesia	0.75	0.47
Philippines	0.98	1.00

*Source:* World Bank: Transparency, Trade Costs, and Regional Integration in the Asia Pacific, November 2007

*Note:* 1.00 signifies major problems and 0.00 the absence of any problems.

still appear to struggle with hidden trade barriers, while in the Philippines both trade barriers and extra payments are a constraint; conditions in Indonesia are slightly better but here too trade barriers are an issue. Rapid relaxation of barriers and elimination of extra payments are preconditions to the expansion of trade.

# CHAPTER 7. AGRICULTURE SECTOR VISION 2040 AND RELATED STRATEGIES

It is possible to paint a bold and optimistic vision of what ASEAN agriculture and that of VIP countries could look like based on successfully marshaling the transformational trends discussed above. This section presents such a vision for each country and for ASEAN.

While preparing the vision we considered carefully the international markets and prices for the key commodities imported and exported by the VIP countries. A key conclusion arising from a review of numerous commodity publications and forecasts is that there are reasonable prospects for a steady supply at stable prices for the key food items of importance to VIP countries (rice, maize, soybeans). As for the tree crops that they export, the prospects are for steady increase in demand and a somewhat more modest rise (and in some instances a slight decline) in prices. Under these expected conditions there is bound to be keen competition between VIP countries as well as from producers in other parts of the world. Land and labor constraints (the latter being in part also a question of competitive wages) along with improvements in productivity will play an important role in determining the competitiveness of VIP countries. A brief summary of global outlook for the key commodities is presented in Annex 8.

Our 2040 vision of what ASEAN and VIP countries would look like under an optimistic scenario is based on issues, constraints and prospects that were identified by the country level reviews and supplemented by the modeling exercise projections. More comprehensive reviews are included in Annexes 2–4 and in the individual country reports. It should be noted that the visions are not projections but a view of what the sector would look like under a “best case” scenario. Subsequent paragraphs in this section of the report outline the visions and describe the strategic measures that will have to be adopted by VIP country governments for the visions to materialize.

## **A VISION FOR ASEAN**

The vision for ASEAN includes regional cooperation, introduction of a single market and a production-based economic community, currently scheduled to take effect by the end of 2015. Under this scenario member countries would also agree to include the previously exempted items (rice and sugar) well before 2040, and to intensify actions to enhance intra-regional trade. Integral features of these agreements would be emergency short-term food relief arrangements and humanitarian assistance, as well as effective early warning systems. By harmonizing standards and by standardizing trade certifications, agricultural products of ASEAN origin would be fully acceptable to consumers worldwide.

As discussed earlier, the current situation is much different from this bold vision. Although free trade negotiations have taken place for many years, progress has been slow so far. However, as the economies continue to grow and the countries become more prosperous, there should be greater willingness to rely on trade and to forego special exemptions for key agricultural commodities. Realizing the ASEAN vision outlined here will largely depend on the political will of the leaders of the ASEAN member countries and their ability to forge a viable common market. Specific aspects of the vision are outlined below.

The emergence of a single ASEAN market has made it possible to augment domestic food production with imports thereby enhancing food security. With guaranteed free access to regional food markets members have moved away from the present self-sufficiency policies and are instead relying on regional stocks and trade to meet domestic shortfalls. With the removal of food availability as a pressing food security issue, at least under normal conditions, members are focusing now on food accessibility. Further reforms implemented at the regional level include the introduction of

a more predictable regime for rice trade involving phasing out of trade monopolies and quantitative restrictions (upheld by the special protocol on rice and sugar), and a phasing-in of tariffs that would still permit some level of protection for domestic producers, but on a rule-oriented basis.

Regional collaboration is the norm for addressing common issues. Many of the issues facing ASEAN in the coming period could be handled more effectively at the regional rather than the national level. We foresee collaboration in a variety of areas but especially agricultural research, climate change, and planning and managing water extraction on international rivers.

The focus of agricultural investment has shifted. Creation of a single market has convinced members to shift policy attention and investment efforts from a traditionally heavy focus on production to other stages in the agricultural value chain, both for the main subsectors and newer high value agriculture, fisheries and livestock activities.

Agricultural innovation is driving productivity. There is greater focus on agricultural innovation and productivity that is essential if the countries are to successfully confront an array of natural resources, socio-economic and technical challenges and opportunities. A rapidly changing environment confronting ASEAN countries is driven by policies and institutions (changing roles of the state, civil society and the private sector), climatic changes, technical advances, globalization, and increased price volatility for agricultural outputs and inputs.

Rapid GDP growth will transform VIP countries into upper middle income countries by 2040. With considerable disposable income there will be demand for more sophisticated food products, greater emphasis on quality and food safety, and a rapid shift from shopping at traditional open markets to supermarkets and quality stores.

## COUNTRY SPECIFIC VISIONS

While the general direction of transformation in all countries will be similar, the specifics will vary significantly. The nature, pattern, and magnitude of the transformation will

be country-specific, as progress to date and the natural resource endowment of the three countries differ, and the issues they face are quite distinct. Country-specific visions developed under the study are portrayed below.

**Vietnam.** By 2040 Vietnam will have a bigger population than in 2012, but at about 104 million not much bigger because the population growth rate has declined. As a result of the decline in population growth rate, (and better health and nutrition), the age distribution “pyramid” is substantially different in shape from that in the year 2000, with an aging population leading to a closer balance between young and old. In the rural areas, the labor force being dominated by the older generations as younger people move to the urban areas.

From a regional perspective, population growth in the Southeast and in the Central Highlands was above the national average, and slower in the Mekong Delta, Red River and the Central Coast Regions. In the North, the mountain areas would just about maintain their level of the population.

Urbanization in the intervening years has progressed rapidly and some 50 percent of the citizens are living in urban conglomerations compared with 30 percent today. The rural population will have declined to 51 million (compared with 63 million today) as the rural labor force migrated in search of work in industry and services close to the urban areas.

By 2040 the Vietnamese people are also much richer than they are today, with more than 90 percent having achieved “middle class” economic status with a surplus income available to create a comfortable life for themselves and their families.

Diets have changed and the demand for rice has diminished; in its place there is greater consumption of higher priced foods such as fish and meat. Transformation of agriculture and fisheries has made it an even more dynamic sector of the economy as a result of greatly improved productivity arising from the use of advanced technologies (inputs such as seeds, fertilizers, and disease control), more widespread mechanization, improved quality of production, and higher value added through processing. Food security

has remained robust because of the high level of technology adapted by Vietnam from international and national sources. Sector exports continue to grow as farmers diversify into higher value crops, while also maintaining significant rice exports to ASEAN and other destinations.

Farms have become bigger on average than they are today as commercial farming has become more important and many farmers will have taken advantage of government land consolidation programs. With farming units becoming more efficient from land consolidation, farm incomes have greatly improved, allowing rural salaries to match urban levels more closely. However, a considerable number of older farmers are involved in part time farming as a food security endeavor.

Other key changes in the sector that have upgraded or change performance include:

- Irrigation systems: Following the implementation of a well-focused investment program, irrigation schemes have been upgraded to permit high standards of water control and water use efficiency, saving water and allowing farmers to diversify cropping patterns and maximize the economic use of irrigation investments.
- Shift to animal feed-crops: In response to the substantial increase in demand from feed-mills for raw materials for animal feed to support the high growth in demand for meat, some 1–1.5 million ha of farmland now produce crops used as feed-grains (mainly maize) in the farming rotation.
- Industrial crops: Rubber and coffee have remained popular industrial crops, adding to farmers' incomes. A major investment in replanting rubber and coffee plantations with high quality cultivars has successfully upgraded industrial crop production and safeguarded Vietnam's export prospects.
- Value Chain: The private sector has greatly expanded investments in the post-harvest value chain and transformed the storage, transport, processing,

and marketing of farm outputs, adding value to Vietnamese agriculture.

- Research: Major reforms in the national agriculture research system have stabilized and upgraded staffing. The focus of research has been redirected to be less theoretical and more supportive of solving technical and financial problems at the farm level.
- Aquaculture development: The high rate of growth of aquaculture has been maintained by a shift towards marine aquaculture which has become the major driver of growth in the sector.
- Disease Control: While crop and livestock diseases remain a concern, the upgrading of research and of the capacity of the veterinary and technical services has greatly improved early disease identification and management, and reduced losses to more acceptable levels.
- Food safety and quality: An effective first class food safety agency is in place, with modern laboratories and a strong professional cadre that is capable of ensuring quality and consistency for all agricultural products both for the domestic market and for exports. Rejections by foreign partners and complaints from domestic consumers have been reduced to a minimum. Improved quality, including rice, fisheries, sugar, and coffee would fetch much higher unit prices for Vietnamese exporters.

Underpinning this performance is a strengthening of policies including good national performance in upgrading the efficiency of investment, the building up of a strong financial sector, successful state-owned enterprise reform, a strong and dynamic private sector role in the economy, continued social harmony, and buoyant international economic conditions. The investment rate averages a high 35 percent.

Indonesia. An optimistic vision of Indonesian agriculture in 2040 will include a smaller agricultural labor force than at present, perhaps involving 15 percent of the total labor

force, older than in the urban areas, which by then will likely claim 68 percent of the population. Given major simplification, improvement, and coverage of the national land service some consolidation in ownership (through sales) and operation (through leases, especially among family members and village neighbors) will have taken place through market transactions; however, smallholdings will still be the dominant ownership pattern, with typical Javanese holdings between 0.4 and 0.8 ha, and Outer Island holdings in the 3–6 ha range. One reason for the persistence of this pattern is the relatively slow development of alternative residential options for older citizens; the small homestead will serve this function, as well as the home of one offspring electing to carry on farming (and elder care) and the family center for “pilgrimage holidays” such as Hari Raya Puasa (Id ul Fitri), when all family members are expected to return home.

Agricultural growth in the Outer Islands will have been largely carried by tree crops for export, with oil palm overwhelmingly dominant, with over 15 million ha producing nearly 90 million tons of crude palm and kernel oil, or about half the world’s edible oil. This result would be directly due to a government managed replanting program for smallholders. Based on grants to planters at appropriate stages of tree life, and financed by an export “cess,” the program would preserve the impressive base established by 2010, and permitted continued expansion. By 2040 some of this land should also be devoted to intercropping, including to leguminous forage for cattle, as well as some of the 10 million ha under rubber, coconuts, and smaller trees like coffee and cocoa. Each of these crops will have an individually tailored replanting program, based on grants to smallholders from earmarked fiscal financing, mainly through export taxes of various sorts.

Agriculture on Java will continue to be more complex than on the Outer Islands, but will also be more complex than at present due to continued development of food tastes among the population. First, rice consumption will have declined to about 87 kg/capita. With a population of about 344 million, about 29.2 million tons of rice will be needed, only about 6 percent more than today. Thus, even with loss of paddy land to other crops and other uses, the average yearly produc-

tion may be closer to consumption than today (with slow increases in yield), and may even reach or exceed self-sufficiency in some years.

The goal of rice self-sufficiency has been abandoned for decades, and with it the extremely high domestic prices that cause considerable welfare loss today. The main support by government is on markedly improved irrigation facilities over the 7 million ha of irrigation feasible, which also provides, where possible, municipal and industrial water and flood control to the general population.

The rice import monopoly has been replaced by dozens of certified private importers franchised to import rice (and purchase domestically) in any quantity. As per other transport reforms, imports of rice are possible in every port in Indonesia, with no mandates to transship via Jakarta or Surabaya. This in turn reduced prices to consumers throughout the country, and improved food security in more remote locations (e.g., the Eastern Islands). A smaller BULOG will serve as a buffer stock agency holding 1–2 million tons at all times as an emergency reserve. The larger reserves will be maintained by the trading community and the farmers themselves. BULOG would handle many of the government’s own institutional needs for rice through the normal turnover practiced by any stockholding entity, but in general would function as one more competitor in the rice trade. The stock mentioned is well distributed around the country, and is more than sufficient to break any hoarding strategy of any market players, or unintentional panic behavior.

There is no shortage of rural banks (1,669) and micro-credit units (about 80,000) in Indonesia, nor of government programs which supply subsidized credit through commercial banks to firms and individuals in the rural sector. There is still, however, a lack of relevance of formal credit to production trends, due mainly to the heavy focus of most of the actual lending on trade rather than production per se, and within agricultural production the great bulk of the credit goes to the booming tree crop subsector, not to field crops, fisheries, or animal husbandry. One concrete example is the credit guarantee program, Kredit Usaha Rakyat (KUR—People’s Business Credit). This program, for those without collateral but with sustainable activities, is 70%



(80% for agriculture) guaranteed by public sector insurance companies, with fees paid by government. It has Rp 29 trillion (\$3.26 billion) in loans outstanding—but only 15% of this was for agriculture, and of this, 61% was for tree crop plantations.

Similarly, the three main credit subsidy programs, KKP-E for food security, KPEN-RP for rural energy, and KUPS for cattle breeding, had uptake rates of only 34%, 17%, and 9%. Chief reasons for failure seem to be lack of interest by commercial banks, and lack of collateral by small farmers.

The high rates of subsidy for the main food crop inputs (fertilizer and seeds), and the engineering of extremely high domestic market prices for rice through banning of private sector imports (and reluctant last minute imports by the parastatal BULOG), may in a sense have destroyed credit demand by the predominant smallholder sector, at least for field crops. Thus the surprisingly small role of formal credit in the main subsectors of Indonesian agriculture other than exportable perennials may be due to economic distortions deriving from other government policies.

But this does mean that elimination of those distortions over the years to come will have to in some sense be compensated by creation and implementation of workable agricultural credit programs, especially for field crops, fisheries, and livestock. For tree crops, which could easily use much more capital than these three combined due to the long immaturity and indeed maturity periods of the crops, replanting by smallholders should be financed by a government cess (export tax) and replanting grant system, which would take huge pressure off the credit system, as well as the land registration and cadastre system, since collateral need not be an issue in such a replanting program design.

A considerable area of irrigation, especially on Java, is in very small schemes (smaller than 100 ha, averaging about 30 ha in size), which may total 500,000 ha. Many of these areas will not be viable in the long run for rice, with no economies of scale in mechanization, harvesting, marketing. On the other hand, for horticulture such areas are large, providing both efficient scales of production and good water control that is required by most horticulture crops. These

“pocket irrigation schemes” have become highly effective bases for horticultural cooperatives at the village level, with a natural grouping of production; it is here where government programs promoting such organization and investment, and the entry of private joint venture partners, will be focused in the decades to come.

Fish production and consumption is considerably greater than today, averaging about 36 kg/capita. While marine catches have leveled off at 2010 levels, due to careful conservation management of various coastal resources, growth was provided by aquaculture. This was carried forward by investments by large international and smaller domestic firms, often in joint venture with coastal villages with implied rights to stretches of coastline, important for development of high-value mariculture species.

Further protein diversity is being provided by rapid development of both industrial and advanced village poultry production systems, which will underpin continued growth in egg and layer meat production. Beef production, focused on finishing imported weaners has risen to levels several times the very low 1–2 kg/capita of 2010, with little government interference. However, beef is still not a major element in the Indonesian diet.

Finally, the entire value chain between the farmers and consumers (both urban and rural) has been modernized to meet the needs of the country of which per capita income will make it a higher middle-income country and the vast majority (90%) of population will be middle class. The majority of consumers will shop for both fresh and processed food in supermarkets or other modern food outlets. These outlets will be supported by a streamlined distribution system and widespread use of refrigeration.

This optimistic scenario, would not only result in positive welfare outcomes for the general population and the rural community, but would also cost the government much less money than due today's confused policies.

*Philippines.* Our vision for the Philippines in 2040 foresees reforms and investments having been carried out forcefully and early in the 30-year period. Although there may be con-

siderable progress in some subsectors and slower progress in others, we assume all the required measures to achieve the high growth scenario have been implemented expeditiously. One final point; the locally developed (i.e. in addition to the Centennial Group model) models and forecasting tools used to develop the optimistic (and also the pessimistic) vision and scenario presented here can easily be adapted to elaborate other outcomes, and in fact their main contribution may be as instruments to support and refine national strategic planning efforts.

Our vision assumes strong agriculture sector performance in the context of an overall economic framework characterized by sustained high GDP growth of about 6.9 percent p.a., driven largely by accelerating productivity change and innovation, adherence to sound macro fundamentals, good governance, an improved investment climate, openness to trade, and a development strategy that ensures broad-based participation in the benefits of growth and therefore substantial improvements in average well-being and expansion of the domestic consumption component of the economy.

Although the last 30 years have not, on average, been particularly impressive for the Philippines in terms of overall economic performance and poverty reduction, this vision foresees the country shifting into a higher growth trajectory. Convergence occurs in the next five years, as the current leadership proves able to sustain sufficient reform momentum to bring this about by the end of its mandate. It is then succeeded by several like-minded administrations that further develop and consolidate the reforms. The rate of TFP growth would be comparable to that achieved by other Asian convergers in recent decades. On this basis, the Philippines not only becomes the world's 9th most populous country by 2040, it also moves into the ranks of the 20 largest economies.

Some of the salient features of this vision include the following:

- Real agriculture GDP growth averages about 3.5 percent and, although the sector share of total GDP decreases to about 5 percent, the multiplier

effects of downstream and agribusiness activities actually drive some 20–25 percent of the national economy. Rural poverty is reduced to only about 5–10 percent, and extreme rural poverty is eliminated, both because of strong growth and well-established social safety nets.

- The middle class' share triples to about 75 percent of the population, which produces a significant increase in total consumption and in consumption patterns.
- Agriculture sector growth is somewhat higher in Mindanao, because that region is less affected by climate change and natural disasters and also enjoys a relatively large share of the higher value tree crops expansion. This helps to consolidate peace and contributes (along with mining and other activities) to eliminating current welfare gaps between the region and other parts of the Philippines.
- The country enjoys a substantial expansion of tree crops, particularly rubber, coffee, cocoa, oil palm and other agro-forestry, driven mainly by foreign and private investment using modern technology and management arrangements. Besides growth, public revenue and trade benefits, this improves the environmental sustainability of degraded forest and upland agricultural areas.
- Philippines retains its global leadership in the coconuts sector, but with increasingly heavy reliance on 'new' coconut products both for the domestic and export markets. This has been central to eliminating acute rural poverty, which in 2010 was concentrated among households depending on coconut production and fisheries.
- The country retains a slightly smaller but highly competitive sugar industry, primarily geared to domestic food and ethanol demand. The trade regime is open to global competition and in some years this also allows Philippines to export.

Our vision has food consumption patterns changing gradually, but rice remains an important component of the diets of all but the wealthiest Filipinos. With a 50 percent increase in population, the volume of rice demand is substantial; Philippines employs a mixed domestic production plus trade strategy to meet this demand, importing about 25 percent of requirements for food, other uses and stocks, entirely through the private sector. Average rice yields improve by about 50 percent (to 6 MT/ha), through a combination of a strong seeds improvement program and further expansion and greater efficiency of irrigated rice areas. We also anticipate a fair number of irrigated and upland rain-fed rice farmers shifting to higher value crops. An important element of this transition is the Philippines' participation in an Asian regional stock arrangement (although it also maintains a domestic stock of some 1–1.5 million metric tons of rice for weather and other natural disaster emergencies).

The Philippines succeeds in reversing the long-term decline of per capita fish consumption and expanding it slightly, especially for lower-income groups. Fruits and vegetable production keep pace with population growth with only modest change in per capita consumption, but the country also exports an increasing share of production to regional markets (e.g., Singapore, China, and Japan).

While we expect aggregate agricultural employment to decline, this is accompanied by an important shift to higher paying jobs. The rural-urban wage differential for unskilled workers has narrowed, and increasing shares of younger people are opting to remain employed in agriculture production and related non-farm downstream and agribusiness activities. Nonetheless, labor scarcity has emerged as an issue in selected areas. Gender gaps in earnings and working conditions have been eliminated.

Most agricultural extension is supplied by the private sector. Sustained investment of about 1 percent of GDP in agriculture research and technology development underpins higher sector TFP rates, and a friendlier environment for biotechnology and innovation. The key commodity research programs are privately managed, with financing from producers, along the lines of commodity boards in Australia. Adaptation to climate change has become a central theme

across research programs, and the Philippines participates actively in regional and global research financing and dissemination.

Strong institutions have emerged to manage and enforce food quality standards, both to protect the interests of Filipino consumers and avoid losses and/or facilitate penetration of export markets (e.g., loss avoidance due to aflatoxin content of copra exports; penetration of regional livestock and poultry markets in East Asia).

We also expect the Philippines to have in place a comprehensive risk mitigation framework and instruments well calibrated to protect the economy, budget, consumers, investors, producers and financial sector from challenges related to (i) natural disasters, (ii) annual weather events, (iii) long-term climate change, (iv) medium-term commodity price uncertainties.

Private equities, banks and financial institutions such as insurance companies and pension funds are active in agriculture, downstream and agribusiness project finance. The public sector continues to play an important role in ensuring access to rural financial services, but mainly through regulation and support for risk management instruments, rather than direct financing.

After investments in physical and communications infrastructure of 5 percent of GDP for several decades, there is good connectivity across the islands and countryside.

Land markets have been freed. Out-migration to towns and cities has left behind idle lands, and land consolidation and farm mechanization are now common due to shortage of labor in some areas. Pressures on land ownership have loosened and land leases—small and large—have become common. Small farms continue to dominate but there is widespread diversification in terms of modes of operation: small farms, centralized management, contract farming, joint ventures, etc. Restrictions on foreign ownership of land have been eliminated. Some of the educated, returning overseas workers and urban retirees are going back to farming, often on a part-time basis, and applying modern techniques and developing new market niches.

For the vision to materialize, a better-educated population will have to place greater emphasis on qualifications and experience in selecting leaders, and hold government more accountable for results. In that context, the civil service will have to be remodeled towards meritocracy, along the lines of Malaysian/ Singaporean examples. Investments in monitoring, evaluation and data collection systems have paid off. The Philippines has the capacity at both the national and sub-national government levels to formulate realistic short/medium/long-term plans, measure results and make course corrections in a timely and transparent manner.

### STRATEGIES FOR REALIZING THE VISION

To attain the 2040 vision for VIP countries will require laser like focus on increasing productivity and enhancing value-added—on farm and in the value chains between the farm and consumers. This should be the centerpiece of country strategies for realizing the above visions. Specific challenges faced by each country would be different. While for Indonesia and Vietnam the challenge is how to sustain the past rapid growth in TFP and avoid the middle-income trap, the Philippines must first endeavor to move to a much higher growth trajectory and then sustain the higher agricultural growth. Despite such differences across countries, the following elements would be common to all country strategies, though the emphasis on individual elements would vary.

To achieve and sustain the desired level of productivity growth, the countries need to focus on the following mutually reinforcing areas: (i) agricultural research and extension; (ii) crop diversification; (iii) expansion and development of value chains; (iv) capital investments and mechanization; (v) enhanced role for the private sector; (vi) pricing and incentives; (vii) land issues; (viii) irrigation; (ix) role and effectiveness of government; (x) governments refrain from intervening in rice market activities; and (xi) adaptation to climate change.

**Agricultural research and extension:** With limited opportunities to open up new lands to expand food production, sustained productivity improvements will be crucial. Well before 2040 attention should shift to research and technological change aimed at increasing productivity. There is consider-

able scope for enhancing TFP from the current relatively modest levels. This would be best achieved through a much closer collaboration on agricultural research between the public and private sectors, and a paradigm shift in the way research is conducted and disseminated that goes well beyond allocating additional resources. Governments must come up with approaches to tackle the limited research capacity and the failure to make effective use of emerging research findings (including completed research that could have an immediate impact on smallholders' productivity lacking an effective mechanism to transfer it to farmers), as well as globally available knowledge, and the limited engagement of interested stakeholders in determining research priorities. Fragmentation of responsibilities for agricultural research and extension among a number of central agencies and provincial governments should be corrected in order to underline the crucial role of technological progress in sustainable agricultural growth and facilitate future growth of TFP. Also, VIP countries must ensure that closer links are established between research institutions, private sector actors, farmers, and extension services. And, the decentralization of extension activities to local governments must be made much more effective in order to significantly enhance the government's capacity to deliver such services. Finally, while the full extent of additional funding for agricultural research and development will depend on the effectiveness of the above measures, it is clear that there is a need to increase funding from the current level in both public and private sectors.

**Crop diversification:** Rapid response to changes in consumers' demand will require a fundamental transformation at the farm level by introducing more intensive farming activities (land consolidation, farm mechanization, and credit availability will be critical inputs), higher productivity (effective research and extension services along with an assured irrigation system are key ingredients) and the development of effective value chains. Aforementioned changes in demand will require introduction of more intensive and specialized farming activities and higher productivity. Farmers will require considerable technical advice to make the switch from traditional to high-value crops as well as sound marketing information and linkages to actors further up the

value chain. This calls for more effective extension services combining inputs from the public and private sectors as well as encouragement to agro-industries and retailers to enter into contract farming arrangements with (small) farmers (preferably with technical advice, credit and marketing outlets).

**Expansion and development of value chains:** Demands associated with storing, processing, and distributing the expected growing volume of perishable food items will require a supply side response in the form of substantial investments in the different value chains. These are best undertaken by the private sector but to elicit such response governments will have to improve governance in the sector, predictability of the rules of law, and a better business enabling environment. By introducing a greater degree of local processing, VIP countries will expand opportunities for value addition of agricultural production, with larger shares of domestic products processed locally and exports shifted from agricultural raw commodities to processed foods. New high paying jobs in agro-industries will become available in semi-urban and rural areas. Agro firms engaged in large-scale contract farming in turn will provide farmers with technical, financial and marketing assistance, all of which are only partially available through the public sector. Governments should also relax constraints on multinationals which are especially effective in developing these value chains. An important role remains for the government to ensure the rapid development of trade logistics and infrastructure though sound policies could convince the private sector to assume a greater role both with a view to mobilizing additional resources and securing technical expertise that is not readily available in the public sector.

**Capital investments and mechanization:** Except in the case of irrigation and rural infrastructure, most capital investments will be by the private sector. For this to happen, on-farm and off-farm activities must be profitable; pricing and incentives will be crucial in determining profitability. Equally important will be availability of finance for on-farm and off-farm investments, easy availability of risk insurance and resolution of land titling issues.

**Enhanced role for the private sector:** As countries make the ongoing transition from subsistence and input-driven production to mainly commercial and more capital intensive agriculture, the role of the private sector will become paramount. Most of the financing necessary to modernize agriculture and sustain productivity improvements (except for irrigation, rural infrastructure and basic research on staple crops) would come from the private sector. Even in areas such as development of new seeds and technical know-how needed by the farmers (extension services, etc.) that were traditionally provided by public entities, the private sector will play a bigger and bigger role. Further, the private sector will play a leading role in investing in assets and providing services throughout the value chain between the farmers and consumers. Instead of seeing these developments as a threat to the public sector entities, they should be welcomed as long as the farmers can obtain high quality and timely access to the services needed by them at lower cost. The enhanced role of private sector players would allow the public sector to concentrate on (remote) areas and groups of farmers (subsistence) that cannot be served by private sector players.

**Pricing and incentives:** In the future, pricing of inputs and outputs at market rates would become all the more important given the need to attract more private capital and to make farms more profitable. By 2040, domestic prices of most agriculture products and inputs should approach international prices, with conditional cash transfers becoming the main channel to provide any subsidies needed by special groups of farmers (in remote areas, subsistence farming, etc.).

**Land issues:** Counteracting the loss of farm workers arising from urban migration and aging will require land consolidation to permit rapid introduction of machinery, and the issuing of secure land titles to expedite leasing. These titles will also encourage long-term investments and permit access to credit to finance the intensification of agricultural activities. Increased food crop production in the recent past has resulted primarily from productivity increases). Land consolidation, secure land ownership and titling will be a precondition for modernizing agriculture and improving productivity,

including for investing in land improvements, moving to greater mechanization.

**Irrigation:** Upgrading and expanding the irrigation network will be crucial for increased production through crop intensification and higher yields. Many of the existing systems have deteriorated just as changing monsoon patterns make the dependence on irrigation more vital. Steps the governments could take to rectify the situation include: recentralization of major irrigation planning and management functions, intensification of efforts to establish and strengthen water users associations; allocation of additional budgetary resources to permit the upgrading and rehabilitation of existing systems, construction of new ones, augmentation of existing storage capacity, ensuring the proper maintenance of the main systems. Furthermore, farmers will require access to credit in order to finance on-farm improvements in water management practices (drip, sprinkler, lined canals, etc.). Finally, ownership of most of the smaller irrigation systems (say under 100 ha) and even some of the medium and large ones should be transferred from the state to water user associations. Specifically, the Vietnamese and Indonesian governments could take steps to rectify the situation include: recentralization of major irrigation planning and management functions, intensified efforts to establish and strengthen water users associations; and provision of a budget for the operation and maintenance of the systems that is far larger than the present. Possible steps that the Philippines could take include revisiting the assignment of responsibilities for maintenance and rehabilitation of communal irrigation systems, where the greatest losses in irrigation capacity have occurred; intensification of efforts to establish and strengthen water users' associations and improve their participation both in financing and discharging O&M responsibilities; fundamental review of water balances in all regions to update knowledge on potential for expansion—or likely contraction—of irrigation command areas, and sustained investments by the national government.

**Role and effectiveness of government:** An efficient and effective public sector is a critical pre-requisite to rapid growth, as it will affect the future performance of the agricultural sector. Allocation of additional funding to the sector

will also be a critical pre-requisite for accelerated growth along with a more effective management of the regulatory framework. In all three countries there is an urgent need to revamp government entities responsible for providing services to all parts of agriculture. At the same time, the exact changes to be made in the institutions concerned would vary greatly between countries, and must be tailor made to country conditions perhaps more than any other area. Subjects requiring greater attention include an increase in public investments in rural infrastructure, adaptation of technology and agricultural research (both from domestic and global sources), new and innovative ways of disseminating results (extension), and human resource development. In pursuing the above agenda, the role of local governments is critical. However, the complexity arising from overlapping institutional roles and responsibilities has worked against the realization of better outcomes. In the context of decentralization, countries must resolve three distinct challenges to enable local governments to effectively deliver the respective programs for supporting agricultural development and rural poverty reduction: (i) developing sound and effective intergovernmental organizational arrangements; (ii) introducing robust financial mechanisms for channeling money to sub-national governments; and (iii) ensuring local governments have appropriate management capacity.

**Governments refrain from intervening in rice market activities:** With growing intra ASEAN trade, there would be no longer a need for governments to intervene in the rice market. Allowing the market to operate freely and efficiently with all trades being managed by the private sector in an open and transparent manner will be a key aspect of this new role. These changes will enable ASEAN members to create the prerequisite conditions for introducing and operating a rice futures market that benefits participants through price discovery, price risk management, and improves price transparency to all players. The availability of a liquid rice futures contract will also fill an unmet need for a hedging instrument.

**Adaptation to climate change:** To counter the adverse impacts of climate change on agriculture and thus on national food security to VIP countries will need to take incremental

adaptation actions to increase productivity by about 0.25–0.4 percent per annum over and above the trend line of area expansion and yield improvements in order to counter the effects of a 1°C rise in temperature over the study period. The VIP countries need to accelerate the completion of unfinished sectoral reforms and implementation of well-known and already practiced adaptation measures which are good for the sector with or without climate change. Known adaptation techniques involving changes in crop varieties, cropping rotations, calendars, and improved irrigation efficiency can counter some of these negative threats. Governments can support adaptation through hard measures such as promotion of more weather resistant seeds, more efficient irrigation systems, more water storage facilities, etc., and soft measures such as ensuring the timely

availability of climate information, strengthening the ability of farmers to use it, promoting research into new varieties, strengthening early warning systems, developing water efficient irrigation techniques, providing effective veterinary care to deal with increased threat of disease in livestock and enhancing farmers' ability to absorb the increased risk of climate variability through crop/livestock insurance. At the same time, VIP countries need to exercise due caution in phasing in the implementation of major investments to counter the slow, long-term but uncertain risk of sea level rise. To counter the long-term threat to global food security, they need to join the global community in controlling greenhouse gases, particularly by stopping deforestation and land use changes therein, while continuing to build national institutional capacity to manage increased climate risk.





## CHAPTER 8. CONCLUSION

The basic conclusion of this study is that, while in the past, developing ASEAN countries have legitimately been concerned about food security, given their resource endowment and vast potential for increasing agriculture outputs through productivity improvements, the prospects are good that they could not only meet their domestic food requirements but as a group also remain net exporters to the rest of the world. But to do so, they should adopt conducive policies, make appropriate institutional reforms—including regional arrangements to have more assured trade—and facilitate a greater role for the private sector (in both on-farm and off-farm activities and services).

Other main messages are:

- The current approach to food security being followed in the three VIP countries (focused mainly on rice) has high economic and financial costs, and may be both anti-farmer and anti-poor.
- The objective of rice self-sufficiency is widely accepted in ASEAN countries, leading to active government interventions. On other hand, the policies on other sources of calories and protein (wheat, maize, meats, fish, milk, eggs, horticulture products, etc.) are much more open and market oriented; for these products the markets are being allowed to play a greater stabilizing role.
- Per capita rice consumption may have peaked in Indonesia and Vietnam, and in developing ASEAN as a whole. Over the long term (by 2040), the importance of rice in the diet and price of the food basket will steadily decline; a likely exception here is the case of the Philippines where per capita rice consumption is not likely to begin decreasing until after 2040. Other food items (such as wheat, fruits, vegetables, fish, eggs, meats, etc.) will become

much more important as income levels rise and people are able to afford a more balanced diet.

- The fundamental approach to food security needs be rethought. If the ASEAN countries cannot rely on each other to meet their needs for rice through trade intra ASEAN trade, then how would overall integration work? Assured and open trade in rice (together with an effective joint buffer stock) is a test case of the region's political will to become an "economic community" as already announced by the political leaders.
- The bigger issue facing the governments is how to transform their agriculture economies between now and 2040 (as consumption patterns change and rural wages rise sharply), and focus on the longer-term issues.
- The key to future transformation of agriculture and profitability of farms will be improvements in productivity.
- Agriculture research, extension and a greater role for the private sector in the value chain will be key to raising the productivity, as will be the need to raise investment levels to increase irrigated areas, support greater mechanization and adoption of new technologies, and modernize all elements of the modern supply chain.
- While most mainstream studies suggest that, until 2050, climate change may not be a serious threat to global food production, the situation is much less sanguine for VIP countries. Their agriculture will suffer well before 2050. Adaptation measures need to be introduced now.

- The Visions outlined for the three countries would not be realized immediately. Countries would have as much as 40 years to move gradually from where they are today to what is desired in 2050.
- The medium and long-term strategies and policies required to realize the Visions would necessarily be country specific, and adapted to country circumstances.
- Finally, given the large gains to both farmers and consumers at large by realizing the Visions, countries should adopt the related strategies and policies starting now.

# ANNEX 1—CENTENNIAL GROUP GROWTH MODEL

## CONCEPTS UNDERLYING THE MACRO MODEL AND SCENARIOS<sup>1</sup>

### *PRODUCTIVITY CONVERGENCE*

A wide body of research has shown that some growth differences between emerging market countries can be successfully modeled by dividing them into two groups: ‘converging’ countries with rapid growth and ‘non-convergers’ stuck in the middle income trap.

The ‘convergence’ idea is this: It has been observed that the convergers’ incomes catch up to those of global best practice over time, and that convergers with lower incomes converge more quickly. Three main forces drive convergence: First, open economy forces yield convergent growth if poorer countries focus on their comparative and factor advantages and then trade with nations lacking those factors, e.g., cheap labor. This leads to more equal cross-country factor prices. Second, capital deepening boosts growth more in countries with lower ratios of capital to skilled labor (usually the poorer ones) due to the nature of diminishing returns.

The third force is productivity convergence. Here it is the TFP of convergers that catches up to that of best practice, with those further behind in TFP converging faster. This phenomenon reflects technology leap-frogging, technology transfers, shifting underemployed agriculture workers to efficient export-led manufacturing, transferring child laborers into schools, a steady increase in the average level of literacy, building roads to connect the unconnected to markets, and the diffusion of management and operational research from more advanced countries. It appears that countries can shortcut productivity-improvement processes

by learning from economies that are already at the productivity frontier.

### *MIDDLE INCOME TRAP*

However, as suggested by the records of many middle-income countries around the world, it is difficult (but possible) to avoid a stagnation in growth after a fast-growing economy reaches middle-income status. This stagnation has been termed the ‘middle income trap’ and results from an inability to make some difficult—yet critical—structural adjustments to the growing economy. Once the rural workers have been shifted, the labor-capital ratio approaches that of developed nations, educational attainment reaches higher levels, the old-age dependency ratio increases, everyone is connected by physical infrastructure, and productivity approaches best practice levels—so that importing foreign technology offers only small benefits—the strategies above no longer reap rewards. For example, moving from a BA to MA offers a smaller boost than moving from illiteracy to literacy.

The critical question in this context becomes the following: how have some countries managed to avoid the middle income trap?

Across the world, maintaining high growth after reaching middle-income status has required a change in approach, shifting focus from low-wage, export-led manufacturing to a knowledge-based society with strong domestic demand and a large middle class. Once a fast-growing country’s citizens reach middle-income status, they will no longer accept wages low enough for low-wage manufacturing to be internationally competitive. The economy must become more dependent on innovation and differentiation, transitioning from input-driven growth to productivity-driven growth, but this cannot happen without developing advanced educa-

<sup>1</sup> This subsection is taken from Kohli, Szyf, and Arnold (2012).

tional institutions, efficient financial systems to allocate resources, reliable public safety and pleasant living areas to attract mobile skilled workers and prevent a ‘brain drain’, skill-training programs and social safety nets, affordable housing, sufficient and wise investment, elimination of corruption and inappropriate regulations, and free information flows. If countries cannot change their economic strategies and move up the value chain, they find themselves stuck in the middle—between rich countries that have the legal and financial base to allow for economic growth through high-value innovations and poor countries that are globally competitive because labor and other input costs are low.

These concepts of convergence and the middle income trap drive the productivity component of the model and form the basis for our alternate growth scenarios for Indonesia, the Philippines, and Vietnam.

## ESTIMATING FUTURE GDP<sup>2</sup>

To estimate the total GDP of each country through 2040, the model uses the following Cobb-Douglas function, with  $\alpha$  equal to 2/3:

$$GDP = TFP \times L^\alpha \times K^{1-\alpha}$$

GDP figures are generated for three different measures: real GDP (constant 2010 dollars); PPP GDP (constant 2010 PPP dollars); and GDP at market exchange rates (explained in Section 1.4).

Our units to measure labor force are the number of workers economically active each year. Labor force growth stems from population growth and from changes in labor force participation rates. Labor force participation rates are projected separately, by gender, for seven age cohorts (15–19, 20–24, 25–29, 30–49, 50–59, 60–64, and 65+), using a separate auto-regression for each cohort. The labor force in each of the fourteen age-gender cohorts equals the number of individuals in that cohort times the participation rate for that cohort. Male rates are projected directly; female rates

are derived by projecting the difference between male and female rates.

For the Philippines and Vietnam, population estimates are taken from the United Nations. For Indonesia, we have two different population scenarios: one from the UN, and the other from a country source.

Capital stock is projected by applying yearly investment and depreciation to each year’s stock, beginning with an initial stock derived using the Caselli method. For each country, a quota is set so that its investment rate (over historical years and projected years combined) cannot remain above 30 percent (as a share of GDP) for more than 35 years. Once it reaches its quota, its rate linearly decreases to 30 percent over 10 years. And for countries with rates below 20 percent, the rate tapers up over time, reaching 20 percent in 2020.

Finally, TFP is estimated using the following equation:

$$TFPGrowth_{i,t} = DefaultRate + CB_{i,t} - FP_{i,t}$$

where  $i$  is the country,  $t$  is the year, *DefaultRate* represents the expansion of the global productivity frontier (1 percent), *CB* is the convergence boost benefiting ‘converging’ countries, and *FP* is the penalty suffered by fragile states (–1.8 percent).

The convergence boost is defined as follows:

$$CB_{i,t} = c_{i,t} \times BoostCoefficient \times \ln\left(\frac{TFP_{USA,t-1}}{TFP_{i,t-1}}\right)$$

where  $i$  is the country,  $t$  is the year, *BoostCoefficient* is the convergence coefficient (0.0269), *TFP* is the total factor productivity, and  $c$  takes a value between 0 and 1 and identifies whether the country is treated as a converger ( $c=1$ ), as a non-converger or fragile state ( $c=0$ ), or as in an intermediate position ( $0 < c < 1$ ), wherein the country is experiencing some, but not all, of the convergence boost.

For non–developing-ASEAN countries, the classification of whether the model treats them as convergers, non-convergers, or failed states may be found in Annex 1 of Kohli, Szyf, and Arnold (2012).

<sup>2</sup> Subsections 1.2, 1.4, and the middle of 1.5 are taken from or based on Kohli, Szyf, and Arnold (2012), where further details may be found, and Kohli (2011). Kohli, Harpaul Alberto. (2011). Model for Developing Global Growth Scenarios. In Harinder Kohli, Ashok Sharma & Anil Sood (Eds.), *Asia 2050: Realizing the Asian Century*. New Delhi: SAGE.

For developing ASEAN countries, their classification as convergers or non-convergers constitutes the most important difference between the optimistic and pessimistic scenarios.

### THE MACRO SCENARIOS: OPTIMISTIC AND PESSIMISTIC

In all cases, the differences between the scenarios consists in the values chosen for  $c$  in equation 3.5.1 (which affects productivity growth) and the investment rate. The precise definitions for each scenario for country are as follows:

Indonesia: In both scenarios, Indonesia starts out as a converger, continuing its overall success over the past two decades. In the optimistic scenario, this status remains unchanged through 2040, which corresponds to the  $c$  in Equation 3.5.1 remaining 1 for all years. But in the pessimistic scenario, beginning in 2017, it gradually begins to lose most of its convergent status, reaching a minimum  $c$  of 20 percent (meaning it is treated as in an intermediate position between convergence and non-convergence, in this case reaping just 20 percent of the convergence boost) in 2024 and continuing at that level through 2040.

As we also have two population scenarios, this yields four macro scenarios (identified in §1.8).

Table A1.1 provides the full details of Indonesia's scenario specifications. All other parameter values are as given earlier in this annex and Kohli, Szyf, and Arnold (2012), which is also the source of the investment rate given in the table.

Philippines: In both scenarios, the Philippines starts out as a non-converger. In the pessimistic scenario, it maintains this status through the end of the time period, and its investment rate gradually falls, reaching 15 percent in 2025 and through 2040. But in the optimistic case, it begins to experience increasing portions of the convergence boost beginning in 2014, reaching a  $c$  of 40 percent by 2022 and through 2040. In addition, in this optimistic case it enjoys the new-converger investment boost described in Kohli, Szyf, and Arnold (2012),<sup>3</sup> rising to 24 percent by 2020 and then falling back down to a plateau of 20.12 percent

**TABLE A1.1: INDONESIA'S SCENARIO SPECIFICATIONS**

year	c (opt)	inv (opt)	c (pess)	inv (pess)
<=2016	1	25.45%	1	25.45%
2017	1	25.45%	0.97	25.45%
2018	1	25.45%	0.84	25.45%
2019	1	25.45%	0.72	25.45%
2020	1	25.45%	0.59	25.45%
2021	1	25.45%	0.47	25.45%
2022	1	25.45%	0.36	25.45%
2023	1	25.45%	0.25	25.45%
2024+	1	25.45%	0.2	25.45%

Source: These are the scenario definitions being presented in this section of this annex.

by 2035. This investment boost is needed in order for the country to transition from being a non-converger to being a converger.

Table A1.2 provides the full details of the Philippines' scenario specifications. All other parameter values are as given earlier in this annex and Kohli, Szyf, and Arnold (2012), which is also the source of the optimistic scenario's investment rate, based on the investment boost for newly converging countries.

**TABLE A1.2: PHILIPPINES' SCENARIO SPECIFICATIONS**

year	c (opt)	inv (opt)	c (pess)	inv (pess)
2013	0	20.68%	0	20%
2014	0.35	21.71%	0	19.5%
2015	0.4	22.75%	0	19%
2016	0.45	23.79%	0	18.5%
2017	0.5	23.84%	0	18%
2018	0.6	23.89%	0	17.5%
2019	0.6	23.95%	0	17%
2020	0.6	24%	0	16.5%
2021	0.6	23.74%	0	16%
2022–2024	0.6	23.48%	0	15.5%
2025–2034	0.6	declines each year	0	15%
2035+	0.6	20.12%	0	15%

Source: These are the scenario definitions being presented in this section of this annex.

<sup>3</sup> Kohli, Harpaul Alberto, Szyf, Y. Aaron, & Arnold, Drew. (2012). Construction and Analysis of a Global GDP Growth Model for 185 Countries through 2050. *Global Journal of Emerging Market Economies*, 4(2), 91–153.

Vietnam: Although Vietnam has traditionally been considered a converger, in the past few years its TFP growth has slowed. Therefore, in both scenarios, for 2014 Vietnam is made to benefit from only 70 percent of its convergence boost (a *c* of 70 percent). In the optimistic scenario, it gradually increases the share of its convergence boost it enjoys from 70 percent to 100 percent, regaining its fully convergent status in 2027. But in the pessimistic case, it gradually loses more and more of its convergence boost, reaching a thereafter-permanent low of a *c* of 20 percent in 2021. In addition, in the pessimistic case, its investment rate falls much faster than in the optimistic case (wherein it decreases after reaching the 35-year quota described above). As a point of comparison, in the optimistic scenario it does not fall to 35 percent until 2040 but in the pessimistic scenario it has already fallen to 35 percent by 2022.

Table A1.3 provides the full details of Vietnam’s scenario specifications, except for the post-2027 investment rates, which equal the lower of 33.5% and the rate determined by the methodology in Kohli, Szyf, and Arnold (2012), which is also the source of the investment rate given for the optimistic scenario and pre-2020 for the pessimistic one.

Rest of Developing ASEAN: In the optimistic scenario, Cambodia, Malaysia, and Thailand are convergers throughout the entire time period; Laos and Myanmar begin as non-convergers but gradually begin converging, with an investment boost, in 2015 and 2017, respectively, according to the process detailed in Kohli, Szyf, and Arnold (2012).<sup>4</sup> In the pessimistic scenario, Malaysia (given its high income) remains a converger and Myanmar and Laos remain non-convergers throughout the time period; Cambodia and Thailand fall into the middle income trap according to the timetable explained in Kohli, Szyf, and Arnold (2012).<sup>5</sup>

### GDP AT MARKET EXCHANGE RATES

As countries grow richer, over time periods of 10 years or more, their real exchange rates (RERs) tend to appreciate. This gives them an even larger share of the global economy, increases their weight in trade, and increases the interna-

<sup>4</sup> Ibid.  
<sup>5</sup> Ibid.

**TABLE A1.3: VIETNAM'S SCENARIO SPECIFICATIONS**

year	c (opt)	inv (opt)	c (pess)	inv (pess)
2013	1	38.14%	1	38.14%
2014	0.7	38.14%	0.7	38.14%
2015	0.715	38.14%	0.63	38.14%
2016	0.72	38.14%	0.56	38.14%
2017	0.725	38.14%	0.5	38.14%
2018	0.7	38.14%	0.44	38.14%
2019	0.82	38.14%	0.38	38.14%
2020	0.83	38.14%	0.3	37%
2021	0.85	38.14%	0.2	36%
2022	0.85	38.14%	0.2	35%
2023	0.88	38.14%	0.2	34%
2024	0.9	38.14%	0.2	33.5%
2025	0.93	38.14%	0.2	33.5%
2026	0.99	38.14%	0.2	33.5%
2027–2036	1	38.14%	0.2	33.5%
2037	1	37.32%	0.2	33.5%
2038	1	36.51%	0.2	33.5%
2039	1	35.70%	0.2	33.5%
2040	1	34.88%	0.2	33.5%

*Source:* These are the scenario definitions being presented in this section of this annex.

tional purchasing power of their citizens. To capture this effect we generate a measure of GDP at market exchange rates, which serves as our proxy for nominal GDP.

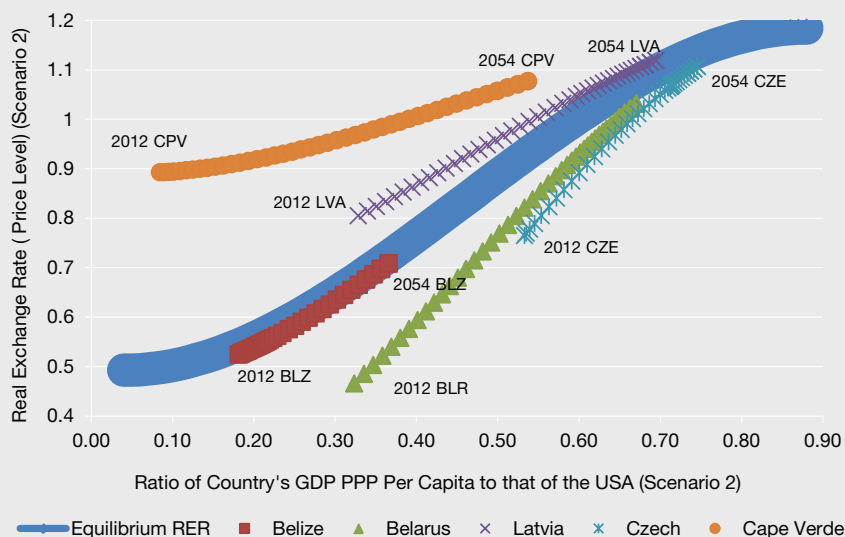
For the historical observations we create the GDP at MER measure by taking away US inflation relative to 2010 from each country’s nominal GDP and leaving in exchange rate differences. But for the future we project this indicator by inflating a country’s estimated real GDP (at constant 2010 dollars) by its expected real exchange rate appreciation.

Our first step in estimating future RERs is to derive the following equation to establish a theoretical equilibrium relationship between a country’s RER and its PPP income relative to that of the US:

$$RER_{i,t}^{EQ} = \frac{PPP_{i,t}}{e_{i,t}} = .498 - .255 \left( \frac{GDPPC_{i,t}}{GDPPC_{US,t}} \right) + 3.23 \left( \frac{GDPPC_{i,t}}{GDPPC_{US,t}} \right)^2 - 2.34 \left( \frac{GDPPC_{i,t}}{GDPPC_{US,t}} \right)^3$$

where *i* represents the country, *t* the year, PPP<sub>*i*</sub> the country’s PPP conversion factor relative to the US (US\$=1), *e<sub>i,t</sub>* its exchange rate relative to that of the US, GDPPC<sub>*i*</sub> its GDP PPP

FIGURE A1.1: EQUILIBRIUM RELATIONSHIP AND MOVEMENT OVER TIME



Source: Kohli, Szyf, and Arnold (2012)

per capita, and GDPPCUS the US's GDP PC. Then, using the following equation, each country's modeled exchange rate converges (see figure) towards the value that corresponds to its income in this equilibrium equation:

$$\ln(C_{i,t}) = \beta_1 \times \ln(C_{i,t-1}) + \beta_2 \times \ln(\text{CappedGDPPC}_{i,t}) + \beta_0 + \varepsilon_{i,t}$$

where  $RER_{i,t}$  is the modeled value of country  $i$ 's real exchange rate at time  $t$  and  $RER_{i,tEQ}$  is the equilibrium RER of country  $i$  at time  $t$  predicted by the previous equation.

Figure A1.1 from Kohli, Szyf, and Arnold<sup>6</sup> illustrates both the equilibrium relationship and the movement over time of example countries' rates.

## MEASURES RELATED TO INCOME DISTRIBUTIONS

The final aspect of the macro model used in this study is estimates of income classes and median and percentile consumption. The first step in this process is to estimate per capita total consumption.

We calculate consumption in constant PPP international dollars (both for base year 2010 and base year 2005) as the GDP PPP PC times the share of GDP spent on consumption. To estimate the latter, we begin with the historical series of the ratio of consumption to GDP from the Penn World Table (Heston, Summers, & Aten, 2009).<sup>7</sup> We then estimate future consumption using the following autoregression across all countries and years:

$$RER_{i,t} = RER_{i,t-1} + (1.184 - RER_{i,t-1}) \times \left( \frac{RER_{i,t}^{EQ} - RER_{i,t-1}^{EQ}}{1.184 - RER_{i,t-1}^{EQ}} \right)$$

where  $i$  is the country,  $t$  is the year,  $C$  is the share of GDP spent on consumption,  $\text{CappedGDPPC}$  is the minimum of \$50,000 and the GDP PPP PC in constant 2010 PPP dollars, the  $\beta$ s are the coefficients, and  $\varepsilon$  is the error term.

To estimate the sizes of the lower, middle, and upper classes, the model calculates what share of the population is between certain income cutoffs (middle class is \$10.80 to \$100 of consumption a day using constant 2010 PPP dollars). As a country's total income increases, more people with small shares of the country's total will attain higher

6 Kohli, Harpaul Alberto, Szyf, Y. Aaron, & Arnold, Drew. (2012). Construction and Analysis of a Global GDP Growth Model for 185 Countries through 2050. *Global Journal of Emerging Market Economies*, 4(2), 91–153.

7 Heston, Alan, Summers, Robert, & Aten, Bettina. (2009). Penn World Table Version 6.3. Retrieved 8/10/2010, from Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania.

living standards. We use a type of income distribution curve called a GQ Lorenz curve (Kohli, Szyf, & Arnold, 2012). We calculate these shares using the following GQ-Lorenz-based headcount function (the share of the country's population below per capita income level  $z$  in a given year):

$$H(z) = -\frac{1}{2m} \left( n + r \times \frac{(b + \frac{z\delta}{\mu})}{\sqrt{(b + \frac{z\delta}{\mu})^2 - m}} \right)$$

where  $H(z)$  is the headcount index,  $\mu$  is the country's mean consumption level per capita in 2010 PPP dollars, and the other letters are parameters that describe the shape of the income distribution (Kohli, Szyf, & Arnold, 2012), with values taken from Povcal (World Bank Development Research Group, 2011).<sup>8</sup>

For our food consumption model, we will also need to calculate percentile incomes, that is, what is the income (or consumption level) so that a given percentage of the population lives under that level. For percentile pct, the following equation identifies below which income level it is that pct% of the population lives:

$$\theta \times H(z) \times (1 - H(z)) \times \left( \frac{\gamma}{H(z)} - \frac{\delta}{(1 - H(z))} \right) = 1 - \frac{z}{\mu}$$

where GDPPC is either the income or consumption level per capita, pct% is the percentage of the population, and the other terms are the same as in the previous equation.

The model also generates poverty measures for all ASEAN countries except Myanmar. However, the GQ Lorenz curve (and hence the headcount formula above) is not as accurate for extremely low incomes (Kohli, Szyf, & Arnold, 2012), and so we must use the Betz Lorenz curve. Using the Beta Lorenz, the poverty headcount ratio (what percent of the population lives below the poverty line) is the value of  $H(z)$  that makes the following equation true (Datt, 1998):<sup>9</sup>

$$\theta \times H(z) \times (1 - H(z)) \times \left( \frac{\gamma}{H(z)} - \frac{\delta}{(1 - H(z))} \right) = 1 - \frac{z}{\mu}$$

where  $\theta$ ,  $\gamma$ , and  $\delta$  are the parameters that characterize the income distribution (with values taken from Povcal (2012)),

$z$  is the poverty line (\$1.25 per day, measured in constant 2005 PPP dollars), and  $\mu$  is the country's mean consumption level per capita in constant 2005 PPP dollars.

This headcount index tells us how many poor there are, but not how poor they are. A country with all the poor living just below the poverty line would get the same score as a country with the same rate of poverty but with most of the poor living on incomes below half the poverty level.

To estimate the magnitude of poverty, we use the poverty gap. This takes into account how far below the poverty line the average poor person is. More precisely, it measures what share of the society's resources would have to be transferred to the poor to eliminate poverty. The poverty gap equals

$$PG = H - \frac{\mu}{z} \times (H - \theta \times H^\gamma \times (1 - H)^\delta)$$

where  $z$  is the poverty line and  $H$  is the  $H(z)$  defined in the previous equation (Datt, 1998).

However, for the Philippines 2040 estimates, we do not use the above equations for the poverty gap and headcount because its Beta Lorenz curve is not valid (Povcal, 2012). Instead, we use the GQ-Lorenz headcount function above and the poverty gap equation given in Kohli, Szyf, and Arnold (2012).<sup>10</sup>

## FOOD CONSUMPTION MODEL

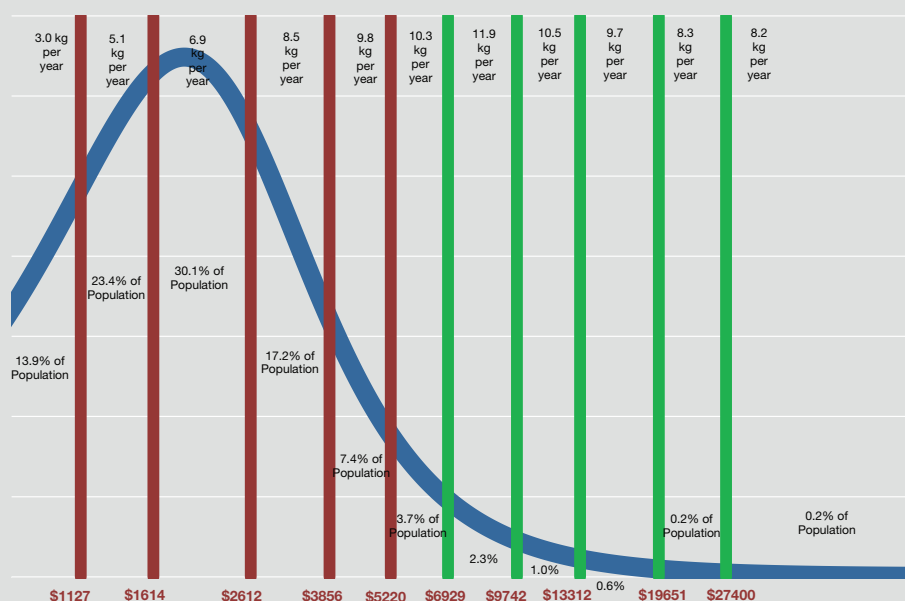
For each food commodity, future consumption is estimated as follows: a table is formed showing, for a set of 9 to 11 consumption income group cohorts, how much of that commodity the average member of each cohort eats. (This pattern already takes into account urban-rural differences.) For each year, the macro model computes what fraction of the population is in each cohort. The final per capita food consumption number equals the weighed average of how much each cohort consumes, weighed by each cohort's share of the total population. As the country grows richer, the number of people in each cohort changes, and so the

<sup>8</sup> World Bank Development Research Group. (2011). PovcalNet. Retrieved 12/13/2010 <http://go.worldbank.org/WE8P18250>

<sup>9</sup> Datt, Gaurav. (1998). Computational Tools for Poverty Measurement and Analysis. FCND Discussion Papers, 50. Retrieved from <http://www.ifpri.org/publication/computational-tools-poverty-measurement-and-analysis>

<sup>10</sup> Kohli, Harpaul Alberto, Szyf, Y. Aaron, & Arnold, Drew. (2012). Construction and Analysis of a Global GDP Growth Model for 185 Countries through 2050. *Global Journal of Emerging Market Economies*, 4(2), 91–153.



**FIGURE A1.2: POPULATION DISTRIBUTION BY INCOME (BLUE) AND EGG CONSUMPTION: INDONESIA 2010**


Source: Centennial Model

country's average consumption changes, as illustrated in the following two charts for egg consumption in Indonesia.

In each chart, the horizontal axis represents a person's consumption income per year, in 2010 PPP dollars (as we will see below, we use PPP because we will be extrapolating between different countries' experiences of how much food each eats, for which PPP is a better measure). The blue line represents a population density function: what the probability is that a random person in the country will have that level of consumption. (The vertical axis values are arbitrary and are not shown.) The higher the value of the blue line, the more people in the country have the consumption level indicated by the corresponding value of on the x axis.

The red and green lines demarcate the different cohorts we use, each cohort defined as a range of possible consumption levels. For example, the second cohort contains everyone with a consumption level between \$1,127 and \$1,614 a year. As will be explained below, the red lines indicate cohorts derived from the actual 2010 or 2006 historical household consumption data and green ones are constructed based on estimates of possible 2040 (optimistic scenario) outcomes.

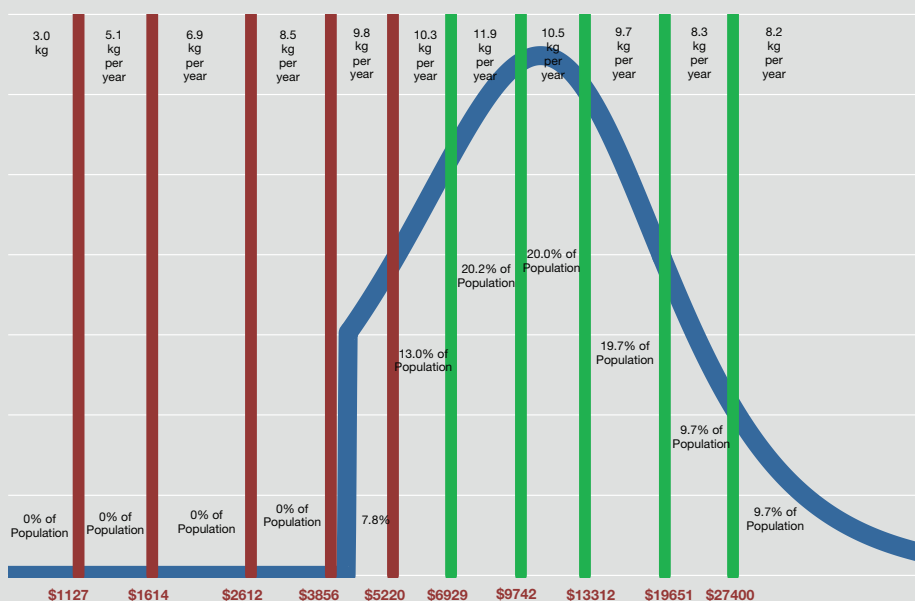
For each cohort, at the top of the chart appears how many kilograms of eggs the average person in that cohort eats a week. For example, for the \$1,127 to \$1,614 cohort the value is 0.426 kg.

Finally, towards the bottom of the graph appears the percentage of the population in that cohort. This simply equals the area on the graph that is under the blue curve and between the upper and lower vertical lines demarcating the cohort (more precisely, this equals the integral of the blue curve between the two demarcating vertical lines). Therefore, the \$1,127 to \$1,614 cohort contains 23.4 percent of Indonesia's 2010 population.

In the first chart, when we take a weighed average of each cohort's egg consumption, weighed by each cohort's share of the population (the area under the curve), we reach an average of 6.7 kg per year.

But in the following graph, representing 2040's optimistic scenario, the average is 10.1 kg per year. The only difference between the two graphs is the income distribution. The cohort definitions (and corresponding vertical lines) and cohort quantities eaten are exactly the same. But as the blue curve moves right over time (indicating more prosper-

**FIGURE A1.3: POPULATION DISTRIBUTION BY INCOME (BLUE) AND EGG CONSUMPTION: INDONESIA 2040 (OPT.)**



Source: Centennial Model

**TABLE A1.4: INDONESIAN EGGS**

income range	< \$1127	\$1127-\$1614	\$1614-\$2612	\$2612-\$3856	\$3856-\$5220	\$5220 +
KG eggs/year	3.0	5.1	6.9	8.5	9.8	10.6
2010 population share	13.9%	23.4%	30.1%	17.2%	7.4%	8.0%
2040 (opt.) pop. share	0%	0%	0%	0%	7.8%	92.2%

Source: Centennial Model

**TABLE A1.5: SINGAPORE'S EATING HABITS**

	1st quintile < \$6353	2nd quintile \$6353-\$10417	3rd quintile \$10417-\$15470	4th quintile \$15470-\$24271	5th quintile \$24271 +
KG eggs/year	4.9	5.6	5.0	4.6	3.9

Source: Singapore Household Expenditure Survey and Centennial Model (for quintiles)

ity), more of the population falls into the higher cohorts and less into the lower.

This model is therefore an application of the macro model to an estimate of the country's food eating patterns by consumption cohort. These patterns are determined as follows:

TABLE A1.6: INTER-COHORT RATIOS

cohort #	1	2	3	4	5	6	7	8	9	10 (& 11)	
orig IDN cohort	<\$1127	\$1127–\$1614	\$1614–\$2612	\$2612–\$3856	\$3856–\$5220	\$5220+					
KG eggs/year	3.0	5.1	6.9	8.5	9.8	10.6					
SGP cohort							<\$6353	\$6353–\$10417	\$10417–\$15470	\$15470–\$24271	\$24271+
SGP eggs/yr							4.9	5.6	5.0	4.6	3.9
ratio of SGP quintile's KG eggs to previous quintile's								1.1=5.6/4.9	0.9=5.0/5.6	0.9=4.6/5.0	0.8=3.9/4.6
new IDN cohort	<\$1127	\$1127–\$1614	\$1614–\$2612	\$2612–\$3856	\$3856–\$5220	\$5220–\$6929	\$6929–\$9742	\$9742–\$13312	\$13312–\$19651	\$19651+	
share of 2010 IDN population	Not relevant	Not relevant	Not relevant	Not relevant	Not relevant	3.7%	2.3%	1.0%	0.6%	0.4%	
new KG eggs/yr value	3.0	5.1	6.9	8.5	9.8	10.3	11.9	10.5	9.7	8.3	
new KG eggs/yr formula	3.0	5.1	6.9	8.5	9.8	x	x*1.1	x*1.1*0.9	x*1.1*0.9*0.9	x*1.1*0.9*0.9*0.8	

Source: SUSENAS (Indonesia), Singapore Household Expenditure Survey, and Centennial Model

We begin with the historical household consumption surveys (broken down by consumption income cohort) collected for each country. (For fish in Indonesia and fish, meat, eggs, roots, vegetables, fruit, and corn in the Philippines, we make adjustments based on other country sources.) For Vietnam and the Philippines, the cohorts are given as quintiles. For Indonesia, a different percentile distribution is provided. For Indonesia we use the 2010 SUSENAS, for Vietnam the 2010 GSO household survey, and for the Philippines the 2006 household survey.

As our consumption model depends on having absolute dollar cutoffs for cohorts, not percentiles, we use the macro model to translate quintiles or other percentiles into dollar amounts. In our example of Indonesian eggs, that gives us the following pattern, with these cohort cutoffs drawn in dark red in the two graphs above. (As said, the green cutoffs above are not based on the historical data.)

But although this division into cohorts gives an acceptable level of detail to analyze 2010 eating habits, it does not provide a useful level of resolution for the 2040 optimistic

scenario: there, 92% of people fall into the top red cohort. In other words, if we were to remove all the green lines from the graph above (all cohorts defined in the actual SUSENAS are drawn in red), our methodology would not be very useful. If we are to understand the national eating habits as the result of the population being distributed into a changing mix of the fixed cohorts (which also already reflect urban and rural differences), not much change or information can be gleaned for 2040 if the top cutoff is \$5,220.

However, our actual historical data for Indonesia does not report any cohort cutoffs above this. That is why the right half of the charts has only green lines, not red ones. If we are to have enough detail through our cohort demarcations to estimate future consumption, we will have to derive richer cohorts' eating habits from elsewhere, thus letting us decompose the richest SUSENAS cohort (\$5,220+) into smaller cohorts.

We use comparator countries for this purpose. But because culture is different in other countries, we do not directly use our comparators' eating patterns. Instead, we use the

following extrapolation procedure, again illustrated using Indonesia and eggs, for which we use a single comparator: Singapore.

Singapore's egg-eating habits for 2008 are:

As with the Philippines and Vietnam, the Singapore cohort data comes in the form of quintiles and not dollar ranges. We derive the dollar cutoffs via our macro model and its income distributions.

To use Singapore's data in order to estimate the behavior of Indonesia's richer cohorts for which we do not have Indonesian data, we create new richer Indonesian cohort demarcations by taking quintiles and deciles of the 2040 optimistic scenario and then construct the table below. (Note that to simplify the following explanation, we aggregate our 10th and 11th Indonesian cohorts into one)

In the below table, we very roughly line up the Singapore cohort cutoffs with our new Indonesian cohorts (the green lines in the charts above). If we were to directly apply the Singaporean eating habits to Indonesia—which we do not do, because of cultural differences—then we would take the Singaporean 5.6 value for our cohort 7. But as seen, we use a value of 11.9 instead.

To derive that, we take the ratio of many kilograms of eggs our approximate cohort 7 consumes in Singapore to how many our approximate cohort 6 consumes there, and then we multiply that by the actual kilograms of eggs consumed by Indonesia's cohort 6.

Likewise, to estimate Indonesia's cohort 9 egg consumption, we take Singapore's egg consumption ratio between cohorts 8 and 9 and then multiple Indonesia's cohort 8 egg consumption by that ratio.

Data permitting, for all countries and commodities, we employ this technique of applying the richer countries' inter-cohort ratios to our countries. As our comparators, we use Singapore and Japan, sometimes choosing one and sometimes taking their average.

One step is missing. We have established the relative values between cohorts 6, 7, 8, 9, and 10/11 based on this ratio-extrapolation method, but this does not give us the absolute values.

This is because we want our new eating pattern to be fully consistent with the real household survey table for 2010. What we have just done is decompose the richest cohort from the SUSENAS into subcohorts. We want the weighted average of our new sub-cohorts to equal the 10.6 SUSENAS value for the richest cohort.

For this we use the last line of the table. In it, the kg of eggs per year is expressed in terms of an unknown number  $x$  and the ratios derived from Singapore. We therefore search for the  $x$  that makes the weighed average of cohorts 6, 7, 8, 9, and 10/11 (weighed by the third-to-last row, which is the population shares) equal to the original 10.6 value of the original highest cohort, before we decomposed it into subcohorts. Once we have identified this  $x$ , our food eating pattern for Indonesian eggs is completed, with the relative values of the new subcohorts determined by the ratios between the Singaporean cohorts and with the absolute values chosen to be consistent with the original 2010 SUSENAS. Data permitting, we employ the same procedure for all countries and commodities.

## AGGREGATE AGRICULTURAL PRODUCTION MODEL

To estimate future aggregate agricultural production, we use the following function, based on Fuglie (2010b):<sup>11</sup>

$$AgProd = TFP \times Labor^{\alpha} \times QualAdjLand^{\beta} \times LivestK^{\gamma} \times MachK^{\delta} \times Fert^{\epsilon}$$

where AgProd represents the total agricultural production, Labor the agricultural labor force, QuaAdjLand a measure of land area adjusted for quality, LivestK the livestock capital, MachK the machine capital, and Fert the fertilizer and chemicals. (Factor definitions are given in Fuglie (2010b).<sup>12</sup>

11 Fuglie, Keith O. (2010b). Total Factor Productivity in the Global Agricultural Economy: Evidence from FAO data. In J. M. Alston, B. Babcock & P. G. Pardey (Eds.), *The Shifting Patterns of Agricultural Production and Productivity Worldwide* (pp. 63–95). Ames, Iowa: Midwest Agribusiness Trade and Research Information Center.

12 Ibid.

The exponents  $\alpha$ ,  $\beta$ ,  $\gamma$ ,  $\delta$ , and  $\varepsilon$  are the factor shares and together always sum to 1.

For our historical values of agricultural production, we multiply the country's GDP by the World Bank figure for agriculture's value added as a share of GDP.

### LAND

The quality-adjusted land measure we use is based on dividing land into 3 categories: Rain-fed land gets a weight of 1, irrigated land a weight of 2.993, and pasture land a weight of 0.094 (Fuglie, 2010b).<sup>13</sup> For our purposes, we ignore pasture land because its weight is so low. Land for tree crops is treated the same as rain-fed land (Fuglie, 2012).<sup>14</sup>

For Indonesia, we have one scenario for quality-adjusted land area change over time: a 0.50% average increase per year. For Vietnam we also have one scenario: a 0.27% decrease per year. For the Philippines, we have two scenarios: In the first, there is an increase of 0.47% per year; in the second, the increase is 0.65% per year. These rates are based on taking quality-adjusted sums of the initial and final land areas used in the country studies.

### LIVESTOCK, MACHINE CAPITAL, AND FERTILIZER

For all countries and scenarios, estimates for future growth rates for livestock capital, machine capital, and fertilizer are set equal to the average annual growth rates experienced from 1990 to 2006 derived from the data in Fuglie (2010a).<sup>15</sup>

### POPULATION

To estimate the future agricultural labor force, we use the following relation:

$$\text{Labor} = \text{Population} \times \text{Share of Population that is Rural} \times \text{Ratio of Ag Workers to Rural Pop}$$

<sup>13</sup> Ibid.

<sup>14</sup> Fuglie, Keith O. (2012, August 13, 2012). [Conversation with Centennial Group].

<sup>15</sup> Fuglie, Keith O. (2010a). Sources of Growth in Indonesian Agriculture. *Journal of Productivity Analysis*, 33, 225–240.

For population we use our macro model's estimates; for the second term we use the UN urbanization estimates; and for the third term we use, for future years, the value of the agricultural-workers-to-rural-population ratio for the most recent year with actual data available. Therefore, the third term remains constant, the second term decreases over time, and the first term increases over time. The result is little net change in the agricultural labor force.

### FACTOR SHARES

The next component of the production equation is the factor shares. For years through 2013, we use the factor shares for Southeast Asia given in Fuglie (2010b).<sup>16</sup> As a country becomes more prosperous, though, the structure of its economy changes, and so the factor shares change. For example, in Fuglie (2010a),<sup>17</sup> the factor share for machine capital was usually about 0.01, and sometimes was even listed as 0. But in more developed countries, mechanization strongly boosts output. Therefore, as a country's income level rises, we set its factor shares' values to linearly change, converging to China's 1997 share values as its income approaches that of 1997 China, and, beyond that income level, converging towards the 2002 US values as its income approaches that of the 2002 United States.

### TFP

The last component of the production model is the agricultural TFP growth rate. For each country macro scenario (GDP growth and population), we generate two agricultural TFP scenarios:

Vietnam and the Philippines: In the pessimistic agriculture scenarios, agricultural TFP growth is 2% per year. In the optimistic scenarios, it rises linearly to 3.22% in 2020, stays at that value for ten years, and then decreases linearly

<sup>16</sup> Fuglie, Keith O. (2010b). Total Factor Productivity in the Global Agricultural Economy: Evidence from FAO data. In J. M. Alston, B. Babcock & P. G. Pardey (Eds.), *The Shifting Patterns of Agricultural Production and Productivity Worldwide* (pp. 63–95). Ames, Iowa: Midwest Agribusiness Trade and Research Information Center.

<sup>17</sup> Fuglie, Keith O. (2010a). Sources of Growth in Indonesian Agriculture. *Journal of Productivity Analysis*, 33, 225–240.

to 2.61% in 2040. (The 3.22% is that given in Fuglie and Evenson (2010) for China's most recent period.)

For Indonesia, yearly TFP growth is 3% in the pessimistic scenarios. In the optimistic scenarios, it rises linearly to 3.5% in 2020, stays at that value for ten years, and then decreases linearly to 3.25% in 2040.

### **SCENARIO SPECIFICATIONS**

Table A1.7 shows how many variants each country has for each alterable component and in which section of this appendix those variants are defined:

Table A1.8 defines each scenario. See the previous table to locate where in this appendix the definition of each component appears.

**TABLE A1.7: SCENARIO SPECIFICATIONS**

# alternatives for each component	GDP growth (\$1.3)	population (\$1.3)	agr. TFP (\$1.7)	agr. land area (\$1.7)	total # of scenarios for macro & consumption	total # of scenarios for production
Indonesia	2	2	2	1	4	8
Philippines	2	1	2	2	2	8
Vietnam	2	1	2	1	2	4

Source: This table is a re-statement and summary of the scenario specifications in this annex. Therefore, the source is the previous content in this annex.

**TABLE A1.8: SCENARIO DEFINITIONS**

	Indonesia	Philippines	Vietnam
Scenario 1	High GDP Growth	High GDP Growth	High GDP Growth
	Low Population Growth	High Ag. TFP Growth	High Ag. TFP Growth
	High Ag. TFP Growth	Low Land Growth	
Scenario 2	Low GDP Growth	Low GDP Growth	Low GDP Growth
	Low Population Growth	High Ag. TFP Growth	High Ag. TFP Growth
	High Ag. TFP Growth	Low Land Growth	
Scenario 3	High GDP Growth	High GDP Growth	High GDP Growth
	Low Population Growth	Low Ag. TFP Growth	Low Ag. TFP Growth
	Low Ag. TFP Growth	Low Land Growth	
Scenario 4	Low GDP Growth	Low GDP Growth	Low GDP Growth
	Low Population Growth	Low Ag. TFP Growth	Low Ag. TFP Growth
	High Ag. TFP Growth	Low Land Growth	
Scenario 5	High GDP Growth	High GDP Growth	
	High Population Growth	High Ag. TFP Growth	
	High Ag. TFP Growth	High Land Growth	
Scenario 6	Low GDP Growth	Low GDP Growth	
	High Population Growth	High Ag. TFP Growth	
	High Ag. TFP Growth	High Land Growth	
Scenario 7	High GDP Growth	High GDP Growth	
	High Population Growth	Low Ag. TFP Growth	
	Low Ag. TFP Growth	High Land Growth	
Scenario 8	Low GDP Growth	Low GDP Growth	
	High Population Growth	Low Ag. TFP Growth	
	High Ag. TFP Growth	High Land Growth	

Source: This table is a re-statement and summary of the scenario specifications in this annex. Therefore, the source is the previous content in this annex.





# ANNEX 2—HIGHLIGHTS OF THE VIETNAM REVIEW

## MAJOR FINDINGS

Vietnamese agriculture and fisheries sectors have performed well over the last two decades and have recorded sustained growth of 3–4 percent over the period. The rice and aquaculture subsectors have been particularly successful. From 1990–2010 paddy production doubled, while aquaculture production increased nearly 20 fold. Both subsectors have seen a strong performance in exports. In parallel, industrial crops have also greatly expanded, particularly rubber and coffee, which have also found strong export markets. This good performance has been accompanied by a sharp fall in the national poverty rate during same period.

The limited amount of land suitable for agriculture is a major resource constraint for Vietnamese agriculture, so that productivity per ha is a key consideration for the growth of the sector. The current situation of agriculture in Vietnam is still strongly influenced by the small size of the landholdings that were created following the 1988–92 “Doi Moi” reforms that launched the major growth of the sector detailed in the main report. The emphasis on equity in land holdings led to the creation of a large number of small farms on which, given a weakness of rural markets at the time, the best way for a farming family to survive was to produce the family food needs.

Today, markets are developed, and, except for land designated by the government as rice land, farmers are free to select the crops they wish to grow. Impressive increases in rice production achieved during the last two decades, primarily in the Mekong and Red River deltas, the country’s two rice bowls, have not, however, resolved the problems associated with the large number of small holdings with limited earning potential. But the legacy of the past remains, with the government still prescribing rice national self-sufficiency approach as the best way forward and prescribing

lands that are only allowed to produce rice. One consequence of this approach is that income from specialized rice farming on very small farms (typically 0.1 ha in the red River area) is particularly low and continues to fall further behind that of other segments of the population as the economy grows. Already for many of these farmers rice is a part time occupation and unless the restrictions on diversifying out of rice are eased, the country faces the risk of only the old continuing with rice cultivation. Increasing rice productivity, cropping intensity and farm mechanization could somewhat ameliorate this situation but with yields already at a fairly high levels the scope is limited.

The current land policy designating rice areas has costs for farmers and costs for Vietnam. The costs for farmers are mainly linked to lost opportunities to plant and sell higher value crops such as horticulture crops where this is possible. The costs to Vietnam are lost opportunities to export a greater volume of higher value commodities than rice.

Moving forward, improving farm productivity and generating higher incomes for farmers will depend on the creation of larger size farm units through the consolidation of existing farms and better access to finance to enable crop diversification and intensification. In addition, farming activities will become more attractive if the government would recast current food security policy and relinquish altogether the prescription prohibiting certain areas from producing anything but rice and allowing farmers to choose their own cropping patterns or at least rotate rice with other crops. This will put the improvement of current land policy at the center of coming government efforts to maintain sector and income growth in agriculture in the coming years.

The government will also have to take account of another change that is occurring, which is a change in the Vietnamese diet. While rice is currently, and will likely remain, the primary source of caloric intake in the Vietnamese diet, as

incomes continue to grow per capita rice consumption will continue the gradual decline that has been observed for the last two decades.<sup>1</sup> Rice remains of extreme importance for the poor, but urban dwellers, with higher incomes, are already moving to other food sources including wheat based products and higher protein products, particularly meat and fish. Government policy still gives great importance to rice production over any other crop. A recognition that rice can be expected to decline in importance in the coming years from the current dominant level will enable more balanced national agricultural policies to be developed in the future.

In contrast to the ongoing fall in per capita rice consumption, meat demand, particularly beef, is rising rapidly while fish demand shows minor growth. Production of fish is many times current consumption but high prices probably reduce urban consumption so the balance is exported. Presently domestic production of animal feed is already grossly below demand and the requisite imports totaled over \$2 Billion in 2011 suggesting that there are opportunities for more local production of feed grain inputs, particularly maize. Pork production has been highly successful and domestic production currently supplies 90 percent of demand, though diseases have set back production.<sup>2</sup>

As the previous discussion indicates, Vietnam is in a very favorable food security position; it produces enough quantities of most food items to satisfy local demand though there is a growing deficit of corn used as animal and fish feed. The success of Vietnam's agricultural sector can be judged by the ability to meet local demand while also exporting large quantities of rice and fish. Various scenarios of future GDP, population, and changing diets indicate that Vietnam will still be able to continue to meet most domestic demands and have surplus production for exports. Thus unlike some of the other ASEAN members, food security is not a major issue for the country.

The success of industrial crop production in recent years, mainly rubber and coffee, has been noticeable but it has

been consistently threatened by unstable international market prices which have complicated investment decisions. However, high yields and good productivity suggest that Vietnam has a competitive advantage in these crops so that they have good long term prospects. To safeguard production in the medium term, suitable arrangements need to be introduced to maintain investment in tree planting and renewal, particularly for the growing number of small commercial farmers.

Looking ahead, the proposed shift in land policy mentioned above will encourage the creation of farms of a size big enough to spread costs, increase incomes, and have sufficient security of tenure to encourage capital investments by commercial farmers in infrastructure and machinery that will help Vietnam remain competitive in the coming years. However this change in land policy will not be sufficient to safeguard the future of the sector. The country report outlines six additional critical areas where the government should play a key role in the coming years by providing support for market friendly reforms that will facilitate the farmers' professional activities and suggests the orientation of an action program in each case to remedy each potential problem. In addition to land policy improvement they cover:

Support for the development of the post harvest value chain by private sector investors and managers. Compared with regional middle income comparators Vietnam is still backward in the development of post harvest facilities by the private sector to increase the value added from domestic and export marketing of agriculture and fishery products. This results in lost opportunities for Vietnam and reduced marketing opportunities for farmers. The government can assist in this area by ensuring that the investment climate is geared better to encourage investment by the private sector, in a level playing field with State Enterprises particularly regarding access to land, access to production for processing, access to credit and marketing channels.

Support for the rehabilitation and upgrading of irrigation systems and introducing more sustainable systems of management of system operations so that farmers have flexibility to introduce remunerative cropping patterns linked to the market demand. At the same time government needs to

<sup>1</sup> Vietnam's national institute of nutrition reports per capita consumption falling from 164 kg/annum to 136 kg/annum from 1990–2010. GSO gives a figure of as low as 116 kg /capita/annum for 2010 based on household surveys.

<sup>2</sup> Currently blue ear disease has been widely observed in the pig subsector.

work to help upgrade water use efficiency so that Vietnam is best prepared for possible future limitations in water availability from climate change and other reasons. It will also be important to introduce good economic analysis into government investment assessments of irrigation to try to upgrade the investment efficiency in the sector.

Work to upgrade national agriculture and fisheries research capacity and outputs. Vietnam has already adopted a high level of technology in these sectors which needs to be supported by a high level and capacity of research if progress is to continue. The government can play an important role in bringing about an upgrading research in Vietnam and encouraging the private sector to participate in this effort. A vibrant and effective research system will be critical to enable Vietnam maintain its cutting edge in growth and development of the rural areas in the coming years as the country is faced with multiple challenges from technology and climate change. Without a strong national research and problem solving capacity closely linked to political decision makers on a real time basis, Vietnam could easily drop back into a minor league and lose the forward momentum already gained.

Safeguarding fisheries sector production and supporting growth. While fishing and linked industrial activities should be firmly anchored in the private sector, the government needs to continue to play a supporting role if the high growth rate envisaged is to be achieved. Areas of support could include (1) assistance with fishing boat design and safety; (2) improving and in some instances consolidating value chains, supply channels, diseases control and environmental management within the full range of aquaculture options; (3) increase training of workers, restructuring and in some instances relocating fishing villages, strengthening fisheries inspection capacity; (4) improving management through co-management options partnering fishers and local communities.

Working to upgrade food safety. As in many other countries, after a number of food safety scares, Vietnam faces a serious problem of consumers' distrust in the quality of national food products, particularly products of animal origin. Newspapers report concerns over diseases such as SARS,

HPAI, PRRS, and residues of pesticides, antibiotics in fruits vegetables and fish. Increased urbanization has increasingly separated the consumer from the production side of the food chain and reduced the possibility for the consumer to understand and verify the production process. This has all combined to increased consumer concern on food safety issues and put at risk several export lines from Vietnam, particularly in the fisheries sector. This problem can get worse and can easily undermine production and growth for the next 30 years unless the government takes a firm position on food safety issues and, in partnership with the private sector puts into place effective measures to remedy the current situation.

Climate change: designing and implementing mitigation measures. While the country study has assessed that not too much negative impact on food supplies is expected on Vietnam up to 2040 due to climate change, current models predict that serious impacts could start around 2050. In preparation for future effects it would be advisable for the government to monitor carefully evolving changes being caused by climate change to best determine the timing and type of mitigation measures that should be introduced. It will be important to exercise caution and careful phasing when considering high cost public expenditures to build dykes and embankments to deal with slow, long term and uncertain threats of sea level rise otherwise scarce resources can easily be wasted on measures taken too early in the expected climate change cycle. The government should also further strengthen institutional capacity to manage climate change through continued improvement in its unique resource allocation framework for climate expenditures and through integrated management of its coastal zones.

## **STRATEGIES FOR AGRICULTURAL TRANSFORMATION**

In the preceding section we projected continued solid growth of the agriculture and fisheries sectors and an upgrading of the rural areas and rural incomes through the widespread growth of commercial farming. This vision could be achieved provided the government takes the necessary supporting measures, and farmers have the incentives to transform their production systems. Vietnamese farmers have already demonstrated their high capacity to adopt ad-

vanced agricultural technologies and Vietnamese businessmen have shown proclivity to market products and compete in the international market. The challenge is to ensure the sustainability of this performance and to allow this high income growth for farmers to maintain a reasonable balance between rural and urban incomes.

This transformation will require a continued restructuring of agriculture. The main restructuring measures described in more detail the Country Report include:

- Changes in the land policy. Commercial farmers will require farms of a size that is big enough to spread costs and have sufficient security of tenure to encourage their investment in their farms to increase the efficiency of their operations. Over time a broad land consolidation program should be implemented to facilitate expanding farm areas taking advantage of continuing departures from the rural areas. The full and timely implementation of the government's ongoing Land Administration and Management program to upgrade the administration of land management can greatly facilitate this process.
- Border price transmission to farmers. The government should make every effort to ensure that prices available to farmers are not unduly distorted by government administrative actions.
- The growing disparity of income between rural and urban workers will result in farmers being more demanding on the profitability of farming, and less able to accept government directed cropping patterns. Over time, government should give farmers more freedom to choose their own cropping patterns particularly in those rice designated areas which are amenable to flexible cropping rotations. The Government should start moving away from a centrally planned directed approach to cropping towards a more market based approach.
- The aging of the population, the continuous flight of younger people from the rural areas, and the development of bigger farm sizes should lead to increased mechanization of farming activities to increase labor productivity. The Government research system should work with the private sector to test and demonstrate opportunities to make farming more profitable through increased mechanization.
- Government should facilitate investments by the private sector in value chains, including the processing of farm produce, in order to maximize the market opportunities for farmers and the value added in Vietnam. Vietnam is currently very backward in this area.
- Government needs to rethink the investment policy in the rural areas particularly regarding support for irrigation schemes. Investment priorities in irrigation need to be determined on the basis of economic priority. This should lead to more support for rehabilitating and upgrading existing schemes by incorporating a better flexibility and water control in operation so that farmers can have a choice in cropping patterns based on market demand. Vietnam's long-term water resource management strategy, especially in Mekong Delta, has to take into account the fact that dam activities by upstream countries could threaten its rice production. The country must remain vigilant in this respect and continue negotiations with neighboring states, particularly China and Thailand.
- Government should support the restructuring efforts by moving decisively on food safety issues, especially for field crops, and fish and meat products. Current arrangements are clearly not working. Responsibility for food safety needs to be better coordinated and led by a high level in government. Inadequate action in this domain will severely set back the development and growth of the sector.
- Disease control. Government will need to continue to work on improving disease identification and control measures in the various sectors to avoid major setbacks in production and growth.

- A key factor for the continued high growth of the aquaculture subsector is development of marine aquaculture. The Government needs to ensure a strong effort by the national research system to help resolve technical problems currently hindering this expansion.
- Agriculture/fisheries/livestock research. Improvements must be introduced in the national research system if the vision is to materialize. The current problems have already been well analyzed and the strategy must now be to implement identified

reforms to improve relevance, efficiency, effectiveness, impact and sustainability of research. Reforms will require a reassessment of current funding levels for research that are low by regional standards.

A strategy to address climate change impacts must include the continued support for current efforts to monitor the evolving impact of climate change on Vietnamese agriculture to that mitigation measures can be introduced as needed to safeguard sector performance.



# ANNEX 3—HIGHLIGHTS OF THE INDONESIA REVIEW

## MAJOR FINDINGS

Two parallel stories of agricultural performance, one of unrelieved consistent success, year after year and decade after decade, the other of early success and later stagnation, emerge from our study. The first story revolves around tree crops and is concentrated on the key Outer Islands of Sumatra, Kalimantan, and Sulawesi. The second, mainly focused on Java, revolves around rice, the ostensible center of food security concerns, as well as presumed future highly profitable production of horticulture, aquaculture, and animal products.

## THE DRIVERS OF INDONESIAN AGRICULTURE

While rubber was the early dominant export crop, the dominant growth crops of the 1980–2011 period were oil palm on a grand scale, especially on Sumatra and Kalimantan, where Indonesia eventually surpassed its technical and commercial leader and prime foreign investor (Malaysia) and became world leader, and cocoa on a smaller scale, especially prevalent in Sulawesi. Indonesia's oil palm exports alone (the country is also a large consumer) already exceed in value the entire world rice trade and over the next few years production is expected to further increase merely based on immature hectares already planted. Yields of commercial nurseries of oil palm are much higher still, implying that the position of this oil as the most abundant and cheapest edible oil in the world, that preferred by the new, poorer consumers of India, China, and much of the rest of the developing world, will not be challenged within the study period. The crop also produces a very large by-product (palm kernel oil), much finer in quality and higher in world price, indeed very similar to coconut oil, for the more affluent markets. It is also increasingly smallholder in origin (now about 40 percent), and given huge areas of degraded forest (already logged over for timber) will not need any new

rainforest land to further consolidate its premier position in world edible oil markets by 2040. It will, however, need a serious and effective replanting program, like all tree crops, which does not exist yet (see below).

## POVERTY REDUCTION

The past 30 years saw two major reductions in general and rural poverty in Indonesia, essentially from near 62.8 percent incidence in 1984 to 18 percent in 2011—the latter very close to current levels in Philippines and Vietnam. The initial decline in poverty was largely based on the Green Revolution in rice, mainly on Java, and was supported by large government programs in irrigation, adaptive research, production credit, and agricultural extension in a fairly coordinated manner. However, as government saw self-sufficiency in rice achieved in 1984–85, and rapid (if fragile) increases in employment in manufacturing and services, it gradually withdrew support to agricultural programs to very low levels, until the financial crisis of 1998 put an end to much of the import-substituting manufacturing capacity and employment, threw tens of millions of people back into poverty for many years, and forced agriculture to once again serve as the safety net for the nation. Here, the robust growth of tree crop exports carried the revival of the rural economy (and enlarged workforce), e.g., enabling otherwise poor and neglected regions like Kalimantan to achieve the fastest agricultural growth rates and lowest levels of rural poverty in the country. Other segments, like fisheries, livestock, and horticulture, helped feed and employ the millions displaced from manufacturing and services, while significantly slowing the eventual transformation of Indonesia from an agricultural to an industrial and commercial nation, but the consistent driver has been the development and expansion of tree crops—despite the lack of government-sponsored credit, research in the field (there was considerable private sector research in the major tree crops, much

of it brought over from Malaysia), extension, or efficient land titling programs. Thus pure comparative advantage can triumph over most of the so-called obstacles to development—if government does not explicitly hinder it, a powerful lesson for the next 30 years of agricultural development.

## REPLANTING PROGRAMS

While oil palm now dominates export crops in Indonesia, the crop where a government-sponsored replanting program is most urgently needed is, however, rubber. Replanting in general is harder to encourage than initial conversion of former forest to plantation, in that there is now an (albeit dwindling) income which must be sacrificed from the aging trees. Rubber replanting is most critical however, because a) the average age of the rubber stock is much closer to senility (or beyond) than is the case in oil palm; b) rubber is now much more a smallholder crop (85 percent) than oil palm, and it is smallholders who need the assistance of government; c) due to the possibility of self-processing (smoking) of latex by smallholders, and hence avoidance of the “nucleus estate” mills which may extend replanting credit, government is not even currently experimenting with credit schemes for rubber replanting; fresh fruit bunches of oil palm offer no such escape route from credit repayment, as they must be delivered and processed by a nearby mill within hours of harvest. Thus 3 million ha of rubber, and millions of people largely dependent on them, are currently at risk of gradual loss of income from rubber. It is thus strongly recommended that a government financed, grant-based replanting program for smallholder rubber, financed largely if not exclusively by a small export tax (“cess”) as pioneered in Malaysia over 50 years ago, be designed and implemented as soon as possible to ensure continued long-term rubber income streams for Sumatra and Kalimantan. The smaller replanting program for cocoa begun in recent years under government auspices may be an example here that Indonesia can indeed design and execute such a program without destructive levels of corruption. Based on success here, other programs may be devised for smallholders in oil palm, coffee, and perhaps even coconuts.

Replanting programs need to be based on the following:

a) planting materials supplied by nurseries, whether public

or private, must be only of the highest quality—these are investments of 20–30 years, which must not be crippled by short-term considerations of minor savings or personal profits; b) effective anti-corruption mechanisms to ensure the integrity of field and managerial staff in awarding the grants to smallholders is extremely important—wages and rewards for good work in the replanting service must be high, punishments and penalties for criminal staff must be onerous and well-publicized; and c) the grant system is so much less complex than credit schemes for this purpose, that only the former has hopes of reaching the great majority of the smallholders and plantings. The temptation to once again try the credit approach as the main approach to smallholder replanting, if only to protect the government’s balance sheet, should be avoided. The cess approach will ensure that as the programs grow larger, so will the self-financing.

## FOOD SECURITY AND SELF-SUFFICIENCY

A major confusion in Indonesian agricultural policy-making, or perhaps a substitution of short-term political gains (e.g., safety of agricultural jobs) for true food security, has been the emphasis on self-sufficiency in production (especially of rice) as the definition of food security. Indeed, in rhetorical terms four other products—beef, corn, soybeans, and sugar—are also officially designated for domestic self-sufficiency. What they all share is that in none of them does Indonesia have agro-economic comparative advantage, which means the probability is extremely low that self-sufficiency will ever be achieved (nor should it) for any of them. Indeed, in recent years despite the rhetoric, beef production has actually declined. In the case of the four smaller commodities, there is little actual welfare loss for the mass of Indonesians from the policy, except perhaps for excessively expensive beef (and hence extremely low domestic consumption) due to repeated interference in imports at various stages in the value chain. For rice, however, welfare losses are extremely high, due mainly to restrictions on imports and high final output prices borne by all consumers. For 2010 OECD calculated the “consumer support estimate” for agriculture, the great bulk of which for rice, at 215 trillion Rp (about \$24 billion), equivalent to a \$US 100 tax on every



Indonesian citizen, representing the transfer of this income from consumers to producers of rice. By comparison, all “general services support” to agriculture (all development expenditure including infrastructure, research and development, agricultural schools, inspection services, etc.) summed to only 13 trillion Rp.

Even if one accepted that self-sufficiency in production (at any cost) represents the most rational approach to food security, it is doubtful that one would approach production maximization mainly by charging consumers (poor as well as prosperous) rice prices far above world prices, which is the main pillar of current food policy. The main production-oriented program to back up the price incentive is fertilizer subsidies costing the equivalent of US\$1–3 billion per year (depending on world prices for petroleum products), which mainly subsidize the use of nitrogen. Nitrogen may well be overused in Indonesia today, but it is certainly well-known by now to all Indonesian farmers, and hence needs no educational or extension campaign to introduce it to the farm community. A much smaller program tailored only to phosphorous, potassium, and important trace elements in specific places probably would be much more effective in stimulating production of rice at much lower cost. More effective still would be a revival of investment in the most basic of production aids, such as irrigation, where in recent years government expenditure has been only about US\$ 500 million/year, covering new investment, rehabilitation, and operation and maintenance of a system officially rated at 7.2 million hectares, but now probably hardly more than about 6.4 million hectares. As can be noted, this real production base for paddy is depending on only a fraction of the budgetary amount allocated to fertilizer subsidies, while compared to the welfare cost of excessive prices, it is negligible.

Meanwhile, banning private rice imports to hold up domestic prices would seem to have two very negative consequences. First, it reduces food security, by putting rice imports (which seem to be necessary year after year even with the “self-sufficiency” policies) in the hands of a single agency (BULOG) which could after all make large errors in estimation of domestic and world crops, or in the management

of trade flows. With private participants entitled to import shiploads of rice at will, at ports throughout Indonesia, and store rice where and how they thought best, there would be a constant stream of rice arriving at all times, competition to increase efficiency and keep prices down, and little chance of shortage anywhere. The second negative consequence of artificially restricting rice supplies to the Indonesian population is the impact on increasing poverty, although poverty alleviation is sometimes claimed as a goal of the restrictive policy. A recent article demonstrates that 3/4 of Indonesians plant no rice at all and hence must purchase in all their rice from the market.<sup>1</sup> Those with surplus rice to sell are the larger rice farmers—who may not be “wealthy” in general, but on the other hand are not the absolute poor.

In part to compensate Indonesia’s poor and near-poor for extremely high rice prices, the above-mentioned RASKIN (Rice for the Poor) program was developed to distribute subsidized rice (mainly imported) to poor consumers, but by now targeting has degenerated to the extent that 90 million people (nearly 40 percent of Indonesia) receive a few kg of rice every month, meaning that here is one more highly expensive program which does not serve well those who need it most, serves many who do not need it, and contributes little to real food security. Facing the decades to the year 2040, Indonesia instead needs different programs that will ensure: lower food prices—including imported meats as well as grains—for the entire population, and more agents (firms) involved in constant rice imports and storage; higher domestic production at lower cost through investments in real production capacity—irrigation, effective research and extension, new breeds and seeds (some imported) with real potential to increase yields or overcome losses to pests, diseases, and climate change; and poverty programs which better target their recipients, and which are more efficient than hauling bags of rice around Indonesia, likely more dependent on cash transfers.

### **OTHER CONCERNS FOR THE NEXT 30 YEARS**

Management of marine fisheries resources must improve substantially if this main source of protein (aside from rice

<sup>1</sup> Neil McCullough: Rice Prices and Poverty in Indonesia, Bulletin of Indonesian Economic Studies, No. 1, 2008, pages 45–65.

itself) of the Indonesian populace is to remain strong. It must also be augmented by mass aquaculture developments available to smallholders, or at least villages, perhaps on the technical leadership model demonstrated by oil palm. But there needs to be a more welcoming attitude of government to foreign investment if major foreign and domestic investments are going to be made in Indonesian aquaculture or for that matter in horticulture and animal industries also. Foreign investments in such fields typically bring with them foreign markets, in addition to cutting edge technologies, and it is difficult to duplicate the value of such packages in any other way. Thus, the government needs to work much harder to ensure that such investments are made in Indonesia, as against her many competitors. New laws like the Horticulture Law of 2010, with an attitude harshly negative to foreign investment (indeed with requirements for foreign investors to reduce their investment) are not the way Indonesia might become a strong factor in high-value agriculture industries by 2040. Thus in aquaculture as well as in land-based industries, a positive approach to foreign investment in such industries must permeate the Indonesian bureaucracies as soon as possible.

While it was noted above that even lack of an efficient land titling and registration system could not long delay the development of oil palm in Indonesia, few crops will carry that overwhelming vista of profitability. For the other crops, it will be necessary to improve the ease of access to land for development. In order for the country's land administration system to be seen as a facilitating, rather than hindering, force in land management, procedures will have to be simplified to the extent that simple, uncontested transactions like sale of a plot of land can be consummated within one day.

Rehabilitation of irrigation systems needs to once again be seen as an urgent national priority, even if rice self-sufficiency is rejected as an impractical and inefficient goal. The imbalance between high prices for consumers and enormous subsidies on items like fertilizer, as against public goods (like irrigation), which are absolute necessities for rice production, argues for a return once again to a robust irrigation program with heavy central funding. Without this,

domestic rice production will simply get weaker and weaker over the decades to 2040.

## STRATEGIES FOR AGRICULTURAL TRANSFORMATION

Conceptually, it will not be a simple task to design in detail and then to implement, strategies to ensure the revival of Indonesian agriculture, and then to facilitate its continued rapid growth over the next 30 years. One reason for this is that many of the preferred courses of institution-building and actions have been proposed in the past and for various reasons rejected. An example is the grant-executed tree-crop replanting program for smallholders, proposed in the past but rejected in part because of a pessimistic attitude to the country's ability to enforce honesty and integrity on a large scale, in meeting high agronomic standards, inspection of field work, and then funding the required smallholder actions phased over several years. In other cases, for example the organization of large-scale irrigation rehabilitation and maintenance programs, or the coordination of food crops adaptive research, disciplined agricultural extension, and production credit, the programs were actually implemented successfully (in the 1970s and early 1980s); the problem here is to return, at least to some extent, to "old fashioned", quite centralized modes of government programming, with hierarchical control, considerable discipline, and responsibility for results. In other cases, such as reliance on private sector rice traders to fulfill the import segment of the nation's staple food needs, there is some genuine fear of the unknown, though in part this was tried in 1999–2004. Given these difficulties, here are the most important long-term strategies for the next 30 years.

### REPLANTING PROGRAMS

A series of smallholder replanting programs, starting with rubber, must be planned and implemented shortly, before Indonesia loses her major export crop assets in rubber, smallholder oil palm, cocoa, coffee, and tea. For coconuts, a diversified program of tree (and varietal) renewal, intercropping (including with cocoa), and livestock keeping might markedly upgrade incomes on millions of relatively unproductive hectares.

## IRRIGATION

Without “gold-plating” systems, it is time to complete existing systems that were never fully built—especially in Outer Island locations where social assessments show strong willingness and expertise of local populations in paddy production. Where there is strong farmer interest, on both Java and Outer Islands, smaller irrigation systems where rice production is faltering, may be redeveloped for low-cost, low-pressure pipe and drip irrigation systems suitable for horticulture, where on-farm costs would be borne by individual farmers, farmer groups, or entrepreneurs trying to secure supplies for processing and marketing. The general program would be, however, to rehabilitate about a half million ha per year, while instituting a standardized maintenance program designed to reduce rehabilitation frequency to about 20 years.

Coordinated research and extension. A new major effort is required to collect, develop, and disseminate technical and agro-economic knowledge for Indonesia’s millions of farmers. The “bottom-end” of this new system should not rely primarily on routine visits to farmer groups to impart such knowledge, but should utilize media preferred by today’s farmers, such as TV, radio, internet, and social networking, as well as demonstration plots, to communicate new packages and concepts. Livestock and aquaculture should be much more integrated with cropping than heretofore. It is obvious that this type of research/extension communication must be executed by higher level units than those of the decentralized kabupatens, though it is possible that provincial units may be able to play this role, along with central ones

Focusing input subsidies. Reducing costs of standard fertilizers forever is neither sustainable nor useful. All input subsidies, at levels much lower than current ones, should be based on introducing new practices and inputs in areas where they may be extremely beneficial—in part as determined by the revived research/extension system. Subsidy programs must be seen as large-scale experiments, with periodic analysis, comparison of outcomes, and redesign of subsidy programs on this basis.

Liberalization of rice imports. The rice trade should be opened up to the maximum number of competitors, with a view to lowering retail prices throughout Indonesia. Those who lose by declining farm gate prices, e.g., the larger rice farmers, may be compensated in part by improved irrigation and rice varieties, with higher yields and cropping intensities, and indeed organizational assistance by Ministry of Agriculture to shift to higher return activities (e.g., livestock, aquaculture, horticulture) perhaps on a cooperative basis. BULOG should be made explicitly responsible for preventing local shortages, panics, hoarding behavior and price spikes through its reserve stocks and its network of warehouses and logistics to handle them, and constant market intelligence.

Land titling. The National Land Agency must be specifically mandated to cover the great bulk of alienated land plots within a specific time frame (e.g., 10 years may be sufficient with the recommended sporadic (transactional) approach), while reducing the time for uncontested land transactions (sales, leases, mortgages) to a single day.

Coastal fisheries co-management. All coastal fisheries should be placed under the overview of cooperative management by the local fishermen themselves, guided by fisheries extension officers who can advise the associations on the relationships among average and marginal catches and the volume of fishing effort. The cooperatives themselves should then be given a strong say in managing local effort, including protected zones, seasonal limits, banned practices (dynamite fishing, trawling of spawning beds, etc.).

With these strategies, the sector could be placed well on the way to superior performance, with both higher levels of food security, and higher farm incomes than at present.



# ANNEX 4—HIGHLIGHTS OF THE PHILIPPINES REVIEW

## MAJOR FINDINGS

Performance of the Philippines' agricultural sector has been lackluster during this period. Overall GDP growth rates, productivity of rice and other key crops, agricultural exports, and public and private investment have been well below regional averages. While climate, geography and natural resource endowments have certainly accounted for some of this performance 'story', policy choices and institutions have played the greatest role in driving outcomes.

The main long-term opportunities for agricultural transformation, poverty reduction and food security in the Philippines over the next three decades lie mainly within the domain of public policy to achieve. Challenges such as the rapid pace of demographic growth, vulnerability to climate change and natural disasters, and global developments affecting the Philippines' main trading partners are not insignificant. But future development of the agriculture sector will be determined, inter alia, more by how the Government (i) manages the final stages of the agrarian reform and puts in place the institutional, legal and regulatory framework for a well-functioning land market; (ii) eases restrictions on foreign investment to improve the flow of capital and technology to the agricultural sector; (iii) develops greater fiscal space by raising the revenue to GDP ratio and concomitantly increasing public investment in infrastructure, safety net and other services critical for income growth and well-being of the rural population; (iv) replaces dysfunctional arrangements at the national level, and between national and sub-national governments, in terms of institutional responsibilities for agricultural research, technology transfer and water resource management; and (v) puts in place a risk management framework that addresses short term weather and other production risks; land longer term climate change; commodity price risks for small producers, investors and the financial sector for long-gestation tree crops.

Population pressures and historically weak domestic agricultural performance, combined with uncertainties about the global market's ability to meet the Philippines' heavy import requirements at affordable prices, have fueled policy makers' anxiety over food security and the pursuit of self-sufficiency in rice. This objective has dominated public expenditure decisions, reducing the volume of investment available for core services and other agricultural activities, including those with higher value added potential. Analysis of issues and options to improve food security has been complicated by inconsistent and/or insufficient data. Findings from this study show: (i) while rice is unquestionably the single most important component of the food basket across income levels and in both urban and rural areas, the actual volume of per capita consumption may be slightly lower than official estimates, and apparent increases in rice consumption in recent years are probably not indicative of longer-term trends; (ii) the Government is close to, and may succeed in, achieving rice self-sufficiency in the near-term depending on vagaries of weather, but sustaining this policy over time will pose unnecessarily high costs to Philippine consumers, the public sector and the economy, and may well undermine the goal of food security itself; (iii) the goal of food security needs to be redefined towards improving rural and urban incomes sufficiently so that all Philippine citizens have the means and accessibility to acquire a nutritionally sound mix of calories. In that regard, insufficient focus on fisheries, other food crops and higher value agriculture in general is causing serious food security risks that need greater policy attention and resources.

The Philippines has considerable potential for tree crop development, but this will require private investment on a scale that will likely materialize only after land reform/land market issues are resolved. As much of the potential is centered in Mindanao, political resolution of conflict issues is also critical (after which tree crop and other higher value

added agriculture development can play an important role in sustaining peace). Small, largely donor or NGO initiatives, and some private investment, are producing modest tree crop growth with important welfare gains for beneficiaries of those projects, but the scale is still too small to have a serious impact on poverty and growth. Opportunities exist to scale up rubber, oil palm, coffee and cocoa much above the current rate of growth. Should these potentials fully materialize, Philippines would still be a relatively small player in regional and global markets, but export, income and employment benefits would be significant. There is also scope to intensify coconut yields through fertilization and replanting, and to embark on major intercropping (particularly cocoa).

The Philippines risks losing some of the area under sugar production as trade reform advances, with possible conversion to much lower value crops and loss of employment, depending on how the land reform process is managed in the next couple of years. Population growth and increases in per capita consumption, on the one hand, and domestic bio-fuels/ethanol targets (for which sugar is the main feedstock) on the other, will increase demand in the local market—the question will be whether this is met through robust domestic production or increasing sugar imports in the post-2015 period.

Demand for both livestock and poultry products will increase, but Philippine producers will also face stiff competition in capturing part of that growth, as domestic production costs are higher than in the main exporting countries (e.g., Thailand, Brazil). The ruminant sector has changed drastically over the last 20 years due to land reform; the poultry sector through large-scale local and foreign investment. The pig sector, although also with its share of investments, is still fragmented and mainly centered in backyards. As both consumer and farm gate prices for pork and poultry are above world prices, technical and real smuggling occur. Local producers will need to increase competitiveness through application of latest technologies and reorganizing, especially the pig sector, to take advantage of specialization and economies of scale. If production costs can be reduced sufficiently and quality standards met, the Philippines could

also export pork and poultry meat to nearby countries, as it is free from HPAI and FMD.

The Philippines has tried to build a dairy sector, with little success as domestic production accounts for less than 1 percent of aggregate dairy consumption. Government strategy has shifted from free dispersal to a payback/credit scheme, but this is unlikely to have much impact without greater private sector involvement. The possibilities to run extensive cow-calf operations linked to feedlots as in the past are limited after land reform, so imports will likely be the most economic way to satisfy local demand, considering that there are more profitable alternative uses for the land than extensive grazing.

## **STRATEGIES FOR AGRICULTURAL TRANSFORMATION**

There are numerous policy, institutional and investment choices that are important for the transformation of the agricultural sector in the Philippines.

### **CONCLUDING THE LAND REFORM PROCESS AND MODERNIZING LAND MARKETS**

Land reform/land markets is a 'gateway issue' that cuts across the entire gamut of agriculture and fisheries sub-sectors. Three measures are critical. First, whether Comprehensive Agriculture Reform Program Extension with Forms (CARPER) ends in 2014 as presently scheduled, or is extended in some fashion, a clear and transparent decision is essential, and budgetary allocations need to be fully consistent with that decision. Second, the legacy of land reform-related debt needs resolution once and for all. Third, there is an urgent need to accelerate the land titling process and eliminate many of the regulatory restrictions that affect the farmers' ability to rent or lease land, use it as collateral, how it may be treated in inheritance, etc.

### **ADJUSTING THE LOCAL GOVERNMENT CODE**

Decentralization has not served the agriculture sector well in the Philippines. It has clearly been beneficial in many other respects, and this study in no way suggests reversing the process. However, insofar as agricultural transformation and

rural poverty reduction are concerned, the Local Government Code of 1991 has some deficiencies which need to be addressed. These include decentralization of agricultural extension, decentralized oversight, decentralization of decision-making over water resource management, and management of the fisheries of sector at the lowest level of local government.

#### ***FAST-TRACKING THE INSTITUTIONAL RATIONALIZATION PROCESS AT THE NATIONAL GOVERNMENT LEVEL***

National government agencies have been mandated since 2004 to implement ‘rationalization’ plans, but few have done so in the agriculture sector (the same is also true of many other sectors). Absent a plan approved by the Department of Budget Management (DBM), an agency is not able to reorganize or recruit new staff; while some relief is possible through short-term contracting, this generally makes it impossible for agencies to attract experienced professionals in critical ongoing or new skill areas. For the agriculture sector, DBM needs to fast track the institutional rationalization process. In addition, all agencies need to repeatedly audit their human resources and take steps to audit if necessary, so their human resources are in line with institutional responsibilities.

#### ***OPENING TO FOREIGN INVESTMENT AND TRADE***

The Philippines has a fairly open foreign investment and trade regime, however there are some important restrictions that affect the agriculture sector which need to be addressed. On the trade front these include the extension of protection arrangements for the rice sector (under review at this time by WTO), and the fact that the Philippines avails itself of the highest tariff options for several other subsectors. Regarding the investment regime, the main issue concerns the Constitutional prohibition of foreign ownership of land.

#### ***ADAPTING TO CLIMATE CHANGE AND CLIMATE VARIABILITY—THE ‘NEW NORMAL’***

First, as one of the countries most vulnerable to natural disasters and climate change, the Philippines should continue

to participate actively in international climate negotiations fora. Second, at the national level, it will be important to maximize the potential synergies between disaster risk and climate change strategic planning and institutional arrangements – some of this work is presently taking place in parallel, with less coordination than could be possible. Third, the Philippines also needs to invest more aggressively in strengthening its institutional capacity to monitor and analyze changes in temperature, precipitation and ground-water resources.

#### ***PLACING POVERTY REDUCTION AND INCOME GROWTH AT THE CENTER OF FOOD SECURITY POLICY, AND RELYING ON SOCIAL SAFETY NETS TO HANDLE THE OCCASIONAL MARKET FAILURES***

Food security policy is presently focused on quantities, i.e. the volume of incremental production needed to achieve higher self-sufficiency ratios in key food crops. The emphasis needs to shift to identification of long-term requirements for a nutritionally sound food consumption basket (with different options in terms of the mix of foods that could achieve those goals) and to designing strategies to ensure that all segments of the income distribution have sufficient capacity to acquire that basket. Essentially, this means the elimination of hunger and extreme poverty—widely understood to be a condition in which a household is unable to acquire at least a minimum nutritionally sound food basket.

#### ***PLACING TOTAL FACTOR PRODUCTIVITY GROWTH AT THE CENTER OF AGRICULTURE TRANSFORMATION POLICY***

With the exception of a few crops, the Philippines does not have a highly productive agricultural sector; rather, yields tend to lag those of comparable countries, and returns to labor and land are low. Transforming agriculture will mean moving to a fundamentally higher TFP growth trajectory. International experience indicates that this will require a much stronger agricultural research complex (in terms of institutional mandates, coordination, financing and public-private cooperation) than presently exists. It will also require reconfiguring the country’s organization of its agricultural extension and technology transfer, resolving the ‘gateway’

land issues discussed above, and providing access to rural financial services and risk management instruments on a much larger scale -- in other words, a 'full court press' on the land, labor, capital and knowledge dimensions of TFP and growth.

***SHIFTING THE FOCUS FROM AGRICULTURAL CREDIT TO FINANCIAL SERVICES AND RISK MANAGEMENT***

Access to credit for investment in agriculture and related downstream activities is limited in the Philippines, with the main providers being public sector institutions (Land Bank and Development Bank of the Philippines). The sector will not be able to grow sufficiently on the strength of public investment alone; nor will agriculture grow if financing requirements are approached mainly as a 'credit problem' rather than a complex of issues involving credit, equity financing and other financial services that include effective arrangements for risk management, with strong private sector participation.

***MODERNIZING WATER RESOURCE MANAGEMENT; DEALING WITH COMMUNAL IRRIGATION***

The Philippines lacks up-to-date information on water balances outside of a few geographic areas (metro Manila

and metro Cebu); does not have an up to date dam safety baseline (again, with a few exceptions); has a rapidly deteriorating communal irrigation system; and no overall institutional arrangements capable of effective oversight of water resource planning, allocation, and monitoring. Institutional responsibilities are fragmented at the national and subnational levels, and between the two; there is insufficient alignment along river basin lines. In order to make integrated water resource management, the Government of the Philippines is now in the process of establishing a new institution consolidating the fragmented responsibilities for managing water resources.

***IMPLEMENTING THE ABOVE MEASURES WILL REQUIRE SIGNIFICANT ACTION IN THE FOLLOWING CROSS-CUTTING AREAS***

Raising public and private capital formation in all elements of the agricultural value chain, from farm to consumer;

Strengthening the knowledge base and tools for public sector planning, strategy formulation and oversight and

Letting the private sector lead the required agricultural transformation.



# ANNEX 5—ASEAN EFFORTS TO ENHANCE FOOD SECURITY

## ASEAN FOOD SECURITY

Food security issues in the ASEAN region will be greatly influenced by changes emerging from the ASEAN Trade in Goods Agreement (ATIGA), which provides for phased elimination or reduction of all import duties for all goods (with some exceptions), under the ASEAN Free Trade Area (AFTA). An explicit exception is made for rice and sugar under a Protocol for Special Consideration, which calls for bilateral agreements between an importing country, and a rice and/or sugar exporting country. The ATIGA also provides for trade facilitation and harmonization. The ASEAN as a group have also entered into various trade expansion agreements with Australia, China, India, Japan, and New Zealand.

ASEAN is currently moving towards a single market and production based economic community by 2015. Among the priorities foci for integration are enhancement of trade among ASEAN member countries, and long-term competitiveness of their food and agriculture products. By harmonizing their standards and quality and by standardizing their trade certifications, their agricultural products are expected to become more globally competitive. Although the final shape of these agreements is still uncertain, they have received close scrutiny during preparation of this section of the report.

We have interpreted food security to mean more than availability by also including affordability and nutritional content. To that end, when analyzing food security we also considered the following:

- Rice is by far the foremost cereal being consumed in VIP countries.
- The rice traded on the world market represents a fairly small fraction of total production.

- ASEAN has been a consistent net exporter of rice.
- There is growing demand for rice in markets outside Asia (e.g., sub-Saharan Africa's rice imports increased from 0.5 million tons in 1961 to 10 million tons in 2009, and now account for a third of global rice imports).
- Considerable price volatility has been the norm in recent years.

A major conclusion of our review is that the fundamental approach to food security must be rethought. With all the talk about the coming economic integration of ASEAN, if the member countries cannot rely on each other to meet their short term needs for rice through trade with each other, then how would the overall integration work? Should assured and open trade in rice (together with an effective joint buffer stock) be made a test case of the region's real political will to become an "economic community" (as already announced)? A major factor influencing our position on this issue is the fact that the ASEAN countries have a large net rice surplus with respect to the rest of the world and member countries that are importers should be able to rely on those that are exporters. However, ability to bring about such a political transformation remains elusive, though there are some positive signs as seen by the impetus from ASEAN integration (Economic Community Blueprint, ATIGA, AIFS-SPA-FS) as part of the gradual process of opening up the rice market at least within the region.

## RICE SELF-SUFFICIENCY

By most accounts, rice self-sufficiency policies distort investments in the sector, lead to higher prices for consumers, and are an obstacle to regional integration. The costs of these policies are substantial. And yet, reluctance to rely

on the global rice market has solidified following the recent price volatility.

Rice sector policies being pursued in Indonesia, Philippines and Vietnam, as well as various other ASEAN members, are underpinned by a perception, deeply embedded in the Asian culture and political psyche, that food security is best defined as self-sufficiency, especially for rice. That definition, understandable in an era of frequent famine and erratic maritime transport, is badly outdated. Establishing a new definition of food security, our study argues, is the essential first step to effective policy making in the production, processing, marketing, and trading of rice in Southeast Asia (Alavi et al, 2011, p. 34).

While the long term decline in the importance of rice in diets and livelihoods might be seen as eroding the status of rice as a political commodity, the contrary is true. The political status of rice is likely to be sustained or even strengthened in the next couple of decades, with Southeast Asian policymakers' prime concern being to alleviate the relative poverty of farmers, even as bottom income groups mostly escape absolute poverty in the course of economic development. Experience in Thailand today and in Japan during the inter-War period attest to this pattern; even today, rice remains a major driver of trade barriers and subsidies in advanced East Asian countries (e.g., Japan and Korea).

Distortions are also rife in exporting countries (e.g., the paddy pledging program in Thailand, which is tantamount to a paddy procurement scheme at an elevated price floor). In Vietnam, the thrust is to protect domestic markets while also maintaining food affordability for consumers. Up to the late 1990s Vietnam restricted exports by a quota system, which when abolished in 2001 contributed dramatically to subsequent export growth (Ryan, 2002). However, controls are still maintained through approval of export permits and mandatory registration of export contracts. The latter was the mechanism by which new export sales were effectively halted in the initial phase of the 2008 food crisis. There is little evidence to suggest, however, that these policies have succeeded in isolating domestic prices from the volatility on the world markets and as is suggested by some, such er-

atic policies have seriously worsened the business climate for rice exports (Tsukada, 2011).

When food security is equated with self-sufficiency, consumers in general but the poor in particular tend to suffer. The alternative to pursuing self-sufficiency is deploying more direct instruments for addressing shortfalls in international trade during emergencies. One option is to guarantee shipments of food, say from reserves of another country, during a crisis period. This is the concept behind an international emergency reserve system which we describe later on in the report. The other is to address at a policy level the uncoordinated actions of trading countries, such as unilateral export restrictions (for food surplus countries) or stock build-up (for food importing countries). This is the concept behind the rapid response forum of G20 and the Rice Trade Forum in ASEAN, though as some experts maintain, this is unlikely to work in a crunch but perhaps it is worth a try.

Our review of past regional initiatives (see Regional Food Security Study) has highlighted the overwhelming importance of rice in regional cooperation. Timmer (2011) has pointed out the contrast between this emphasis, and the declining importance of rice in the global and particularly the Asian market. In 1961, rice accounted for 14.5 percent of GDP for Southeast Asia, and over 0.5 percent worldwide. By 2007 the respective shares have shrunk to just 3.8 percent and 0.173 percent. During this same period, the share of rice in regional agricultural output has also fallen gradually, from 40 to 32 percent. By 2040 the typical East Asian diet is likely to be richer in protein, fat, and less dependent on grain or root-based carbohydrates.

On the consumption side, the role of rice in diets is gradually diminishing; its share in total calorie intake in Southeast Asia has been declining, both on average and by country (except for the Philippines). Driven by greater household purchasing power, food consumption in the future is expected to be increasingly characterized by proliferation of specialty and value added foods and ingredients (US Grains Council, 2011). The role of rice would likely be eroded further in this scenario.

Nevertheless at present rice remains a dominant crop and is the most important single source of calories; in the Philippines and Indonesia its share is nearly half, while in Vietnam the share approaches 60 percent, though here too preliminary estimates of the 2011 consumption point to a decline closer to the 50 percent level. Rice also remains the biggest crop in terms of land area for VIP countries. Consequently, when faced with the thinness of world rice markets, policymakers have tended to adopt a protectionist stance, targeting either self-sufficiency (for rice deficit countries) or export deflection (for rice surplus countries).

As observed by Rashid, Cummings, and Gulati (2007), by the 1970s, an interventionist food policy regime in grain markets was firmly entrenched in Asia. Governments were directly involved in the procuring-stocking-distribution chain; this involved the following (with varying degrees of application): accumulation and release of buffer stocks to stabilize prices; monopoly controls over international trade; restrictions on movements of grain; cheap credit and access to transportation for the parastatals; and limits on private storage. Based on their case study of six countries (including Indonesia, Philippines, and Vietnam), the aforementioned study concludes that up to the 1970s, such a regime may have been necessary owing to prevailing conditions of grain markets; however these conditions have long since improved, rendering the interventionist regime in need of serious modification as the rationale for government interventions shifts. Still, instability in staple grain prices remains mostly a public responsibility.

The initial conditions justifying governments' interventions, and recent progress, include:

- Weak infrastructure and limited flow of price information. Over the past three decades all indicators of infrastructure and information technology have improved in the study countries; Indonesia for instance has experienced a nine fold improvement in road length; in all countries ground telephone lines per thousand people have increased nearly fifteen-fold, while mobile phone penetration now exceeds that of ground lines.
- Risk of adopting new technologies, which faced farmers at the advent of the Green Revolution. Modern varieties now account for most of cereals grown; hence the risk factor has been overcome.
- Thinness and volatility of international markets; and inability to participate in the international market. Today, world grain markets have matured; trade has grown as a percent of global production and consumption; annual rice trade is currently about thirty million tons, far in excess of any one country's historical import requirements. Major importing countries have accumulated sizable foreign exchange reserves, far in excess of requirements to finance their food import bill; and improvements in logistics and reduced transaction costs have increasingly integrated the study countries with the world market.<sup>1</sup>

Among the dimensions of food security, food availability is no longer a pressing issue at least under normal condition; rather, what is relevant for developing countries in the region is food accessibility.

Despite the recent robust economic performance in VIP countries, purchasing power of households remains low; average per capita income is below \$4,000, compared with \$33,000 for countries with a high human development index. In addition, a substantial proportion of the population in Indonesia and Vietnam (larger than the proportion of the poor), are rated as vulnerable to poverty. Not surprisingly, based on the Global Hunger Index (GHI), conditions in these countries is rated Serious. Poor people are especially susceptible to rising food prices; when rice prices increase, consumers find it difficult to identify more affordable substitutes. This difficulty is less stringent for other basic consumer items such as cooking oil, or low value fish, for which substitution is easier. Thus, lowering the domestic price of rice, the poor's' staple food will greatly improve their food security. One final point on this issue is that while markets

<sup>1</sup> The counter argument here is that many of these grain markets have now become "financialized," sharply increasing volatility. There are therefore some questions about a credible private sector response to this development; nevertheless, there are also some positive aspects such as increased liquidity, depth of market, price discovery, etc.

can handle the normal times, food security planners are probably rightly preoccupied with “non-normal” conditions.

Timmer (2005) has argued that, in practice, food security in Southeast Asia is associated with rice price stability rather than the idealized, multi-dimensional concept adopted by the World Food Summit. Since 2008, however, Indonesia and the Philippines have gone further and associated food security with no less than complete insulation of the domestic rice market from world prices.

A self-sufficiency policy is too blunt and heavy an instrument for protecting against outlier events (failure of international rice trade). The real rationale for domestic protection and self-sufficiency policy is populist politics.

Aside from the desire to protect poor farmers, the argument behind protection of domestic rice producers in importing countries is thinness of global rice trade; the share of exported rice in global output is about 7 percent, compared with 11 percent for maize and 20 percent for wheat. Furthermore, since the late 1990s world food prices have become considerably more volatile (FAO, 2011). In the case of rice the increased volatility, as exemplified by the 2008 crisis, was largely due to trade shocks on both export and import sides (Headey, 2010).

Regardless of whether the measure of a “thin” market is based on actual trade, what is relevant for food availability at the global level is potential trade.<sup>2</sup> The latter may not be easy to estimate precisely, but some measure can be derived from the amount of rice stocks, which can be readily converted into trade flows. Using figures from FAO (2012) for rice, world trade flow plus available stocks (141 million tons) is 37 percent of world production. Even if the amount of stocks is limited to the main exporting countries (India, Thailand, and Vietnam), it is equivalent to 30.2 million tons and the ratio is still 14 percent, double the current trade-to-output ratio.

The intangible security benefits of self-sufficiency come at a very tangible cost, given the lack of comparative advantage

in Indonesia and the Philippines as they attempt to expand rice production outside the main growing areas of Java and Luzon.

It worth noting, however, how easily policymakers can turn the point being made above on its head. Failure to provide food security in a politically visible manner, namely rice self sufficiency, has very tangible short run costs (they are out of office). Most of the efficiency costs from misallocated resources are quite intangible and certainly not borne by the policymakers. Still, between 2000 and 2004, the nominal protection rate in Indonesia, incorporating input subsidies, was about 19 percent (Fane and Warr, 2009). Since then government has all but banned imports (save for occasional government-to-government deals by BULOG, the public logistics agency). During the intervening period input subsidies have soared, reaching about 12 percent of the value of rice production in 2009 (based on figures provided in ADB, 2011a).

For the Philippines, Gergely (2010) estimates that the domestic wholesale price of rice is 42 percent above its import parity price. Despite low social returns, farmers find it profitable to produce rice owing to various distortions, namely: high domestic prices maintained by import barriers; subsidized provision of irrigation service; and subsidy on hybrid rice seed. Subsidies account for 28 percent of economic cost and are borne by taxpayers.

While rice self sufficiency (and government interventions) are widespread, by 2040 we project the importance of rice in the diet and the food basket will steadily decline.<sup>3</sup> Other food items (such as wheat, horticulture, meats etc.) will become much more important. Indeed, Peter Timmer contends that quite possibly rice consumption may have peaked or will soon peak in Indonesia, Philippines and Vietnam and instead of shortages, the former two and possibly other importing members of ASEAN may even have a rice surplus before 2040.

<sup>2</sup> It is worth noting, however, that potential trade is hostage to trade policies in both exporting and importing countries, so reserves in exporting countries become endogenous to the food security situation.

<sup>3</sup> This is in accordance with Engel's law according to which as income increases, households' demand for food increases less than proportionally.

## NATIONAL EMERGENCY RICE RESERVES

Sanguine assessments about the practicality and costs of price stabilization through public agencies have given way to skepticism, due to past overestimation of benefits and underestimation of costs (Newberry and Stiglitz, 1981).

Many Asian countries continue to maintain public buffer stocks in pursuit of price stabilization, despite their obvious excessive costs and excess burden on society. The social mandate for a public stocking agency—to procure at prices favorable to producers, while selling at prices favorable to consumers—is inconsistent with profitability. In fact there are few examples of public agencies that have profited from buffer stocking (Berck and Bigman, 1993). Lastly, even if effective in stabilizing prices, it is unclear whether public stocks are simply crowding out private storage (Islam and Thomas, 1996). Lack of commercial motive, together with a soft budget constraint, suggests weaker adherence to operational efficiency on the part of public storage. Releases may be targeted to the poor, i.e. as part of a safety net package in periods of price crisis or disaster emergency. Releases to the market (at market prices) may also be justified as an effort to restore calm, allay fears, and manage market expectations (Timmer, 2010). While public stocks can clearly have a positive role, the time has come to rethink what this role should be and as a minimum improve their management.

Another option is to rely on the private sector to own and operate rice reserve facilities. The theory of private storage under competitive conditions is fairly well understood; however, it has some significant limitations in stabilizing prices since while it can eliminate negative price shocks (from an extremely large harvest) it is unlikely to eliminate positive price shocks (from an extremely low harvest). This provides a *prima facie* case for establishing public emergency reserves. The reliability of private storage is further undermined by departure of real world markets from rapid adjustment towards market fundamentals, tracking instead erratic (and persistent) market dynamics, as reviewed in Briones (2011). One common (but still largely anecdotal) narrative is that of hoarding in which traders (in fact as

the 2007/2008 episodes has shown, farmers, consumers, and even non-rice traders have become hoarders) withhold stocks from the market in anticipation of higher price. Such behaviour, if sufficiently widespread, can itself raise prices and further aggravate market instability.

## INTERNATIONAL AND REGIONAL RICE RESERVE SCHEMES

International food security cooperation has long been a preoccupation of the global community. The founding of the UN's Food and Agricultural Organization in 1943 was one of the first tangible outcomes of global concern with food security. The next turning point was the world food crisis of 1972–1974, which prompted the UN General Assembly to establish the International Emergency Food Reserve or IEFRR (Shaw, 2005), which, however, did not function. After the next major food crisis in 2007–08, the World Food Summit of 2009 acknowledged that the global food crisis has catalyzed stronger international coordination and governance for food security.

Most recently the G20 declaration of 2011 tackled the issue of food price volatility by launching several specific mechanisms, namely: the Agricultural Market Information System (AMIS); a Rapid Response Forum to improve policy coordination; the development of market-based risk management tools for vulnerable countries, firms, and farms; and the piloting of an emergency humanitarian food reserve. Only time will tell how effective these initiatives are going to be.

Cooperation on food security issues has made greater progress at the regional than the international level, probably because of far lower costs of coordinating a smaller group of neighboring countries; though even among ASEAN countries this cooperation has been largely symbolic to date.

An initial initiative in Southeast Asia was the establishment in 1979 of an ASEAN Emergency Rice Reserve (AERR) scheme to enhance food security in the face of disruptions in the supply and production of rice. The scheme consisted of rice stocks that have been pledged or earmarked by member countries, and grew from an initial earmarking of 50,000 tons to 87,000 tons. When the AERR was established, food security was associated explicitly with the

dimension of food availability (and stability), especially in instances of mass starvation scenarios, typically associated with disasters (e.g., drought) or war. It was this definition that influenced to scheme's objective of assigning the members' domestic emergency reserves as the frontline defense in case of disasters, as well as to prevent displacement of normal imports/exports of rice. An ASEAN Food Security Reserve Board was created to oversee implementation of the Agreement and to coordinate the flow of information (member countries were tasked to submit regularly to the Board information on government stockholding policies, programs, and other aspects of food supply and demand situation, with focus on rice).

After nearly 20 years of existence, no releases were made from the AERR and this prompted a review of the mechanism in 2001, and the initiation of a pilot scheme in 2003 at the level of ASEAN Plus Three (China, Japan, and Korea), called the East Asia Emergency Rice Reserve (EAERR). The new scheme expanded the regional reserves to 787,000 tons (primarily through contributions from the Plus Three countries). The EAERR was in turn replaced in October 2011 by the ASEAN Plus Three Emergency Rice Reserve (APTERR), which formalizes the EAERR earmarks as a permanent commitment but also added the concept of a stockpile (in cash or in kind); unlike the earmarked stocks, stockpiled emergency reserves are voluntary and are not subject to numerical commitment or obligation. As with other international initiatives, APTERR ascribes great significance to accurate market information and trade coordination but thus far has made limited progress on the more crucial aspects of food security.

Although procedural details of APTERR are still under discussion among member countries, it is safe to say that it is no panacea for regional food security; rather, it is a stop-gap measure that can provide valuable but incomplete protection against market instability.

Minimum conditions imposed on emergency rice earmarked as stock for APTERR are as follows: (i) earmarked stocks must be under government ownership and/or control; (ii) the earmarking country is responsible for quality and cost of storage; (iii) stocks must be available in milled form and

fit for human consumption when conditions for their release are satisfied. The scheme comprises two tiers and conditions for release depend on which tier is being applied. The pre-arrangement under Tier 1 is structured as a voluntary forward contract. The precedent for this was the forward contract between Vietnam (supplier) and the Philippines (buyer) under EAERR, which provided for delivery of 10,000 tons of rice at market price. The Philippines invoked the forward contract on February 2010, to support its domestic efforts to deal with the lingering effects of Typhoon Ketsana. This contract, which was completed in March 2010, is designed to ensure minimum negotiation and delays in delivery in the event of emergency.

Voluntarily donated stockpiled emergency rice reserves are directly owned and controlled by the APTERR Secretariat, and distributed for free as humanitarian food assistance. Earmarked stocks on the other hand are under the ownership and/or control of the earmarking country but the Secretariat provides a matching service between supplying and demanding countries involving coordination, facilitation, and technical guidance. In the private sector this service is typically provided by brokers or agents operating on commission basis. In the case of APTERR the service is provided for free, as the Secretariat's operational costs are already fully funded by member contributions.

To reduce storage cost borne by the collective scheme, the APTERR Agreement provides for a voluntary storage, that is: a donor country donating stocks, a prospective recipient country, or other host country, may volunteer to store or "host" stocks that have been donated. In short, the earmarking system combined with host country arrangement effectively outsources the storage and release functions of APTERR; the collective scheme therefore incurs only the cost of coordinating these functions.

Despite the scheme's advantages, a more direct approach would be to address the underlying gaps in the food distribution system that make it vulnerable to shocks. APTERR may in fact be supportive of efforts to deepen specialization and interdependency in the food marketing system, if it can be seen as a credible device in (rare) cases of market failure. One advantage of the earmarking system is cost-ef-

fectiveness: it imposes no additional financial burden of procuring and storing stocks for the regional scheme. It does this by leveraging existing national rice reserves by making them available for international flows. In a practical way, such leveraging reduces the operating cost of APTERR and underpins its financial viability. Another way to view this is that international cooperation effectively increases the size of standby stocks available to meet an emergency in any member country, without actually requiring increases in total emergency reserves of the region. (The premise of course is low covariance of food emergencies across countries). Equally relevant is the world rice market understanding that there are no additional rice reserves in the region, so their importance for price stabilization is insignificant.

Moreover, releases from APTERR during emergencies may be quicker and more reliable than normal commercial imports partly because importers may be vulnerable to the hoarding problem. Based on APTERR procedures (particularly for Tier 1), these flows dispense with the time-consuming government-to-government grind and to a lesser extent of normal commercial imports (initial contact, canvassing or tendering, negotiation, purchase order, delivery). Finally one big improvement of APTERR over its forerunner (the ASEAN Emergency Rice Reserve) is its clear multi-lateral governance structure. Releases under APTERR are subject to Council approval. Moreover negotiations under APTERR would be facilitated by a matching service from the Secretariat.

Both benefits and costs are difficult to quantify, let alone juxtapose to compute the optimal level of earmarked reserves. Data for making evaluation of optimal stock levels are not readily available; even at a national level, setting of domestic stocks is based more on rule of thumb; FAO itself suggests setting a reasonable level of domestic reserves at about 18–19 percent of domestic utilization. Rather than attempt to estimate optimal reserves, we evaluate whether there are compelling reasons for increasing earmarked stocks, based on benefit, compared with cost and feasibility. An analysis of strengths and weaknesses of the APTERR scheme shows, somewhat paradoxically, that the scheme's

strength (cost-effectiveness) also gives rise to weaknesses. Key shortcomings of the system include:

- When using earmarked stocks, the scheme becomes completely dependent on each member country's follow through on its commitment ex post.
- The scheme's governance rules requiring decision making by consensus are ill-suited in an emergency response mechanism.
- The vagueness in the conditions for defining an emergency can pose an obstacle to rapid response.
- Further enhancement of the scheme's effectiveness will require members to:
  - Ensure proper food security monitoring, and governance of the reserve, to enable rapid response in case of emergency
  - Back up members' commitments with action in an emergency situation, despite domestic resistance.

A more direct approach would be to address the underlying gaps in the food distribution system that make it vulnerable to shocks. APTERR may in fact be supportive of efforts to deepen specialization and interdependency in the food marketing system, if it can be seen as a credible device in (rare) cases of market failure.

Two additional points deserve mentioning. First, aside from size of the rice reserve, another aspect of the scheme is the commodity scope. In the 18th ASEAN Summit of 2011, the Chairman's Statement assigned the relevant Ministers "to study the possibility of APTERR incorporating commodities other than rice to secure the alarming risk of food price volatility." Subsequently, the Ministerial Meeting acknowledged the need for adopting a step-by-step approach in considering expanding APTERR as a role model for other food commodities. This sequential approach appears to be a judicious modality in future widening of commodity scope for the emergency reserve scheme.

The second point pertains to the frequently mentioned scheme of a rice futures market, which is already part of the agenda of the Rice Trade Forum as a possible long-term strategy for developing rice trade. A futures market fundamentally serves as a hedging tool to mitigate price risks. With sufficient liquidity and depth in the futures market, the futures price may have the added function of “price discovery”, i.e. a continuous process by which futures prices are reassessed by buyers and sellers as new information becomes available (Inter-Agency Report, 2011). The establishment of a “robust futures market for rice” as an instrument to address price risk figures prominently in the Asia Society and IRRI Task Force Report (2010).<sup>4</sup>

The feasibility of a rice futures market for ASEAN is evaluated by Mackenzie (2011). Based on interviews of key market players and commodity exchanges, the study finds that an ASEAN rice futures contract could benefit the rice market through price discovery and price risk management. Moreover, ASEAN rice markets are opaque and a futures market would improve price transparency to all players; a liquid rice futures contract would also fill an unmet need for a hedging instrument.

Whether a rice futures market can actually be organized to meet this need is another matter. Mackenzie outlines several key features of the cash market needed for a successful futures contract, namely:

- Adequate cash price volatility;
- A large competitive and well-defined underlying cash market that lends itself to standardization;
- Minimal government intervention in the underlying cash market;
- Free flow of public information.

As the rice market in ASEAN satisfies only the first item above, a rice futures contract is unlikely to be successful under current conditions.

## CONCLUSION

Ultimately however protection and other forms of counter-productive intervention would need to be gradually dismantled, particularly those premised (incorrectly) on the weakness of private sector operations. These include self-sufficiency policies (for importing countries), insulating policies (for exporting countries), as well as costly input and output subsidies.

Withdrawal of regional governments from their traditional role in the rice sector does not rule out all forms of government engagement. Their positive role, however, lies in facilitating private sector investment and operation of efficient supply chains. A recent World Bank study examining food security in Southeast Asia contains a set of recommendations detailing this facilitating role, including the following:

- Private-public sector partnership (PPPs)—PPPs can assume many forms, such as performance contracts, build-operate-transfer concessions, joint ventures, etc. PPPs may be undertaken for pioneering effect, demonstrating technical and financial viability of developing supply chains for food staples.
- Improving logistics and infrastructure—in addition to ports (still a constraint in VIP countries but especially in Vietnam), the major limitation is rural infrastructure, particularly roads in Indonesia and the Philippines. Aside from funding the requisite investments, governments should elicit participation from the private sector in the design of an efficient rural road network.
- Establishment of warehouse receipt system—negotiable warehouse receipts would greatly facilitate marketing by severing the link between market transaction and physical movement of stocks; at the same time, creating a system of negotiable claims presumes a transparent, credible, and well

<sup>4</sup> At the time this report was prepared the author thought the benefits of a deep rice futures market in Singapore were substantial. He has since changed his views and now believes the potential to serve as a vehicle for hot speculative money, and thus to destabilize regional rice prices, outweighs any benefits from improved price discovery and the opportunity to hedge.



regulated marketing system, which itself encourages market participation, financing, and investment. To this recommendation we add the need for standardization of grades and standards for rice, especially at an international level.

While we believe the above recommendations are valid, in our view they are not going far enough. The only way to substantively and effectively improve food security, in our judgment is through better policies.

In sum: food markets are prone to sporadic crisis episodes, for which short-term solutions such as a regional emergency reserve are a preliminary stop-gap measure. However such instabilities are rooted in underlying distortions and constraints on normal food trade. Hence, permanent

solutions will require equally deep reforms towards improving efficiency and resiliency throughout the regional food production and distribution system.

Obstacles to reform, mainly rooted in domestic politics, are formidable. However regional and international cooperation brings forth a formidable “lobby” by major or potential trading partners. It is easy to be pessimistic about regional or multilateral cooperation, given prominent examples of failure or at least inaction (e.g., Doha Round). However its past achievements are in hindsight impressive. The WTO Agreements have institutionalized restraints against protectionism. ASEAN itself has avowed a vision of a single economic community by 2015, which would have been deemed farfetched during its founding in 1967. The persuasive power of the international community should not be underestimated.



# ANNEX 6—FISHERIES

## ASEAN FOOD SECURITY

Fish consumption in VIP countries has been historically well above average global levels of 16 kg/capita/year. Over the past two decades, expansion of seaweed production has dominated aquaculture development in Indonesia and Philippines while production of cultured fish has expanded rapidly in Vietnam. Table A6.1 shows current fish production and net trade, excluding seaweed.

With declining population growth rates, the steady increase in per capita fish consumption in Vietnam and Indonesia over the past three decades was met through expansion of marine catches and rapid growth of aquaculture production. Stagnating marine catches, higher population growth rates and a more modest expansion of aquaculture production caused Philippine's per capita consumption to slightly decline.

The level of fish consumption is directly correlated with wealth; for example, in Indonesia, rural consumers eat more fish than their urban counterparts, who may have easier access to alternative protein sources. Furthermore, wealthier people tend to consume more expensive—often cultured—fish; poor people are particularly dependent upon low value marine fish. In terms of total consumption, the average high-income Indonesians' fish consumption peaks at about 30 kg/capita/year; by contrast, with rising incomes in the Philippines, the percentage of total household expenditures spent on fish purchases has declined by as much as 50 percent over the past 50 years.

Future fish consumption levels (Table A6.2) will depend on population growth, prices—reflecting local product availability, income growth and distribution—rural-urban migration, changing consumption preferences and the prices and availability of alternative sources of protein. In each country, province, and even city, the relative influence of these fac-

tors will vary. Declining population growth—with Philippines lagging—and strong rural-urban migration will be particularly important. Higher growth rates than those included in this review for population, rural-urban migration or spendable income will sharply increase total fish requirements.

Satisfying future demand for fish—notably for lower value fish consumed by the poor—will mostly depend on the effectiveness of sector governance, sustaining sector productivity and continued rapid growth of aquaculture. Future demand for fish can be satisfied from marine and inland catches, aquaculture and international trade. By 2040, Vietnam, with its huge current exports (Table A6.1), will most likely be able to satisfy domestic demand, mainly through increased production from aquaculture, particularly expansion of marine aquaculture. Philippines will face considerable income constraints, along with political and institutional difficulties, in achieving even modest increases in per capita consumption, notably by the poorest sections of the population. Indonesia will face similar—although less severe—constraints, but has potentially larger natural and financial resources to address them.

## PROSPECTS FOR 2040

Looking ahead to 2040, VIP countries face the following three challenges to sustaining at least the current domestic fish consumption rates and export earnings:

- Improving the management of inland and marine capture fisheries by effectively controlling catch levels.
- Effective protection of key breeding and nurturing habitats and fostering environmentally sound aquaculture development.

**TABLE A6.1: FISH PRODUCTION AND NET TRADE (MILLION TONS)**

	fish production		net trade
	marine/inland	aquaculture	export-import
Philippines (2011)	2.3	0.8	0.01
Indonesia (2009)	5.1	1.7	0.7
Vietnam (2011)	2.2	3.1	2

Source: Ministry of Agriculture and Rural Development.

- Achieving a robust sector structure able to withstand major changes in the global economic and political environment.

Without more effective domestic marine resources management, fish production from most coastal fisheries, which is already exceeding sustainable exploitation levels, will continue to decline, notably in coastal areas. Marine fish production in VIP countries is unlikely to expand substantially in the future. Most coastal fish resources are severely over-exploited, as catches of small-scale and commercial fishing fleets are de-facto unregulated and mostly exceed sustainable exploitation levels. Future access to still under-exploited deep-sea resources in the region will be increasingly controlled by Regional Fisheries Organizations. Without more effective domestic marine resources management, fish production from most coastal fisheries may actually decline in terms of yield and value, and seasonally fluctuate more severely.

Vietnam, which has developed detailed plans for fleet reduction and improved resources management, is most likely to face fewer constraints in achieving better management of the fishery sector. Indonesia and particularly the Philippines, which have decentralized their coastal resources management some time ago, at high institutional costs and with exceedingly modest results, are likely to face considerable challenges in achieving improved sector management. In the latter two countries, more effective management may be best achieved by giving priority to better regulating commercial and industrial fisheries. Over time, restructuring small-scale fisheries employing millions of fishermen (which received priority in the past) may be best pursued through indirect means: major increases in government support to

education and creation of alternative employment. Such a solution is not without political risks and would require modest but feasible institutional changes. Nevertheless, this appears the only technically and financially feasible strategy to achieve sustainable exploitation of marine fisheries—and maintain supplies of modestly priced fish—by 2040.

Each of the three countries has the potential for substantial aquaculture growth, provided they implement a coherent development strategy. Substantial productivity improvement raising fish is technologically feasible. However, past high aquaculture production growth rates have raised the following issues: (i) brood-stock quality and distribution of hatchery products remain a challenge; (ii) disease control has improved, but shrimp pandemics occur periodically; (iii) the environmental impact of fish culture on water quality and gene pools remains serious; and (iv) producer dependence on increasingly expensive, mostly imported, fishmeal (and local trash fish in Vietnam) remains high.

To achieve and sustain the required production growth levels will entail effective research, technology transfer and capacity building. It will also require a coherent set of policies and regulations, an efficient transport network, a functioning land market, improved water management, and effective downstream distribution and marketing chains minimizing post-harvest losses. For most aspects, effective planning will be essential to locate viable areas for expansion or define where restructuring of production is necessary. Integration of these multiple requirements into a coherent development strategy—the most critical long-term requirement facing the sector—appears most advanced in Vietnam. Major efforts will be needed in Indonesia and

**TABLE A6.2: PROJECTED DEMAND FOR FISH (2010–2040)**

	average fish consumption per capita		domestic fish demand (million tons)	
	2010	2040	2010	2040
Philippines	26	29	3.1	4.5
Indonesia	22	25–30	6.3	10
Vietnam	29	30–35	3.3	4.2–5.2

*Source:* Vietnam and Philippine 2010 consumption based on official fish production statistics; Indonesian 2010 consumption based on Susenas daily consumption survey data. Waste estimates are 20 percent for 2010, and 15 percent for 2040. The 2040 consumption levels are based on team's estimates.

*Note:* Fish projections subject to change

particularly Philippines to achieve sufficient production to satisfy demand.

Global availability of small-pelagics<sup>1</sup> and demand for higher value fish will influence the three countries' ability to satisfy domestic demand (and expand export earnings in the case of Vietnam), while fishmeal availability and price will be a critical factor constraining some future aquaculture growth. For most cultured fish, rapid growth entails high quality plant (soya) and animal protein, mostly fishmeal and oil. Aquaculture currently absorbs, respectively, well over one half and nine-tenths of world fishmeal and fish oil supplies, which have been remarkably stable and are unlikely to increase beyond 7 million and 1 million tons, respectively. Sustained high global aquaculture production has gradually increased the ratio of fishmeal and soy meal prices—from around 2 during the past decade to about 4 currently. The main factor limiting the replacement or reduction of the proportion of fishmeal in the feed rations with more readily available vegetable protein—such as yeast that has proven effective with carp poly-culture in China—has been the presence of elements within vegetable meal that inhibit nutrition for carnivorous fish species; recent experience suggests small percentages of additives can mostly rectify that.

Genetic engineering of soya beans may provide longer-term solutions, but presently these products are costly. Exploitation of potential raw material alternatives for fishmeal (large

global resources of mezzo-pelagic fish) has—with current technology—also proven elusive. Hence, fishmeal availability and price will be a critical factor constraining future global aquaculture growth. Vietnam, where culturists use locally caught low quality trash fish as an important source of protein feed, is already facing rapid price increases with a shift to greater dependency on imported fish meal as marine fisheries of those species are reaching their maximum sustainable yield limits.

Failure to manage marine fish resources more effectively in the region will cause production of low-value fish, mostly consumed by the poor, to decline. Philippines and Indonesia currently import modest amounts of frozen small pelagics, mostly for canning and local consumption. As demand in Africa for this fish rapidly increases—annual imports in West Africa alone already exceed 2 million tons—the potential role of imports of cheap fish to counterbalance declines in local production will decline, as prices will increase substantially.

Developments in other parts of the world, but especially in China, will exert considerable pressures on local markets in VIP countries. China has for decades pursued a successful policy of high growth of domestic fish production. Facing increasing production constraints at home China is resorting to encouraging imports of higher value cultured fish to satisfy domestic demand and supply its processing sector for domestic and export markets. It is also seeking long-term access to major sources of fishmeal production. Its trade policy is likely to exert increasing pressure over the next thirty years on local markets in Indonesia and the Phil-

<sup>1</sup> Small pelagics (sardines, anchovy, mackerel and herring like species) are globally mostly processed into fishmeal; a smaller portion is frozen whole. In Vietnam, they also supply a major fish sauce production industry.

ippines. While these developments may not be a problem for Vietnam, that currently exports about 40 percent of its fish production, they could substantially reduce fish—and fishmeal—availability in Philippines and Indonesia.

# ANNEX 7—CLIMATE CHANGE

## ASEAN FOOD SECURITY

The impact of climate change is not new to VIP countries but its pace is accelerating. Changes in climate variables globally and in VIP countries have been as follows:

- Global Mean Temperature (GMT) has risen by 0.76°C, over the last 150 years, the rise being faster in the last 50 years. VIP countries report temperature increase of 1.0 to 1.4°C per century with mild acceleration in recent periods.
- Precipitation patterns have changed in VIP countries over the last century, the overall trend being decreasing rainfall and fewer rainy days but there are important variations due to the very complex topography and maritime influences in VIP countries. For example, the Philippines has experienced an increase in rainfall since 1960, but major regions like Luzon and Mindanao have experienced a decline and Indonesia, more frequent delays in the onset of rainy season.
- Observed sea level rise has been occurring at an increasing rate in VIP countries. Indonesia reports sea level rise of 1–8 mm per year at various stations and Vietnam 1–3 mm/year with acceleration in recent decades.
- Climate related natural hazards in Indonesia have increased from an average of 1 per year in 1950s to 8 per year by 2005. The average number of cyclones entering the Philippine area has increased from 20 overall to 24.2 over the period from 1990 to 2003 and in Vietnam, the typhoon season has moved to later in the year and the primary landing area has moved southward.<sup>1</sup>

Projections show all climate variables moving adversely but long term forecasts carry considerable uncertainty. IPCC predictions are made using 9 equally acceptable Global Circulation Models and as many as 32 different scenarios of future social, economic and technological changes. Thus, there are wide ranges in predictions which as of 2007 4th Assessment Report were:

- GMT increase of 0.75–0.87°C for 2040 and 1.96–3.77°C by 2100 in reference to 2000; GMT is an average over the entire surface of the globe and there are significant variations between land and water surface and among various regions.
- Precipitation decline of 1–2.25 percent, with increased variability geographically and with the wet season getting wetter and the dry season getting drier.
- Sea level rise in of around 0.18 to 0.60 meters by 2100 with 1990 as the reference.
- Increase in tropical cyclone intensity of 10–20 percent due to sea surface temperature rise of 2–4°C, which could be reached by 2100.

The IPCC 5th Assessment Report is to be published in 2013/2014, and early indications from working papers are that scenarios and outcomes projected in the 4th Assessment Report are likely to be overtaken given continued lack of progress on reducing Greenhouse Gas (GHG) emissions. A Copenhagen Diagnosis to update the IPCC 4th Assessment Report prior to the Copenhagen Conference of 2009 assessed that if no further action is taken to cut GHG emissions, GMT could rise by 4–7°C by 2100. It was then estimated that a reduction of GHG emissions of 45 Gtons by 2020 could keep the GMT increase by 2100 to less than 2°C. As of 2012, there is already a deficit of 5 Gtons

<sup>1</sup> ADB, Economics of Climate Change in SE Asia, 2009.

relative to this estimate despite some temporary decline in emissions due to the global economic slowdown.

However, climate predictions are subject to considerable uncertainty, especially in the outer years of the 22nd century, due to weakness in the models, in predictions about the future path of economic and social variables and in the pace of adoption of new technology. Prediction about rainfall are less reliable than for other climate variables; for example, predictions in case of Vietnam show an increase of 5–10 percent in rainfall in the 2nd half of the century.

### IMPACT OF CLIMATE CHANGE ON AGRICULTURE

Climate variables affect yield potential of crops and livestock, but not always adversely. The major climate variable is the rise of local temperature and it affects performance of agriculture differently. In the temperate mid to high latitude zones where the bulk of world food is grown, longer growing seasons work to increase the yield potential of crops and pastures for all crops up to about a 1°C rise. This trend is evident to about a 3°C rise, except for maize. On the other hand, in the low latitudes which characterize most of the developing world and VIP countries, even a 1°C rise leads to significant loss of yield potential, a loss that becomes devastating as the local temperatures rise approaches 3°C. One factor adding some uncertainty is the potential kicking in of the CO<sub>2</sub> fertilization effect, the magnitude of which under farm conditions is still subject of research on crop and pasture yields, when CO<sub>2</sub> concentrations reach 450 ppm, expected in the latter part of the 22nd century. The extent of this effect is impressive under laboratory conditions but the magnitude under farm conditions of nitrogen and water stress, is still being researched (See Box A7.1).

Thus, overall global supplies of food are not likely to be affected at least up to 2050, but food security in many regions and countries may only be secured through increased reliance on trade and, at the individual level, through measures to increase incomes and provide social protection to deal with the impacts of climate change on the most vulnerable groups.

In VIP countries, climate change even to 2040–2050 is most likely to be a setback in agriculture due to the combined effect of higher temperature causing increased evapo-transpiration, increased water stress during the dry season, which is projected to be drier and loss of agricultural areas to sea level rise. Various projected impacts of changes in climate variables in VIP countries over the next four decades are:

- In Vietnam, spring rice yields are predicted to decline by 6–12.5 percent and summer rice by 1.7 to 3.7 percent.
- In Vietnam, maize grown in the wetter North could see an increase of 7 percent while in the South, which is predicted to be drier, could see a decline of 6 percent.<sup>2</sup>
- In Indonesia, the probability of delays exceeding 30 days in the onset of monsoons is expected to increase to 30–40 percent from the current 8–10 percent, and combined with changes in irrigation water availability and pest regime, a loss of 4–10 percent in rice yield potential is predicted.
- In the Philippines, an IRRI study in 2004 concluded that yield potential for rice goes down by 10 percent for every 1°C rise in growing season minimum temperature.
- In VIP countries, loss of agricultural land to sea level rise is a major concern given long coastlines and huge deltas. Vietnam's Red River and Mekong Deltas with a sea level rise by 70 cms predicted for 2100, could under some scenarios, could lose as much as 590,000 ha of current rice areas. Without adaptation actions, Vietnam could lose 2–7 million tons of rice production.
- In VIP countries, for other food items, predictions are that livestock productivity is likely to decline due to heat stress and vector borne disease likely to increase, but no estimates are available. Planta-

<sup>2</sup> IFPRI, Global Food Security to 2050, 2010.



## Box A7.1: CLIMATE CHANGE AND GLOBAL FOOD SUPPLY

The impact of climate change on global food supplies is predicted to change direction over the course of the 21st century as a result of how climate variables affect food production in different regions of the world in different ways.

There is consensus among the multiple climate models and scenarios that global temperatures will rise by about 1°C by 2050. Under IPCC's most pessimistic and optimistic scenarios, temperature rise to 2100 would be from 2 to 4°C; but given the lack of progress on GHG reductions since Kyoto and in the absence of specific and urgent global policy actions to stabilize GHG emissions the world could well be on way to a 4–7°C GMT rise by 2100.

In the mid and higher latitudes where the majority of the world's cereal crops are currently grown, a modest 1°C increase in temperature actually increases yield potential of all crops due to a longer growing season. This positive yield effect is evident to about a 3°C rise, except for maize. Under some scenarios, global maize production shows serious declines at lower temperature rise. On the other hand in the low latitudes, even a 1°C rise poses a threat of yield loss (ranging from 4 to 12%) for all crops, with the situation becoming quite alarming as temperature increase approaches 3°C, when yield losses of 16–29% are projected for the higher tropics and 20–40% for the lower tropics, or 29% globally. A possible positive effect on crop yields which is still only partially integrated into current models is the potential for increased crop yields due to CO<sub>2</sub> fertilization as concentrations approach 450 ppm, possible later in the 22nd century.

Over and above the current trend line of area expansion and yield improvements, the regions in the lower tropics will need to take incremental adaptation actions to increase productivity by about 10–15% over the next four decades to counter the effects of climate change to a 1°C rise. Known adaptation techniques involving changes in crop varieties, cropping rotations, calendars and improved irrigation efficiency can counter most of these negative threats in lower latitudes. In the case of inland fishery, aqua culture and plantation sectors, up to a 1°C rise, even the lower latitudes are not projected to see a loss of production, just more variability.

Given the uncertainties in all climate predictions, they have to be treated with increased caution as the modeling period is extended into 2nd half of the century but overall, the trend is for the potential for global food production to increase somewhat with increases in GMT over the range from 1°C to 3°C; but above this range to decrease significantly.

GHG have increased by 36% from a 1990 base compared to a Kyoto protocol expectation of a decrease of 5% and even the softer Copenhagen agreements of 2009 to limit GHG emissions to 45 Gtons CO<sub>2</sub>e by 2020 are already slipping by 5 Gtons as of 2012. Further, prospects after the recent Rio +20 summit, of achieving a global agreement and urgent action on stabilizing future GHG reductions do not appear bright. Thus, the likely time when GMT rise will exceed the threshold of 3°C, and global food supplies will be seriously threatened, unless there is an extraordinary technology breakthrough, is likely to be much earlier than 2100.

Source: ADB, Economics of Climate Change in SE Asia, 2009; IFPRI, Global Food Security to 2050, 2010; IFPRI, Climate Change, Impact on Agriculture and Cost of Adaptation, 2009; CGIAR, Climate, Agriculture and Food Security, 2009

tion crops may not be adversely affected overall, but will see changes in seasonal and geographical productivity. Migration of marine fishery to other regions of the globe is anticipated as sea temperatures rise and ocean currents change. Aqua culture is not likely to see an overall decline in production, as the effect of increased habitat due to increased flooding in the wet season is likely to cancel out the reduction in habitat in the dry season but sea level rise, saline intrusion and more extreme events will raise costs of maintaining fish ponds and controlling salinity.

over the next 3–4 decades to fully counter these threats.<sup>3</sup> This will call for accelerating the completion of unfinished sector reforms and further intensification of well-known adaptation measures. These adaptation measures can in turn be autonomous, i.e. left to market players, farmers or firms to pursue or they can be planned measures, taken by the government to support autonomous adaptation. Planned measure can be “soft” (i.e. policy and institutional) measures or “hard” (public expenditure supported) investment actions. These are discussed below.

VIP countries would need to achieve a 10–15 percent increase in agricultural productivity above current trends

<sup>3</sup> ADB, Economics of Climate Change in SE Asia, 2009. IFPRI, Global Food Security to 2050, 2010. IFPRI, Climate Change, Impact on Agriculture and Cost of Adaptation, 2009.

## ADAPTATION RESPONSES TO CLIMATE CHANGE THREATS

Autonomous adaptation measures typically are of the “no-regrets” type: they are good for the sector with or without climate change. They revolve around changes in cropping patterns, varieties and farm management and are already being practiced in parts of VIP countries. Changes involve replacing rice-rice rotations with a rice-maize rotation in the Philippines or expanding a fish rotation with 2 rice crops in Vietnam, or changing the planting dates as the onset of monsoon is delayed in Indonesia. Changing to varieties known for higher flood, drought and salinity tolerance is a common adaptation practice. Raising walls of fish ponds or even relocation or changing fresh water intake further upstream to deal with salinity are common practices which will increasingly come into play. These practices are well documented<sup>4</sup> and practiced to varying degrees in the VIP countries and generally ready for wider scaling up with, in some cases, Government support.

Governments can support adaptation through soft measures, top-most being the timely availability of climate information and strengthening the ability of farmers to use it. Indonesia’s program of Climate Schools has been notably successful in this regard: farmers who use climate information through the program have consistently shown higher incomes than those who do not.<sup>5</sup> Promoting research into new varieties, strengthening early warning systems, developing water efficient irrigation techniques and provision of effective veterinary care to deal with increased threat of vector borne disease in livestock, are public goods that Governments can promote. Changes in design standards of rural roads, irrigation systems and market infrastructure can help make the sector more climate proof.

Risks in agriculture will still increase with climate change, in the form of crop failure, losses due to increased floods and livestock disease. Enhancing farmers’ ability to absorb the increased risk due to climate variability is another important soft measure Governments can take. Vietnam’s new pilot program to provide index-based insurance through the

private sector for risk of crop and livestock loss could evolve into a replicable model (see also Box A7.3).

Hard adaptation responses involving large public expenditures need to be subjected to serious due diligence analysis when dealing with distant and uncertain threats. Range of investments by Governments to counter the impacts of CC typically include:

- Expansion of wet season water storage and dry season irrigation to deal with increased variability in rainfall.
- Building of sea dykes and embankments along rivers and estuaries to counter sea level rise.
- Re-establishment of mangroves to provide natural protection against extreme events.
- Provision of expanded livestock services to deal with disease.

Some of these hard options can be quite wasteful should the climate risk not materialize to the extent projected. Notably, sea dykes and river embankments cost about \$ 0.7–1.5 million per meter of height and kilometer of length, and if designs are aimed at 50 or 100 year projected flooding levels, can lead to huge expenditures in anticipation of sea level rise which may not be as high as currently forecast. Cost effective alternatives—“green” dykes which include a mangroves protective zone to increase dyke longevity—need to be considered along with careful monitoring and appropriate timing of decisions to avoid potential waste. Systems for prioritizing adaptation options are needed which can take into account the severity, probability, immediacy of the impact and the costs, cost recovery options and social impact of the adaptation response. None are yet available but an effort is being made to develop them (see Box A7.2).

Attempts made to estimate the potential costs of adaptation have serious limitations in methodology and thus are seen as indicative only. One exercise for Vietnam estimated annualized costs, without costs of dyke construction to deal with sea level rise, to be about \$500 million/yr. By one estimate Vietnam would need to raise the height of or build 6000

<sup>4</sup> CGIAR, Climate, Agriculture and Food Security, 2009.

<sup>5</sup> World Bank, Program Document, Indonesia CC DPL, 2010. Wintaro, et al, LEISA Magazine 24.4 December 2008.

## Box A7.2: VIETNAM PRIORITIZING HARD ADAPTATION RESPONSES

Vietnam has launched a financial mechanism to prioritize public expenditures proposed to counter climate change. Based on vulnerability assessments to various climate threats done for key sectors and geographical areas, local governments and relevant sector agencies are invited to initiate project ideas. These ideas are built around a common planning scenario and local level climate predictions. The projects are screened through a 100 point, 7-factor rating system by the Ministry of Natural Resources and Environment and prioritized by the Ministries of Plan Implementation and Finance, for a final decision by the Prime Minister. In the first few months of operation, 200 project ideas have been reduced to 19 prioritized projects of which about 10 are likely to be funded.

The Vietnamese system is the most structured attempt to deal with prioritization across multiple sectors with local government units taking into account the uncertainty of severity, probability and immediacy of climate impacts. Full results from the first year of operation are likely to be available end 2012. Some challenges which the system will need to deal with are however evident: how to classify expenditures as climate related, when they are good for the sector with or without climate change; how to deal with projects which produce co-benefits which can pay for all or part of the expenditure; how to ensure that soft options which could avoid or reduce public expenditure are being adequately considered; and how to deal with inter sector trade-offs especially in coastal zone management ( see Box 4) or water management issues.

km of dykes/embankments, should the sea level rise by 70 cm in 2100 at a cost of up to \$ 6 billion. For Indonesia, the cost of adaptation for agriculture, including sea walls and research and extension, are estimated to be \$5 billion per year to 2020. No such estimate is currently available for the Philippines.

### SOCIAL IMPACT OF CLIMATE THREATS

With high social vulnerability, household food insecurity can increase with climate change despite availability of food in the country. The lowest 20 percent of households will face inequitable risks and damages and disproportionate decline in real standards of living when the combined effect impact of lower yields, cost of autonomous response measures and increased variability of food retail prices especially the peaks in the drier season hits them. Most poor households are net buyers of food and depend upon non-farm incomes for survival. Enhancing the resilience of poverty affected people and improving their food security is best achieved through income augmentation by facilitating diversification to higher value crops and by generating opportunities to earn non-farm incomes. Payments for environment services provided by rural communities can add to their resilience. Any global transfers on account of carbon mitigation as proposed, for example, for Indonesia (which is to receive \$1 billion from Norway for keeping its forest cover intact for the next 3 years), need to reach the poor rural communities which are safeguarding these global assets. Such payments may need to be enhanced, for example in Vietnam, where

the concept has been introduced but payments do not come close to the real value of the eco-service. In addition, prompt actions are needed to compensate for unexpected loss of crops and livestock due to climate change events. Vietnam has begun piloting an index based crop insurance program aimed at the poorer segments, which if successful, could provide the kind of safety net needed by the most vulnerable segments to cope with the additional risks generated by climate change (see Box A7. 3).

### LONG TERM FOOD SECURITY AND LOW GHG AGRICULTURE

Global and VIP countries food security in the 2nd half of 21st century is critically linked to actions taken now to reduce global GHG. Should GHG emissions continue uncontrolled in the next few decades it is quite likely that GMT will rise by more than 3°C before 2100, and yield potential of major crops could decline quickly by as much as 16–29 percent in the higher tropics and 20–40 percent in the lower tropics or by 30 percent across the globe.<sup>6</sup> In view of the long time lags in the dissipation of accumulated GHGs, urgent action on GHG reduction in the near future is critical to long term global food security (see also Box A7.1).

Although GHG contribution of VIP countries' agriculture sector are too small—1 percent of the global total—to have a major impact on the globe, available technologies to cut these harmful emissions down are being adopted gradually.

<sup>6</sup> IFPRI, Global Food Security to 2050, 2010.

### Box A7.3: VIETNAM: PILOT CROP INSURANCE

A pilot program launched in Dec 2011 aims to offer protection against risks of natural disasters and disease both likely to increase with climate change, with a special focus on poor households. The program is an example of a Public Private Partnership being run by insurance companies owned jointly by the Government and the private sector. The program is voluntary. The established premium is subsidized by the state on a progressive scale, 100% subsidy for the “poor” farmers and 20% for the best off farmers and for agricultural enterprises. Insurance cover is offered for paddy, livestock and fishery. In case of paddy, the program aims to avoid the complexity associated with ascertaining individual loss. It is index based. Natural disaster conditions and extent of loss are established by a committee of county officials based on area wide surveys. However, livestock and fishery coverage is based on assessment of individual loss. Payments of subsidies for the premium are handled directly by Ministry of Finance with the insurance company and loss coverage payments are handled directly by insurance company with the insured party.

In its first 6 months of operation, in 8 of Vietnam’s 63 provinces, 54,000 households have signed up, 49,000 being eligible for 100% subsidy; these early contracts cover 63,000 ha of rice, 80,000 livestock, 620,000 poultry and 59 ha of fishery. Premium paid per household by the State averages about \$25. Events triggering payments have yet to occur, except in fishery where the first claims of 2 Bn VND are being processed.

Many of them are “win-win” i.e. they could pay for themselves through cost reductions. Examples of these are:

- alternate wet and dry irrigation techniques for paddy cultivation which can reduce harmful methane emissions (21 times more harmful than CO<sub>2</sub>), by 25–35 percent without adversely impacting yield and at the same time reducing the use of irrigation water by 22 percent;
- new nitrogen fertilizer application techniques such as using polymer coated urea which can reduce NO<sub>2</sub> emissions (300 times more harmful than CO<sub>2</sub>) by 4–16 percent and increase yields by 17–25 percent;
- bio-digestion of agriculture/livestock wastes which can significantly reduce methane emissions while providing energy for family needs, reducing pressure on forests for fuel wood and providing liquid fertilizer for farm use. In Vietnam, which has installed about 200,000 small family farm digesters costing about \$550 each, a typical digester can reduce carbon emissions by 1.5 to 3 tons CO<sub>2</sub> emissions per year.

However, VIP countries forest sector is far more critical to global GHG reductions as its share of global emissions are nearly 8 percent, mostly accounted for by Indonesia. By controlling these emissions, VIP countries can make a

useful contribution to shaping a less threatening future. This would involve preventing release of carbon sequestered in trees by stopping deforestation, better management of 115 million ha of land under forests and of peat lands and of soils to increase carbon density and preventing other land use changes such as to plantations, whose growth in Indonesia and Vietnam is the highest in the world. Indonesia with a continued loss of forest cover stands out, but land use changes taking place in Vietnam are of importance as is the general loss of mangroves in VIP countries.

Deforestation is a major issue of relevance to future food security: Indonesia alone is losing about 1 million ha of forest annually but the rate has come down from a peak of 2.8 million ha/yr in the 1990.<sup>7</sup> Even in countries where overall deforestation has stopped i.e. Vietnam, plantation crops are steadily replacing primary forests, and mangroves are being displaced by aqua culture, given the high financial returns from alternative uses. It is estimated that a carbon price of about \$27 per ton CO<sub>2</sub> emissions, as global carbon markets develop, could stop all deforestation by compensating for returns from alternative and in the process wipe out nearly 70–75 percent of all projected GHG emissions from VIP countries by the year 2030.<sup>8</sup> Indonesia in 2009 announced a voluntary 26 percent reduction in its GHG emissions by 2020 but progress is uneven.

<sup>7</sup> World Bank, Program Document, Indonesia CC DPL , 2010.

<sup>8</sup> ADB, Economics of Climate Change in SE Asia, 2009.

### Box A7.4: INTEGRATION OF FORESTS, FISHERIES, AND COASTAL PROTECTION AS SEA LEVEL RISES

Mangrove forests provide a range of eco services. They are nature's own shield for coastal areas against extreme sea based events. In North Vietnam, mangroves helped reduce a 4 meter storm surge in 2005 to a 0.5 meter wave causing no harm. They provide nursery areas for coastal demersal fishery. They capture sediment before it reaches coral reefs, protecting the coral reef eco system which is a critical breeding ground for some important species of marine fish. And mangroves sequester carbon (90 tC/ha/yr). It is estimated that in a functioning carbon market, a carbon price of \$ 27/t CO<sub>2</sub>e would effectively pay for all these eco-services and override the incentive to destroy all types of forests due to high incomes generated by alternative uses. Carbon price currently under EU's carbon trading system is about \$8–10/ t CO<sub>2</sub>e.

Mangrove forests have been under threat from manmade sources for the last half century and now face a new threat from climate change. Global consumption of shrimp, which grow in saline conditions, has tripled in the last 20 years and given a big boost to aqua culture in SE Asia, leading to a large scale destruction of mangroves to build aquaculture ponds and in turn to coral reefs. Vietnam mangroves have shrunk from 400,000 ha in 1950 to less than 150,000 ha now. Philippines had a mangrove cover of 417,000 ha in 1967 which is down to less than 100,000 now. Of Indonesia's 9 M ha of mangrove forests, 71% are judged to be damaged (Jakarta Post, Feb 8 2012) and 50,000 km sq of coral reefs are already in dire straits, with only 30 in "good" condition.

Climate change threat to mangroves comes from sea level rise, to which mangroves adjust naturally by moving landwards as sea level rises, but they need this physical space to survive sea level rise. It is uncertain that the pressure on land in coastal areas will permit all remaining mangroves to withstand a 70 cm sea level rise expected by 2100.

The sectoral response to this dilemma is a myriad of actions not fully integrated with other sectors: forest sector promoting public expenditures to restore mangroves while the issue of continuing strong incentives to destroy them to build fish ponds remains unaddressed; flood protection sector promoting "green" dykes to capture the benefits of low cost natural protection offered by mangroves, while the issue of availability of land for mangroves to creep land wards as sea level rises remains unaddressed; fishery sector promoting alternative supply of fish fry for supporting coastal fishery, while the potential damage to coral reef habitat and marine fishery remains unaddressed; and carbon sector promoting a few Clean Development Mechanisms projects to capture carbon sequestration credits while the overall threats to coastal zones remain unaddressed.

An optimal response to these complex inter relationships can best be developed through an integrated process, supported by a strong analytical secretariat to enable decision making about the inevitable tradeoffs at the highest cross-sector level.

Source: ADB, Economics of Climate Change in SE Asia, 2009; World Bank, Program Document, Indonesia CC DPL, 2010; World Bank, Program Document, Indonesia CC DPL, 2010

## INSTITUTIONAL CAPACITY FOR CLIMATE CHANGE ADAPTATION

VIP countries are steadily building their institutional architecture to deal with climate change. Through officially endorsed national programs for combating climate change, VIP countries are in various stages of establishing the legal and institutional framework for managing climate change. This current phase of establishing the basic architecture, supported often by donors, would be complete by 2013. Where skills are lacking they are being filled through donor financed technical assistance programs under which national staff are being trained. Typically, scientific skills in the new and emerging domain of climate change are spread out over 10–15 technical institutes. A systematic assessment is needed of the overall strengths and future needs of skills in this field. In the meanwhile, systematically tapping these existing skills through recognized working groups

and engagement with the national task forces and with the IPCC, as being attempted in Indonesia, can be helpful.

The emerging institutional architecture can benefit from further strengthening of the capacity for inter-sector analysis and decision making. An integrated approach is critically needed in areas such as coastal zone management (see Box A7.4) and integrated water resource management. Indonesia has recently set up a Water Resources Council and prepared integrated water resource management plans.

Similarly, regional collaboration in water basin management needs to be further enhanced, especially in the Mekong delta which receives 90 percent of its water from other countries. There is an urgent need to engage with countries in the river basin who may not be members of the Mekong River Commission.



## ANNEX 8—GLOBAL MARKETS OUTLOOK

As part of the analysis of future food security conditions and agricultural transformation in VIP countries we conducted a brief examination of probable global trends to 2040 of relevant agricultural commodities. This review focused on 12 agricultural commodities (Table A8.1) that will be critical for food security and agricultural transformation. The analysis also included a comparison of price forecasts for six commodity (wheat, rice, beef, vegetable oils, sugar, and corn) prepared by FAO-OECD Agricultural Outlook and the World Bank Commodity Price Forecast; details are provided in the charts below.

Generally, the two price projections are quite similar, though the World Bank tends to predict a slight drop in prices in most cases while FAO-OECD predicts a slight increase in prices. The most closely paralleled projection of both forecasts is in the case of corn, where the projected prices in US dollars per ton are almost identical. Vegetable oils show the greatest price divergence.

Projections for wheat, rice, and corn, generally follow a steady path for both FAO-OECD and the World Bank, with very slight differences, as seen in the charts below. Projections by the World Bank for beef and vegetable oils are not quite as steady while the same can be said for projections by FAO-OECD for sugar, which anticipate a spike in prices in 2015. Overall, the two price projections point to a fairly steady increase in production in tandem with the increased demand. Based on these projections VIP countries should be able to ensure food security in maize, soybeans, and sugar through a combination of increased production and imports.

A key conclusion arising from our review of these and numerous other commodity publications and forecasts is that there are reasonable prospects for a steady supply at stable prices for the key food items of importance to VIP countries (rice, maize, soybeans, sugar). As for the tree

crops that they export, the prospects are for steady increase in demand and a somewhat more modest rise (and in some instances a decline) in prices; under these conditions there is bound to be keen competition between VIP countries as well as from producers in other parts of the world. Land and labor constraints (the latter being in part also a question of competitive wages) along with improvements in productivity will play an important role in determining the competitiveness of VIP countries.

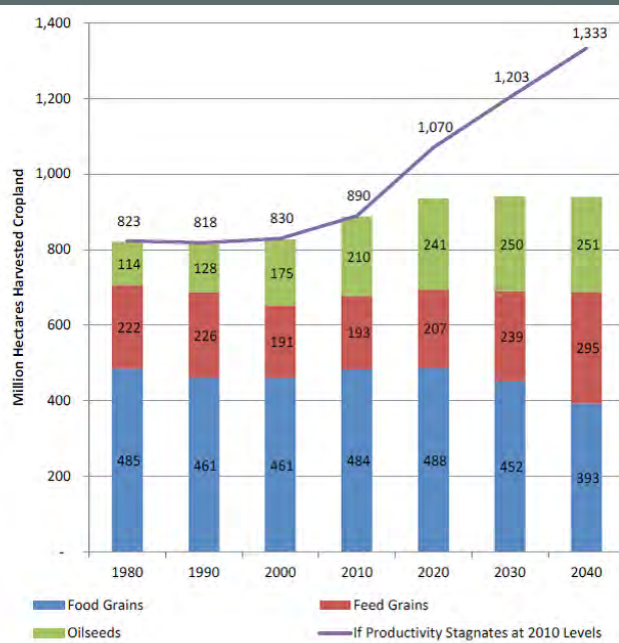
Prospects for food (and feed) commodities will depend on key socio-economic factors that will affect future demand for food items and food security around the world. These include: the expected rate of population growth, population shift from rural to urban areas, and rising incomes. Globally, the UN population projections point to about 9 billion people by 2050 of which 70% will be urban, and with most of the increase taking place in developing countries. A key question facing policy makers will be: can the global production system provide sufficient quantities and kinds of foods that an increasingly populous, prosperous, and urbanized world is likely to prefer? An exhaustive analysis of this question conducted by the U.S Grains Council concluded that the largest increase will be the demand for feed crops (demand for food crops is actually likely to decline) and that this demand could only be met if there will be sufficient public and private investment in, and support for, agricultural productivity technologies and infrastructure. The Council anticipates a growing conflict between agricultural and environmental uses of land, along with constraints on worldwide economic prosperity.<sup>1</sup>

According to FAO's baseline projections, it should be possible to meet the future food and feed demand of the projected world population of 9 billion in 2050 within

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<sup>1</sup> Food 2040: The Future of Food and Agriculture in East Asia—U.S. Grains Council November 2011.

**FIGURE A8.1: THE PRODUCTIVITY CHALLENGE: FOOD CONSUMPTION IN TERMS OF REQUIRED CROPLAND AREA**



Source: Food 2040—The Future of Food and Agriculture in East Asia, U.S. Grains Council, November 2011

realistic rates for land and water use expansion and yield development. However, the level of per-capita food availability will still vary widely between countries.<sup>2</sup> Based on these projections countries should be able to ensure food security through a combination of increased production and imports.

To achieve the required increase in food supply FAO identifies the following prerequisite measures: increased level of investment in primary agriculture in developing countries; creating effective value chains for the respective commodities; investing in related rural infrastructure; assigning priority and resources to agricultural research and extension; and “global markets have to function effectively as food security for an increasing number of countries will depend on international trade and access to a stable supply of imports<sup>3</sup>”.

Our detailed analysis covers rice and tree crops; there is considerable overlap in the production of these commodities in VIP countries: all three countries are major producers of rice; rubber and coffee are being produced in both Vietnam and Indonesia (the Philippines also has a small produc-

tion of rubber), and coconuts are important crops in both Indonesia and the Philippines and to a much smaller extent in Vietnam. Presently, only Indonesia is producing palm oil and cacao on a commercial scale though the Philippines is also attempting to introduce the production of palm oil in Mindanao. Production levels of these crops and a few other key commodities in the three countries and worldwide are depicted in Table A8.1. A brief review of key commodities is presented below.

### RICE

Food grains, which include rice, wheat, and coarse grains account for most of the world’s crop area. In 2010, an estimated 1,461 million metric tons of food grains were produced compared to 744 million metric tons of feed grains worldwide. While the growth in cereal consumption will moderate as ever more prosperous and urbanized population switches to the consumption of meats, fats and dairy products, land pressures due to increased demand for feed and population growth are still going to exert some pressure on supplies.<sup>4</sup>

<sup>2</sup> FAO, (2010)—How to Feed the World in 2050 (page 11)  
<sup>3</sup> Ibid page 15.

<sup>4</sup> Food 2040: The Future of Food and Agriculture in East Asia—U.S. Grains Council November 2011 (page 88).



**TABLE A8.1: PRODUCTION OF KEY CROPS IN VIP COUNTRIES**

crops	Vietnam			Indonesia		
	1990	2000	2010	1990	2000	2010
coconuts	894,419	884,800	1,179,900	12,120,000	15,240,000	18,000,000
coconut (copra) oil	119,936	144,000	163,217	759,780	778,000	861,000
cacao beans	0	0	0	142,347	421,142	844,626
coffee (green)	92,000	802,500	1,105,700	412,767	554,574	684,076
maize	671,000	2,005,900	4,606,800	6,734,030	9,677,000	18,327,600
palm kernel oil	0	0	0	305,000	717,800	2,358,000
palm kernels	0		0	660,000	1,660,000	5,380,000
palm oil	0	0	0	2,412,610	7,000,510	19,760,000
rice	19,225,100	32,529,500	39,988,900	45,178,800	51,898,000	66,469,400
rubber	57,939	290,800	754,482	1,275,300	1,501,430	2,591,940
soybean oil	1,645	2,858	9,967	297,131	339,518	441,250
soybean	86,600	149,300	296,900	1,487,430	1,017,630	907,031
crops	Philippines			world		
	1990	2000	2010	1990	2000	2010
coconuts	11,942,000	12,994,700	15,540,000	43,468,941	51,194,357	59,421,273
coconut (copra) oil	1,462,870	1,358,240	1,913,350	3,358,837	3,381,717	3,987,563
cacao beans	9,848	6,628	5,019	2,532,151	3,373,727	4,187,587
coffee (green)	125,659	107,557	94,569	6,063,100	7,564,401	8,228,018
maize	4,853,890	4,511,100	6,376,800	483,372,614	592,479,279	840,308,214
palm kernel oil	5,133	7,266	10,963	1,675,875	2,767,441	5,688,559
palm kernels	11,406	16,000	23,800	3,717,219	6,479,122	12,594,756
palm oil	45,100	54,000	92,000	11,449,101	22,227,777	43,573,470
rice	9,885,000	12,389,400	15,771,700	518,568,263	599,355,455	696,324,394
rubber	179	71,382	130,430	5,225,369	6,947,472	10,004,206
soybean oil	4,585	38,280	17,575	15,922,935	25,573,310	39,840,137
soybean	4,937	953	812	108,456,438	161,289,911	264,991,580

Source: FAOSTAT

A white paper prepared by Syngenta's Rice Advisory Board<sup>5</sup> concludes that the 2007 global average rice yields of 4.07 t/ha are more than 3 t/ha below the attainable yield levels. Factors preventing yield increases include: inadequate water, lack of soil nutrients, insects, disease, weeds and post-harvest losses of about 15% due to poor processing, storage and transport. A major conclusion of the paper is that current and future concerted efforts to increase production should enable the world to meet expected increases in demand for rice.

An OECD-FAO publication<sup>6</sup> is projecting rice prices (and those for coarse grain that follow a similar pattern) to re-

main flat or moderately decline in real terms between 2011 and 2021, and to register modest growth in nominal terms during the same period. These expected trends indicate no major supply shortages. Table A8.2 presents a similar trend being projected by the World Bank.

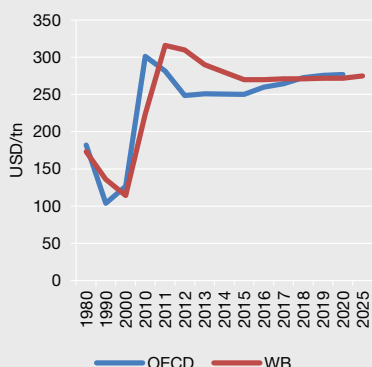
## RUBBER

Significant fluctuations in the prices of natural rubber have seriously affected the wellbeing of rubber growers during the 1970s; these trends have given rise to the formation of the International Natural Rubber Agreement (INRA) in 1979. Established under the auspices of the United Nations' Conference on Trade and Development (UNCTAD), INRA's membership included 37 consuming nations that account for about 75% of the world supply of natural rubber

<sup>5</sup> Rice Feeds Change: An Action Plan for Improving Food Security in Asia (January 2011).

<sup>6</sup> Agricultural Outlook 2012–2021, (2012); (page 120).

**FIGURE A8.2: WHEAT**



Source: FAO-OECD

Note: No 2 hard red winter wheat, ordinary protein, USA f.o.b Gulf ports (June/May), less EEP payments where applicable. WB: US, no. 1, hard red winter, export Gulf.

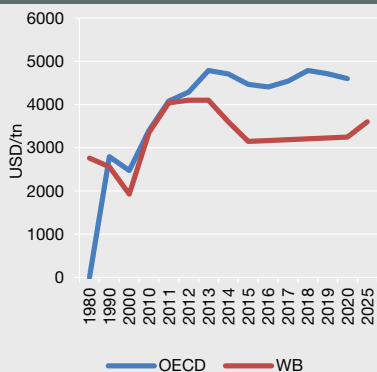
**FIGURE A8.3: RICE**



Source: FAO-OECD

Note: Milled, 100% grade b, Nominal Price Quote, NPO, f.o.b Bangkok (January/December). WB: Thai, 5% broken, white rice, milled, indicative survey price, f.o.b. Bangkok.

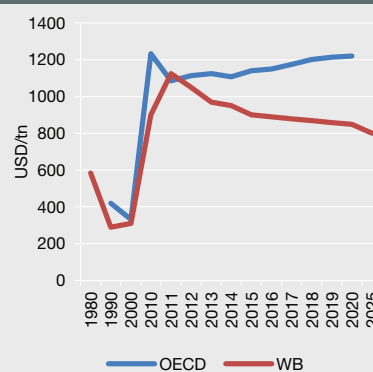
**FIGURE A8.4: BEEF**



Source: FAO-OECD

Note: Choice steer, 1100-1300 lb lw, Nebraska-lw to dw conversion factor 0.63. WB: Australian/New Zealand, frozen boneless, 85% chemical lean, c.i.f. US East Coast.

**FIGURE A8.5: VEGETABLE OILS**



Source: FAO-OECD

Note: Weighted average oilseed oils and palm oil, European port. WB: Palm oil, Malaysian, bulk, c.i.f. N.W. Europe.

**FIGURE A8.6: SUGAR**



Source: FAO-OECD

Note: Raw sugar world price, ICE Inc.No11 f.o.b, bulk price, October/September. WB: International Sugar Agreement daily price, raw, f.o.b. Caribbean ports.

**FIGURE A8.7: CORN**



Source: FAO-OECD

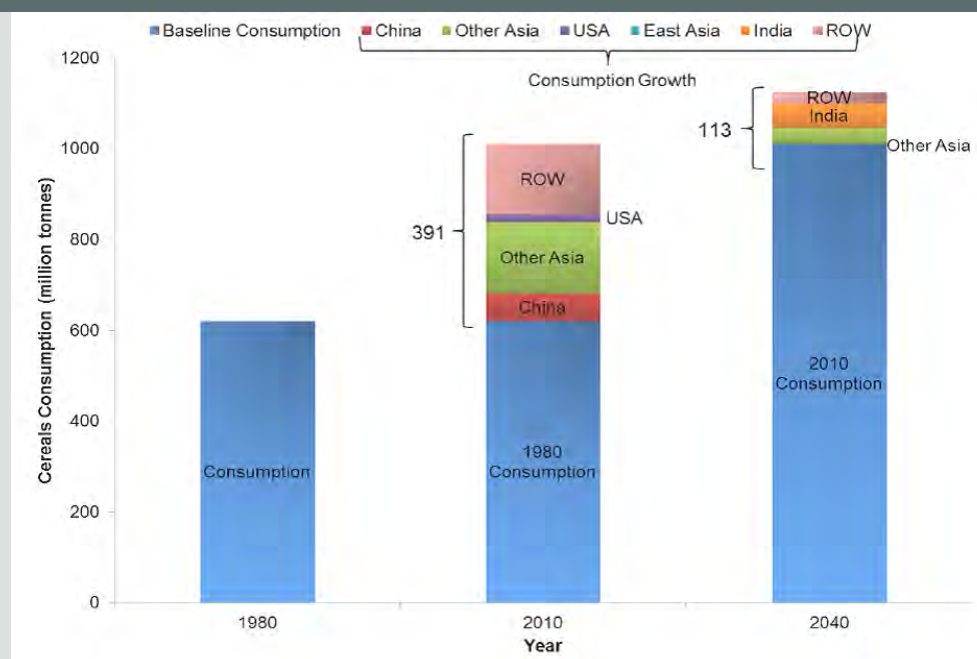
Note: Coarse grains, No. 2 yellow corn, US f.o.b Gulf ports (September/August). WB: Maize (US), No. 2, yellow, f.o.b. US Gulf ports.

TABLE A8.2: WORLD BANK RICE PRICE FORECASTS

year	(USD/ton)
2012	500
2013	490
2014	480
2015	470
2016	466
2017	462
2018	458
2019	454
2020	450
2025	430

Note: WB—current dollars.

FIGURE A8.8: FOOD CEREAL CONSUMPTION, 1980–2010 AND 2010–2040



Source: Food 2040—The Future of Food and Agriculture in East Asia, U.S. Grains Council, November 2011

and seven producing nations exporting 95% of the world output.<sup>7</sup> Following the demise of INRA in 1999, Thailand, Malaysia and Indonesia launched in January 2002, an organization called the International Tripartite Rubber Organization that operates in conjunction with the International Rubber Consortium (IRCo). In 2007, Vietnam agreed to join the IRCo, resulting in four of the world's five leading natural

rubber producers participating in the group (with only India not being involved).

According to IRCo's website, the organization helps to determine and enforce supply and export management among these nations, in an effort to maintain a more consistent balance between production and consumption (and hence price). While the cooperation between members has been imperfect, the group has helped to reopen dialogue between the member nations.

<sup>7</sup> Rubber Asia Magazine, November 2012.

Recent pronouncements by the Secretary General, International Rubber Study Group (IRSG), predict global shortages of natural rubber are likely to increase to over one million tons by 2020, driven largely by robust demand from the automobile industries of China and India. Despite the expected production expansion in countries such as Thailand, Cambodia and China, among the VIP countries Indonesia (and to a lesser extent Vietnam) are well placed to take advantage of this increased demand.

Notwithstanding the bright future, short term fluctuations are inevitable; for example, the price of rubber plunged 40 percent in the past year, falling to its lowest level since 2009 as growth slowed in China, the world's largest auto market and home to 33 percent of global rubber demand, while Europe struggled to cope with its own financial crisis. In response to these adverse conditions, a meeting of the International Tripartite Rubber Council (ITRC) in Bangkok, Thailand, in August 2012, Indonesia, Thailand and Malaysia, which together provide 70 percent of the world's natural rubber supply, agreed to cut exports by 300,000 tons. The largest cut will come from Thailand, which aims to reduce supply by 150,000 tons, with the rest coming from Indonesia and Malaysia.

### **OIL SEEDS AND OIL SEEDS PRODUCTS**

Projections by OECD-FAO for 2021 indicate strong demand for palm oil, a tree crop that is produced exclusively in developing countries and which is the leading vegetable oil in terms of production and trade. Future prospects appear extremely bright, not only because this is the vegetable oil of choice in many countries but also when taking into account the demand for by-products—kernel shells, pulp fibers, liquid and solid effluents, oilcakes—that are used as bio-energy, fertilizer and feed for livestock.

As reported by the US Grains Council, compared with growth between 1980 and 2010 there will be a dramatic increase in fats and oils consumption, including a rise of up to 10% in biofuel consumption over the next 30 years to 2040, or almost double the rate of increase of the previous 30 years.

FAOSTAT shows worldwide production of palm oil in 2010 at 43.6 million tons (the Oil and World, a trade association, reports a slightly higher worldwide production of 49 million tons in 2011 covering an area of 13.41 million hectares). Two countries, Indonesia (19.76 million tons) and Malaysia (16.99 million tons) account for about 84% of worldwide palm oil production. Although future production expansion in Malaysia is limited by land and labor availability; there are no such constraints in Indonesia which is expected to expand production to 40 MT by 2020, with about half of it going for bio-fuel.

While a bright future is expected for palm oil production, it is important not to overlook the environmental damage (destruction of forests, loss of biodiversity, release of greenhouse gases, and soil degradation) that is frequently the consequence of rapid development of palm oil by industrial plantations.

Based on the OECD-FAO forecasts, global consumption of vegetable oil will increase by nearly 30% between 2010 and 2019. Growth will come mainly from developing countries (estimated at 44%), in view of the population growth and the expected income increases. Presently consumption of oil per capita in developing countries is about one quarter that of OECD countries (13.4 kilos per capita per year in India or 12.5 kilos in Nigeria compared with 59.3 kilos in the EU27). World prices for palm oil have reached a peak of \$1,100/ton but have since declined somewhat; long-term projections by the World Bank show prices declining gradually to \$715/ton by 2020. Indonesia and the Philippines remain highly competitive at this price range.

### **COCOA BEANS**

Demand for cocoa is expected to climb 30% in the next 10 years creating a 25% shortage of current supply, according to North American cocoa processor and chocolate ingredients supplier Blommer Chocolate Company. The company also predicts that supply could be challenged by increasing threats from pests and diseases and inadequately trained farmers. Another source confirming possible shortages is Professor David Guest from the Faculty of Agriculture and Environment at the University of Sydney. In a presentation

on April 18, 2012 at the university he warned that a chocolate supply crisis may be looming. Cocoa is presently being produced in areas vulnerable to climate change, political instability, pests and diseases; additional threats to production include ageing plantations, poorly trained farmers and poorly managed trees, dependence on a narrow genetic base and crop substitution where cacao is replaced by maize because of the demand for bio-ethanol.

## COCONUTS

A key issue facing farmers in VIP countries is how to improve the efficiency of coconut farming. A wide range of options is available: “monoculture versus intercropping; the existing varieties, tall versus hybrid, the existing technology, traditional versus intensive, and on agro-climatic zones, coastal versus mountainous<sup>8</sup>”. The authors of this report conclude that subsidies (fertilizers and credit) are unlikely to be the answer to increased farm profitability; instead they advocate adding value by processing coconut products domestically into other forms (e.g., coconut oil, coconut copra). Most large/ medium coconut producers crush the copra themselves and have oil mills. As a consequence of this only about 4% of the copra produced is exported mainly as oil. Current yields in VIP countries are well below the potential of the tall coconut variety of 2–3.5 tons of copra per hectare per year, and even further below the potential of the hybrid coconut variety of 3–5 tons of copra per hectare per year. According to Indonesia’s Sulawesi Coconut Research Center, fertilizer application and intercropping could increase coconut output and double farmers’ incomes.

The three most important forms of consumption for coconuts are fresh (including drinking), coconut oil and desiccated coconut. Global consumption of fresh nuts is growing at a remarkable pace for coconut water and milk (some 30% of coconut consumption). Coconut water is growing in popularity worldwide as a healthy beverage and the milk is used in a number of food products.<sup>9</sup> Indonesia is currently the world’s second largest producer of coconuts (the Philippines ranks as number one). While demand outlook is

promising, there have been few effective programs to bring about technological transformation in the sector and unless these can occur there are limited prospects of transferring Indonesia’s coconut production into a vibrant industry.

Coconuts can be converted to coconut water, coconut milk, coconut oil, toddy and nectar, heart of palm, coconut sprout, candy, caramel and jelly. Another promising use receiving increased attention is the use of coconut oil for energy generation, either mixed with diesel or as a substitute for diesel.

## COFFEE

Coffee consumption in emerging markets such as Indonesia, Vietnam, Mexico, Thailand, continues to grow strongly, and this consumption growth is for the most part in Robusta, which is the main variety produced by Indonesia and Vietnam. The level of coffee crop production in Vietnam and Brazil holds the key to where Robusta future prices will trade; by all indication this will be in the range of \$1,850 to \$2,100 per metric ton. At present there is strong demand for Robusta among roasters, many of whom increased its share in blends last year when Arabica prices soared to multiyear highs, tracking a global crop shortage.<sup>10</sup>

World consumption is forecast to increase by 3 million bags to 142 million in 2012 on steady expansion in most countries; supply is going to increase even faster mainly due to good harvests in Brazil and Vietnam. Even though this year’s ending stocks are forecast to increase by 3 million bags to 27 million, USDA predicts supplies will remain tight.

Indonesia’s coffee production in 2012/13 is forecast at 9.7 million bags, a rebound of 1.4 million with favorable growing conditions, whereas the previous two harvests suffered from excessive rainfall. The forecast falls short of the record 2009/10 harvest because coffee area has declined by more than 5 percent as higher prices for cocoa, rubber, and palm oil encouraged substitution. Bean exports are forecast at 6.1 million bags or roughly 63% of total production. While global demand is likely to remain robust, at the projected prices growers in Vietnam and Indonesia will be hard pressed to compete with alternative tree crops.

<sup>8</sup> Traditional versus intensive coconut production in North Sulawesi—Nordy F.L. Waney and Jon Tujuwale Sam Ratulangi University, 2002.

<sup>9</sup> UNCTAD—INFOCOMM Commodity Profile: Coconut.

<sup>10</sup> The Wall Street Journal—November 8, 2012.



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