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# Market Implications of Integration of Asian Rice Markets

Gen Furuhashi, Hubertus Gay

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## MARKET IMPLICATIONS OF INTEGRATION OF ASIAN RICE MARKETS

Gen Furuhashi and Hubertus Gay  
OECD

This paper explores how the integration of rice markets in ASEAN countries influences the import, export, production, consumption, and prices of rice in those countries, as well as in the rest of the world. The analysis describes current policies applied to ASEAN rice markets, then evaluates the ten-year impacts of two reform scenarios using the OECD-FAO Aglink-Cosimo model. The first scenario involves the elimination of tariffs within the region, while protection *vis-à-vis* countries outside the region remains unchanged. The second scenario involves closer price integration across the region, again with protection versus countries outside the region unchanged. The analysis finds that opening up the regional trade market will lead to greater overall production, consumption and trade across the region. The overall welfare gains are over fifteen times higher with full price integration, as opposed to just tariff reform. Significant price changes create winners and losers within all countries, underscoring the need for complementary policies to accompany a rice market integration agenda.

**Keywords:** Tariffs, self-sufficiency, partial equilibrium model

**JEL classification:** Q10, Q11, Q17, Q18

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## EXECUTIVE SUMMARY

Many countries in Southeast Asia intervene in rice markets. They do so for diverse reasons, which include reducing farm (and sometimes consumer) risk, raising farm incomes, improving food security, and reducing poverty. ASEAN countries seek to reconcile these national objectives with the aim of achieving closer regional integration.

This paper explores the implications of one aspect of regional economic integration: the dismantling of barriers to trade in the regional ASEAN rice market. It explores the implications for consumers and producers in each country, as well as the wider implications for markets within and outside the region.

The analysis uses the Aglink-Cosimo partial equilibrium model of global food markets. Two reform scenarios are considered. The first involves the elimination of tariffs within the region, while protection *vis-à-vis* countries outside the region remains unchanged. The second scenario involves closer price integration across the region, again with protection versus countries outside the region unchanged. This scenario reflects the elimination of not just tariffs, but of all forms of non-tariff forms of protection that cause prices to diverge across the region.

Implementation of these two scenarios involves modification of the Aglink-Cosimo model. The key adaptation is the creation of a regional ASEAN trading bloc. ASEAN members can trade with this bloc or with the rest of the world. Net trade for the regional bloc is zero. In the baseline, the terms under which ASEAN members trade with the bloc are the same as the terms for the rest of the world. Hence the model replicates the original baseline. In the reform scenarios, both importer and exporter countries have a greater incentive to trade with the region; the former because protection is lower for products sourced from within the region; the latter because their effective price rises as a result of lower intra-ASEAN duties.

ASEAN rice trade is characterised by three main importers throughout the baseline projection period – Indonesia, Malaysia and the Philippines. Thailand and Viet Nam are exporters, and the remaining composite region is a net exporter. Overall the region is a net exporter of rice. Indonesia is by far the largest producer and consumer of rice in the region, accounting for over one-third of the region's consumption. However, it is essentially self-sufficient, with less than 2% of rice consumption coming from imports. The Philippines is the biggest trader, accounting for 40% of the region's imports.

The three importing countries impose high rates of protection, which means that imports are lower than they would otherwise be, both from ASEAN countries and from the rest of the world. Under the baseline, self-sufficiency rates in 2025 are projected to be 99% in Indonesia, 62% in Malaysia and 86% in the Philippines. About 82% of ASEAN imports come from within the region, yet high self-sufficiency rates among importers imply that over three-quarters of ASEAN exports leave the region.

Tariffs are high in Malaysia, at nearly 40%, and in the Philippines (nearly 50%), but lower at about 17% in Indonesia. Under the baseline, domestic prices are 50% higher than adjusted border prices in Malaysia, implying a modest degree of protection beyond that provided by tariffs; but much higher in the Philippines (over 100%) and Indonesia (nearly 100%). Hence a much bigger overall stimulus to regional trade would come from deeper price integration than from tariff reform alone.

The dismantling of high rates of price protection across the region would naturally imply substantial national price effects. In the more radical scenario of full internal liberalisation, producer prices in importing countries – Indonesia, the Philippines and Malaysia – would fall by 39.3%, 45.0% and 26.2% respectively relative to the baseline. Producer prices for exporters – Viet Nam, Thailand and the least developed Asian countries (principally Myanmar) – would increase by 13.3%, 8.5% and 16.8% respectively.

Tariff reforms alone would be important in allowing more ASEAN exports to flow into Malaysia (+0.3Mt) and the Philippines (+1.2Mt), but less important for the Indonesian market (+0.1Mt). Closer market

integration would further increase imports into Malaysia modestly (+0.4MT) and into the Philippines significantly (+2.6MT). Crucially, it would open up the largest market, Indonesia, with regional exports flowing into this country (+6.1MT), giving a total of more than 10 Mt of additional intra-ASEAN trade compared with the baseline.

Naturally, the self-sufficiency rates of ASEAN importers will decline with the producer price that increased integration implies. Under the tariff scenario Malaysia's self-sufficiency rate (the ratio of imports to consumption) would decline from 62% to 59% and Philippines' from 86% to 80%, while Indonesia's rate would remain unchanged at around 99%. With full price integration, Malaysia's self-sufficiency rate would decline further to 58% and the Philippines' to 73%, while Indonesia's rate would drop to 89%. Viewed from the perspective of the region as a whole, however, ASEAN would still have an exportable surplus of rice, with regional self-sufficiency at over 110% even under the deeper reform scenario.

There would be some diversion of trade. Of the 10 Mt increase in intra-regional exports, about half would come from a diversion of exports that would have gone to the rest of the world, with the difference attributable to higher production growth and lower consumption growth in exporting countries, relative to the baseline. Reduced supply to the world market would cause international prices to rise by just about 8%.

Overall economic welfare increases in all countries under the full price integration scenario, and for all countries except Malaysia under the tariff reform scenario (where a relatively modest terms-of-trade effect dominates). Welfare increases because consumption exceeds production in importing countries, and prices fall to the benefit of consumers. By contrast, production exceeds consumption in exporting countries and here prices rise to the benefit of producers.

The Philippines accounts for about two-thirds of the overall USD 125 million in gains most from the tariff reform scenario (due to reducing its own tariffs and the fact that it is the most important trader in the region). Consumers gain approximately USD 2.5 billion from lower prices, while producers lose USD 2.1 billion.

The total welfare gains are over fifteen times higher with full price integration, at USD 2.2 billion, with gains of USD 700 million to the Philippines and the remaining gains spread more evenly across countries. In importing countries, lower prices would deliver approximately USD 6.4 and 5.0 billion of gains to consumers in Indonesia and the Philippines respectively, with a large share of those gains coming at the expense of producers.

The two main exporters, Thailand and Viet Nam, gain about six times more from deeper price integration than they do from just tariff reform. This is because there are few benefits from their own reform (as exporters) while the biggest gain comes from a higher regional export price resulting from increased ASEAN demand. In these countries, the losses to consumers are considerably lower than the gains to producers, as a significant share of the producers' gain comes from the increase in volumes as opposed to higher prices.

The findings of this paper complement wider work undertaken for the OECD study *Building food security and managing risk in Southeast Asia*, which suggests that existing price support and production based policies create inefficiencies in resource allocation within the economies instituting those policies and often impose significant budgetary costs on governments, with significant opportunity costs in terms of foregone public investments (OECD, 2017). Greater integration of Asian rice markets would reduce these costs, while spreading production risks and providing a means for countries to manage the risks of food insecurity in the region.

Significant price movements, with prices going up in exporter countries and down in importer countries, would, however, create both winners and losers, notwithstanding net welfare gains and overall improvements in food security. For that reason, the development of targeted safety net measures, in particular to ensure the food security of all households, was identified in the OECD study as an important policy agenda to complement rice market integration in the region. Other tools to enhance the benefits of integration include structural policies to improve farm level competitiveness, infrastructure to develop links to markets, and the development of risk management tools. In terms of implementation, a gradual integration of regional rice markets would also enable sharp changes in rice prices to be avoided and likely make the process of rice market integration more politically feasible.

## 1. Introduction

Many countries in Southeast Asia intervene in food and agricultural markets with the aims of reducing farm (and sometimes consumer) risks, raising farm incomes, improving food security, and reducing overall poverty (OECD, 2015b). Policy makers in these countries are particularly concerned with rice markets, since rice accounts for an average of between 30% and 60% of per capita calorie intake in countries in the region (OECD, 2017).

At the same time, the Southeast Asian countries which form the Association of Southeast Asian Nations (ASEAN)<sup>1</sup> have a regional development plan that seeks to push member economies towards closer economic integration. ASEAN members initially set a timetable for integration, including that of agricultural markets, by 2015, and made significant progress towards this goal (ASEAN, 2015). However, recognising that more was required to achieve regional integration, the ASEAN Economic Community (AEC) Blueprint 2025 sets out plans for full regional integration to be achieved substantially by 2025.

As a group, Southeast Asian countries are large net exporters of rice (Table 1). ASEAN had total rice exports of 20.9 Mt in 2015, up from 13.3 Mt in 2005, representing 47% of global rice exports, while imports were 6.9 Mt in 2015 (up from 4.0 Mt in 2005). Rice trade is of growing importance for ASEAN countries. Of intra-ASEAN trade in 2014-15, over 20% of rice exports of ASEAN countries went to the regional market, while over 80% of imports came from within the region. In 2013, 77% of the USD 1.4 billion total rice imports were sourced from the regional countries, but the share has varied from as high as 91% in 2005 to as low as 70% in 2000. Thailand and Viet Nam are major suppliers of rice to the world market, while Indonesia, Malaysia and the Philippines are net importers.

**Table 1. ASEAN intra- and extra-regional trade**

| (1,000 t)                       |       | Imports |        |        | Exports |        |        |
|---------------------------------|-------|---------|--------|--------|---------|--------|--------|
|                                 |       | 2005    | 2010   | 2015   | 2005    | 2010   | 2015   |
| Indonesia                       | Intra | 445     | 986    | 912    | 0       | 0      | 0      |
|                                 | Extra | 5       | 14     | 388    | 42      | 0      | 0      |
| Malaysia                        | Intra | 543     | 805    | 873    | 3       | 0      | 60     |
|                                 | Extra | 38      | 127    | 277    | 0       | 0      | 0      |
| Philippines                     | Intra | 1,766   | 999    | 2,056  | 0       | 0      | 0      |
|                                 | Extra | 116     | 101    | 44     | 0       | 0      | 1      |
| Thailand                        | Intra | 78      | 248    | 234    | 939     | 1,272  | 2,259  |
|                                 | Extra | 20      | 81     | 62     | 6,466   | 10,178 | 7,341  |
| Viet Nam                        | Intra | 22      | 93     | 237    | 2,443   | 2,660  | 3,196  |
|                                 | Extra | 213     | 555    | 263    | 2,812   | 4,426  | 5,266  |
| Least Developed Asian Countries | Intra | 680     | 839    | 1,506  | 150     | 37     | 304    |
|                                 | Extra | 100     | 93     | 35     | 407     | 1,867  | 2,512  |
| ASEAN                           | Intra | 3,535   | 3,970  | 5,818  | 3,535   | 3,970  | 5,818  |
|                                 | Extra | 491     | 971    | 1,069  | 9,727   | 16,471 | 15,121 |
| World                           |       | 28,404  | 32,376 | 44,295 | 29,720  | 34,449 | 44,410 |

*Note:* In Aglink-Cosimo model, the group of Least Developed Asian Countries comprises Myanmar, Cambodia and Lao PDR, but also six non-ASEAN countries (Yemen, Afghanistan, Timor-Leste, Maldives, Nepal and Bhutan). ASEAN members dominate trade for this grouping.

*Source:* Trade volumes are estimated from UN Comtrade (United Nations Statistics Division, 2016) and OECD-FAO Agricultural Outlook database (OECD/FAO, 2016).

1. ASEAN is comprised of Brunei Darussalam, Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand and Viet Nam.

This analysis explores how the integration of rice markets in ASEAN countries influences rice import, export, production, consumption and prices in those countries, as well as in the rest of the world. The medium-term impacts of rice market integration in the ASEAN region through a reduction in trade barriers among those countries are analysed using the Aglink-Cosimo model (OECD, 2015b).

The structure of the paper is as follows: Section 2 outlines the current policy environment as applied to ASEAN rice markets. Section 3 discusses how the scenario is implemented in the Aglink-Cosimo model and used to project the medium term evolution of both ASEAN and global markets. Section 4 presents the projected results for ASEAN countries under the baseline and the impacts of the proposed scenarios. Section 5 presents the main conclusions.

## 2. Policy description

### 2.1. Market integration policy

ASEAN has a regional development plan that seeks to push ASEAN economies towards closer integration with the development of the ASEAN Economic Community (AEC). The AEC blueprint 2025, which was adopted by ASEAN leaders in November 2015, provides the broad direction for this to occur through strategic measures to be taken from 2016 to 2025 (ASEAN 2016). The Blueprint builds upon the vision of the AEC Blueprint 2015 (ASEAN 2008). Based on the ASEAN Economic Community Blueprint, AEC defined four pillars of actions: (1) a single market and production base, (2) a highly competitive economic region, (3) a region of equitable economic development, and (4) a region fully integrated with the global economy. The process is ongoing with varied degrees of progress across ASEAN members. Although ASEAN has come a long way toward realising its goal, the scale of the challenges remaining suggests that it will be still some time before full integration is realised (Menon and Melendez, 2015).

### 2.2. Rice and food security related policy

The *State of Food Insecurity in the World* (SOFI) report, published jointly by FAO, IFAD and WFP, estimates that on average 9.6% of the regions inhabitants were undernourished between 2014 and 2016, compared with an average 18.3% between 2005 and 2007 (FAO, IFAD and WFP, 2015). Within the region, countries with a notably higher prevalence of undernourishment include Lao PDR, Myanmar, Cambodia, the Philippines and Viet Nam where the rates are 18.6%, 14.2%, 14.0%, 13.5% and 11.0% respectively. Rice accounts for a large part of the energy and nutrition intake in ASEAN countries: on calorie intake rice accounts for 30-60% of household's average calorie intake in the countries (OECD, 2017). The average shares of rice in calorie intake in Myanmar, Viet Nam, the Philippines and Indonesia are 63%, 54%, 48% and 46% respectively. The average share of rice in calorie intake in Thailand has fallen to less than 40%.

In the pursuit of food security, several countries have focused on increasing their self-sufficiency in rice. Indonesia, the Philippines and Malaysia are not currently self-sufficient in rice production. The Malaysian ratio has been below 0.65 since the late 2000s, and is the lowest in the region excluding Singapore and Brunei. Malaysia needed to import almost 40% of its rice consumption in 2015 with an import volume of 1.2 Mt in 2015. The ratio in the Philippines increased from 0.74 in 2009 to 0.9 in 2013. However its ratio did not exceed 1 during the period 2000-2015 and its imported 2.1 Mt of rice in 2015. Indonesia became again a rice importer in the 2010s despite its ratio exceeding 1 in 2007 and 2008. In 2015, Indonesian rice production was 45.8 Mt in 2015 (OECD/FAO, 2016), the largest volume in ASEAN countries, while rice imports were 1.3 Mt. However, Thailand, Viet Nam, Cambodia and Myanmar are net exporters of rice with self-sufficiency ratios above one. Viet Nam's ratio has averaged around 1.2 since 2000. Thailand's self-sufficiency ratio exceeds 1.5, and was higher than 2 in 2007 and 2008. Thailand and Viet Nam, whose production in 2015 reached 19.4 Mt and 29.4 Mt respectively (OECD/FAO, 2016), were net rice exporters despite an increasing domestic consumption. In Cambodia and Myanmar, the ratio has been greater than one since the late 2000s.

The net importers in the ASEAN region, i.e. those with self-sufficiency ratios below one, use import restrictions to support self-sufficiency policies (OECD, 2015a). For instance, Indonesia has import tariffs, tariff quotas, import bans and import licensing arrangements to control import flows. Malaysia and the Philippines have similar policies. These countries have similar policies for commodities other than rice, as part of their self-sufficiency drives. Rice imports in those countries are controlled by state owned enterprises or regulated monopolies which control the quantity of rice imports so as to avoid domestic shortages and manage domestic supply and prices.

Self-sufficiency policies are accompanied by production targets. Indonesia has set a target of achieving complete self-sufficiency in rice by 2017. In 2014, 92% of Indonesian consumption was produced domestically. The Malaysian agro-food policy plan (2011-2020) defined a target of self-sufficiency in rice of 70%, while the self-sufficiency rate in 2014 was almost 60% of its consumption. The Philippines, another rice importing country, also has a self-sufficiency target but shifted away from setting a target date for complete rice self-sufficiency with attempts to diversify individual diets by encouraging consumption of a wider set of food products (OECD, 2015b).

Some countries in ASEAN region have rice stockholding schemes but the state agencies that manage stocks have multiple mandates, which complicate the functioning of these agencies (Deuss, 2015 and OECD, 2016a). The Philippines' National Food Authority (NFA) has the mandate to ensure national food security and stabilise supply and prices of staple cereals, mainly rice and maize, both at the farm and consumer levels (National Food Authority, 2015). NFA stabilises rice supply during emergencies and calamities by releasing rice from its stocks. Indonesia's National Food Logistics Agency (BULOG) has a number of functions, one of its functions is the stabilisation of the rice prices, by mechanisms which include buffer stocks<sup>2</sup>. In addition, BULOG sets a floor or procurement price while selling subsidised rice to the poor through the Raskin programme, which is a social safety net stock activity and remains the largest social assistance transfer targeted to poor households in Indonesia (World Bank 2012).

In Malaysia, PadiBeras National Berhad (BERNAS), a private company, manages public rice stocks. BERNAS purchases paddy rice from farmers at a guaranteed minimum price, manages farm input subsidies, maintains the national rice stock, and is the sole rice importer. This privileged position was extended in 2011 for another ten years.

Thailand, a major rice exporting country, reinstated the rice pledging scheme in 2011, after discontinuing it in 2009. This scheme purchases rice from domestic producers at a premium price to help boost the incomes of the rice farmers (OECD, 2016a). The current government has started to reform this scheme from 2014, transforming payments into a system of farm loans following the accumulation of large stocks (OECD, 2016a).

Some countries in the ASEAN region with net surpluses of rice have applied temporary export restrictions in response to rapid price increases on international or domestic markets. For instance, Viet Nam implemented export bans, export quotas and export taxes during the price hike period (AMIS Policy Database, 2015). Some have also used licensing arrangements to control the level and value of exports, which allow them to manage domestic prices and supplies (OECD, 2015a). For instance, the majority of rice exports in Viet Nam are made through licensing arrangements and via state-owned trading enterprises, particularly the Viet Nam Food Association which purchases rice from farmers as one of functions, in order to maintain domestic prices as food security and promote rice exports (Tobias et al., 2012).

Myanmar also implemented a ban on exports in August 2015 to ensure domestic supply due to adverse weather conditions and Myanmar Rice Federation (MRF) announced a ban on exports. MRF, which has established in 2012 as a national level Federation by restructuring Myanmar Rice Industry Association (MIRA), has functions to ensure rice supply and price stability for the national food security with the

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2. BULOG is the provider of subsidised rice to poor households under the RASKIN programme, manages the government's emergency reserve and it sets minimum purchase prices for farmers through its purchasing responsibilities (OECD, 2015a).

government and to manage rice stock and storage facilities (Myanmar Rice Federation, 2016). The Myanmar Rice Federation works with the government to coordinate private stock releases by the private sector at below-market prices during rice price spikes because the government does not hold public stocks (World Bank 2014b). Export bans were implemented to counter high domestic prices in 2008, 2011, and 2013 (World Bank, 2014b).

### 3. Scenario specifications and methodology

This scenario analysis assesses the impacts of liberalisation of the ASEAN rice market, while keeping trade restrictions with countries outside the region unchanged. The scenarios are implemented with the use of the Aglink-Cosimo partial equilibrium global model. The Aglink-Cosimo model covers the following ASEAN countries individually: Indonesia, Malaysia, the Philippines, Thailand and Viet Nam. Myanmar, Cambodia and Lao PDR are aggregated in the group of least developed Asian countries, which includes also Yemen, Afghanistan, Timor-Leste, Maldives, Nepal and Bhutan. Singapore and Brunei Darussalam are part of the aggregate of other Asian countries but account only for a very small part of the agricultural market of this aggregate. Thus, this scenario analysis assesses rice market integration between Indonesia, Malaysia, the Philippines, Thailand, Viet Nam and the group of least developed Asian countries, some of which are members of ASEAN. The group of least developed countries in Asia was counted as part of the region as rice production, consumption and especially exports are dominated by the ASEAN countries included in this group.<sup>3</sup> The aggregate of other Asian countries is left aside due to the small share of Singapore and Brunei Darussalam in the rice market and in the aggregated region.

Two specific scenarios are considered in this analysis. The first is a tariff removal scenario, which eliminates tariffs among members of the region, but keeps tariffs on trade with non-members unchanged. The second is an increased integration scenario, under which the differences between domestic prices and border prices (adjusted for transport costs and quality differences) are eliminated for all trades within the region, and domestic prices for countries in the region converge. These two scenarios are evaluated relative to the 2016 Outlook baseline, in which current policy settings are maintained.

To implement this analysis a number of refinements to the trade structure of the Aglink-Cosimo model are required. These relate to refining the description of trade, which in the standard model is implemented on the basis that each country supplies to and buys from the international market (that is, there are no explicit bilateral trading flows).

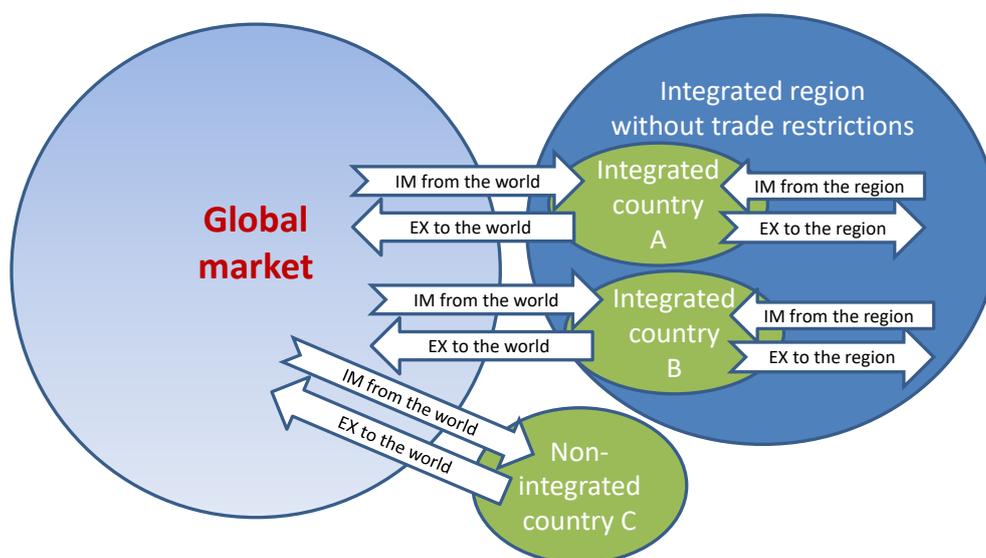
The chosen approach for modelling rice market integration involves creating an additional regional bloc with fewer or no restrictions on trade between individual members and this composite region. Even though the approach cannot trace bilateral export and import between countries in the integrated region, it captures the impacts of intra-regional integration and also the trade links between the regional and the global market. This approach also allows for the modelling of tariff removal for intra-regional trade and deeper integration of domestic prices across ASEAN countries, reflecting the removal of tariff and non-tariff barriers as trade restrictions to trade while maintaining outside protection.

Figure 1 presents briefly the approach for the rice market integration in the ASEAN region. “Country A” and “Country B” in the integrated rice market have trade paths with both the integrated region and the global rice market, but not between each other, whereas “Country C” only has trade paths with the global rice market.

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3. Myanmar, Cambodia and Lao PDR account for about 90% of the production of this country grouping.

Figure 1. Graphical representation of modelling for rice market integration



Note: Abbreviations: EX: export, IM: import.

Trade equations within ASEAN region are expressed by the standard Aglink-Cosimo specification (OECD, 2015b).

$$\log(\text{IM}_{r,t,g}) = \alpha + \beta * \log(\text{PP}_{r,t,g} / (\text{IMP}_{r,t,g} * (1 + \text{TAVI}_{r,t,g} / 100))) + \log(\text{R})$$

$$\log(\text{EX}_{r,t,g}) = \alpha + \beta * \log(\text{PP}_{r,t,g} / (\text{EXP}_{r,t,g} * (1 + \text{TAVE}_{r,t,g} / 100))) + \log(\text{R})$$

Where:

IM = imports

EX = exports

PP = producer price in domestic currency

IMP = import price in domestic currency

EXP = export price in domestic currency

TAVI = import tariff in ad valorem equivalent (in %)

TAVE = export tax in ad valorem equivalent (in %)

Where  $r$  is country or region,  $t$  is a time period as annual term from 2015 to 2025,  $g$  is a trade link that would be indicated as ASEAN region or the rest of the world, and the  $\alpha$  parameters indicate equation-specific constant terms. The  $\beta$  parameters are price elasticities between the domestic producer price and the trade prices, and are negative for exports and positive in the case of imports. The "R" refers to the equation-specific and year-specific residual (OECD, 2015b). The adjustment for the scenario work is that each of these trade equations is specified twice, with one equation for trade with the ASEAN region, a second for with the rest of the world. Proportions of intra- and extra-regional trade are obtained from UN Comtrade (the United Nations Statistics Division, 2016) for historic data. This proportion is applied to the scenario data to calculate total intra- and extra-trade values for the ASEAN region. Exports in exporting countries and imports in importing countries react to the absolute price difference between the domestic market and the regional reference prices. Those reference prices are now allowed to differ between the ASEAN market and the rest of the world.

The market in the Aglink-Cosimo model is cleared by an equilibrium world price for each commodity that ensures that world demand is equal to world supply, and it has a second market clearing price in each

domestic market (OECD, 2015b). The added integrated region serves to clear the trade within the integrated region. It has an own market price but does not trade with the rest of the world. Thus, total exports of members of the integrated region to the integrated region must match total imports from the integrated region. In addition, each member of the integrated region still trades with the rest of the world. In the first scenario, all formal tariffs are eliminated on trade with the integrated region. In the second, the domestic prices of regional members and the clearing price of the integrated region converge.

The analysis explores the effects of two different ASEAN rice market integration scenarios with respect to the baseline presented in the OECD-FAO Agricultural Outlook (OECD/FAO, 2016). In the baseline, trade equations within ASEAN region are expressed by the standard Aglink-Cosimo specification, which relates to the differentials between producer prices and border prices with tariffs (OECD, 2015b), as well as non-tariff restrictions which are estimated as trade barriers based on levels of market price support in the OECD Producer and Consumer Support Estimates (PSE) (OECD, 2016b). In the first “zero tariff” scenario, all formal tariffs within ASEAN region are removed based on the baseline in the Aglink-Cosimo model. Those tariffs are estimated from the current applied levels registered with the WTO. The second “integration” scenario assumes a reduction in the differentials between producer prices and border prices which are estimated based on levels of the OECD PSE, and verified relative to calculations in Hoang and Meyers (2015). Table 2 shows the different assumptions on tariffs and on the ratio of the producer to ASEAN adjusted regional border price.

**Table 2. Tariff assumptions and price relation between producer and adjusted border price**

|                                 | Baseline   |                   |                                  | Zero tariff scenario |                   |                                  | Integration scenario |                                  |                                  |
|---------------------------------|------------|-------------------|----------------------------------|----------------------|-------------------|----------------------------------|----------------------|----------------------------------|----------------------------------|
|                                 | MFN-tariff | Tariff within SEA | Domestic price to regional price | MFN-tariff           | Tariff within SEA | Domestic price to regional price | MFN-tariff           | Tariff and non-tariff within SEA | Domestic price to regional price |
| Indonesia                       | 16.9       | 16.9              | 1.95                             | 16.9                 | 0.0               | 1.80                             | 16.9                 | 0.0                              | 1.07                             |
| Malaysia                        | 39.9       | 39.9              | 1.50                             | 39.9                 | 0.0               | 1.11                             | 39.9                 | 0.0                              | 1.00                             |
| Philippines                     | 49.2       | 49.2              | 2.12                             | 49.2                 | 0.0               | 1.51                             | 49.2                 | 0.0                              | 1.05                             |
| Thailand                        | 52.0       | 52.0              | 1.00                             | 52.0                 | 0.0               | 0.95                             | 52.0                 | 0.0                              | 0.98                             |
| Viet Nam                        | 23.7       | 23.7              | 0.92                             | 23.7                 | 0.0               | 0.87                             | 23.7                 | 0.0                              | 0.94                             |
| Asian Least Developed Countries | 5.0        | 5.0               | 0.90                             | 5.0                  | 0.0               | 0.85                             | 5.0                  | 0.0                              | 0.95                             |

Note: In Indonesia a specific duty for rice is applied at the rate of IDR (Indonesia rupiah) 450 per kg (WTO 2016). This corresponds to an ad valorem tariff rate of 16.9% at the 2016 import price. In Aglink-Cosimo model, the group of Least Developed Asian Countries comprises Myanmar, Cambodia and Lao PDR, but also six non-ASEAN countries (Yemen, Afghanistan, Timor-Leste, Maldives, Nepal and Bhutan).

Source: OECD-FAO Agricultural Outlook database (OECD/FAO, 2016) and scenario calculations.

In the scenarios, the international reference price is Thailand 5% broken rice export price, an indica variety. Rice is comprised of some major varieties that are of limited substitutability in major rice consuming areas (Jayne, 1993). Conventional indica varieties are currently estimated to roughly make up over 85% of world rice production and over 90% of world rice trade<sup>4</sup>, with remainder mostly japonica varieties. Thailand acts as a price leader in the global rice market (Ghoshray, 2008). Prices for indica and japonica varieties may move somewhat independently of one another in the short term, because of limited substitutability in consumption among the different varieties and qualities (John 2014, Rastegari-Henneberry 1985, Jayne 1993). However, in the long term, the prices of indica and japonica varieties move in parallel.

- Major countries which produce japonica rice are Australia, China, Chinese Taipei, the European Union (EU), Japan, Korea and the United States (Calpe, 2006). Based on OECD-FAO Agricultural Outlook database (OECD/FAO, 2016) and some recent production and export statistics of rice types, japonica rice is approximately estimated to be 13-14% and 6-9 % of the global rice production and global trade respectively. According to other sources (John, 2014 and Jayne 1993), conventional indica varieties make up about 85 per cent of world rice consumption and over 80% of world rice trade.

## 4. Results

### 4.1. Baseline projections for the ASEAN rice market

The volume of global rice trade was 44.3 Mt in the base period (2013-15) and is projected to rise to 51.4 Mt by 2025 with ASEAN rice exporters projected to be the main source of increased rice exports. The increase in ASEAN exports is projected to be a result of significant yield increase combined with a general fall in the level of Indian exports. Overall, this sees the share of global exports from the ASEAN region rising from 47% to 59%. In the baseline, the region is expected to become more externally focused with the share of intra-ASEAN exports falling from 20% to 15% (Table 3).

**Table 3. Intra- and extra-ASEAN rice trade under the baseline projections in 2025**

| (1,000 t)                       | Import        |               |               | Export        |               |               | Production | Consumption |
|---------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|------------|-------------|
|                                 | Total imports | Intra-Imports | Extra-imports | Total exports | Intra-exports | Extra-exports |            |             |
| Indonesia                       | 555.9         | 438.4         | 117.5         | 0.6           | 0.1           | 0.5           | 53,167.0   | 53,593.1    |
| Malaysia                        | 1,276.8       | 1,052.6       | 224.2         | 57.7          | 55.5          | 2.1           | 1,984.7    | 3,200.2     |
| Philippines                     | 2,251.4       | 2,130.3       | 121.2         | 1.0           | 0.6           | 0.4           | 13,670.6   | 15,872.1    |
| Thailand                        | 324.4         | 269.8         | 54.6          | 10,963.4      | 1,490.6       | 9,472.9       | 24,795.7   | 14,551.3    |
| Viet Nam                        | 602.5         | 190.5         | 412.0         | 12,261.7      | 2,675.5       | 9,586.2       | 34,905.8   | 23,287.4    |
| Least Developed Asian Countries | 652.4         | 571.1         | 81.4          | 6,902.7       | 430.3         | 6,472.4       | 39,091.9   | 32,878.7    |
| ASEAN                           | 5,663.5       | 4,652.6       | 1,010.9       | 30,187.0      | 4,652.6       | 25,534.4      | 167,615.7  | 143,382.9   |

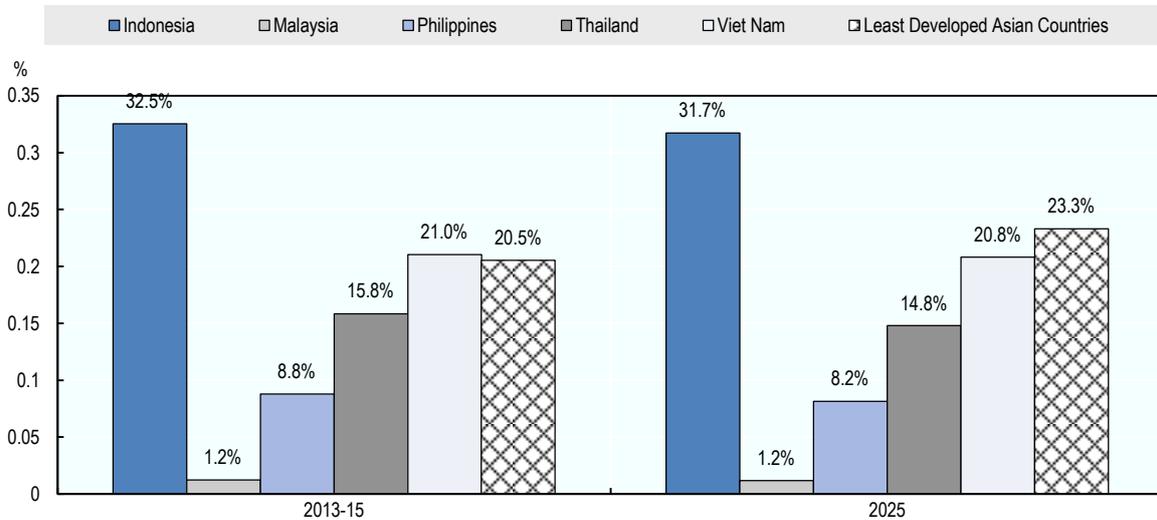
Note: In Aglink-Cosimo model, the group of Asian Least Developed Countries comprises Myanmar, Cambodia and Lao PDR, but also six non-ASEA countries (Yemen, Afghanistan, Timor-Leste, Maldives, Nepal and Bhutan).

Source: OECD-FAO Agricultural Outlook database (OECD/FAO, 2016).

The import volume of the ASEAN region during the base period (2013-15) was 6.0 Mt, of which 4.9 Mt was imported from other ASEAN countries. As countries become more self-sufficient import demand is expected to decline to 5.7 Mt by 2025, of which 4.7Mt will be imported from ASEAN countries. Whilst the ASEAN region accounts for only 11% of global imports, a large share of these imports (82%) are sourced from other ASEAN countries, and this share is projected to remain broadly constant throughout the baseline.

As an aggregate region, ASEAN is a large net rice exporter with surpluses from the exporting countries (Thailand, Viet Nam and Least Developed Asian countries) greatly exceeding the deficits of the importing countries (Malaysia, the Philippines and Indonesia). On aggregate the region produces 28% of global production, and this share is projected to increase to 30% by 2025. The volume of the ASEAN rice production increases from 138 Mt in the base period to 168 Mt in 2025. Indonesia has the largest production of the region at around a third of the regional production (Figure 2). Over the coming decade, the fastest growth is expected in Least Developed Asian countries, principally Myanmar. In the Southeast Asia's rice projection report of USDA ERS (Baldwin et al., 2012), ASEAN countries have also a similar rice trade characterised by three main importers: Indonesia, Malaysia and the Philippines. Thailand, Viet Nam and the remaining composite countries (Myanmar and Cambodia) are exporters.

Rice is mostly destined to direct human consumption and it is a major staple food in the ASEAN countries. Under the baseline, 71% of consumption is to direct human consumption in 2025. Per capita rice consumption in ASEAN countries is expected to rise only marginally despite the shift out of poverty for a significant number of households. The growth in demand is tempered by the impact of income growth which provides opportunities for diet diversification. Consumption is projected to increase from 126.0 Mt in the base period to 143.4 Mt in 2025, with the majority of this increase a result of population increases.

**Figure 2. Rice production within ASEAN countries**


Note: Percentage values reflect shares in total ASEAN production.

Source: OECD/FAO (2016), "OECD-FAO Agricultural Outlook", OECD Agriculture statistics (database). <http://dx.doi.org/10.1787/agr-outl-data-en>.

The world reference rice price (milled, 100% B, fob Bangkok) recently fell 9% from USD 435/t in 2014 to USD 395/t in 2015. During the course of the baseline, the international rice price is projected to remain under pressure in the short term reflecting sluggish import demands, but recover over the medium term, sustained by growing purchases from countries in Africa, Asia and the Near East, to reach USD 416/t by 2025. This nevertheless represents a decline in real terms over the ten-year horizon. This decrease in real terms is stronger than for other cereals because yield increases are relatively high, while demand is dominated by human consumption, while the demand for other cereals also supported by increased feed demand, which is projected to increase more rapidly (OECD/FAO, 2016).

#### 4.2. Scenario results

Under the **zero tariff scenario**, trade conditions become more favourable within the region in comparison with the baseline. The volume of intra-regional trade is projected to increase by 44% from 4.7 Mt to 6.7 Mt in 2025, offsetting both exports and imports to and from countries outside the region (Tables A1 and A2). With increased import demand within ASEAN countries, the reference price within the region is projected to rise to USD 447/t, or by 7.4% relative to the baseline. Extra-regional trade contracts as regional exporters have more favourable access to regional importer markets –extra-regional exports and imports declining by 1.1 Mt and 0.3 Mt respectively. The changes within regional markets in ASEAN have flow on effects to the world market as a result of lower export supply, with global prices rising to USD 421/t, or 1.2% relative to the baseline.

In volume terms the Philippines represents 60%, or 1.2Mt, of the total increases in regional imports, consolidating its position as the lead regional ASEAN importer in the zero tariff scenario. Due to tariff reductions, Malaysia, Thailand, Viet Nam and Indonesia also see increases in regional imports, with rises of 0.3 Mt, 0.3 Mt, 0.1 Mt and 0.1 Mt respectively. As current tariffs for the least developed Asian countries are relatively so small (Table 2), and regional prices are higher under the scenario, regional import conditions becomes less favourable for these countries than the baseline but its price is still lower than the domestic prices. Only the least developed Asian countries (as an aggregate, this region imports) see a small reduction of less 0.1 Mt due to the higher regional prices under this scenario. Rice exporting countries increase their regional exports, with Viet Nam, Thailand and the least developed Asian countries increasing regional exports by 1.1 Mt, 0.7 Mt and 0.2 Mt respectively. A half of the changes in exports are from a re-direction of trade from world to regional markets with, for example, Viet Nam's extra-regional exports declining by 0.7 Mt.

For exporting countries the increased demand for exports in the zero tariff scenario raises internal producer prices. Producer prices for Viet Nam, Thailand and the least developed Asian countries increase by 2.4%, 1.7% and 1.4% respectively compared with the baseline. For importing countries which previously had large barriers to trade, increased competition from imports decreases producer prices significantly. Prices in the Philippines and Malaysia are projected to fall by 23.2% and 20.1% respectively, relative to the baseline. The price in Indonesia declines only slightly, because the low level of duty applied has little impact on regional trade or the domestic rice market.

In the **integration scenario**, which captures the effects of not only tariff reductions but the removal of other barriers to trade in both import and export markets, intra-regional trade increases from 6.5 Mt in the zero tariff scenario to 13.8 Mt (Tables A3 and A4) in 2025. In this scenario, it is assumed that non-tariff based price differences, such as those from other forms of border protection (for example in Indonesia) or due to a lack of access to markets from domestic capability constraints (such as in the least developed Asian country grouping) are removed or overcome in conjunction with the removal of tariffs. Additional demand for imports within the region increases the reference price within the region to USD 461/t, which represents an increase of 11% relative to the baseline. With more favourable conditions within the region than under the baseline and zero tariff scenarios, extra regional exports and imports decline by 5.2 Mt and 0.3 Mt respectively, reducing supply to the global market by 8.4%. This reduction in export supply outside the ASEAN region increases the global reference price to USD 451/t, an 8.4% increase relative to the baseline. The price impacts of the increased integration scenario are essentially an amplification of the main results of the zero tariff scenario.

The integration scenario leads to much larger intra-regional imports, which increase by 8.9 Mt relative to the baseline. This increase is dominated by the 6.0 Mt increase in Indonesia. The impacts of tariff elimination on intra-regional trade for Indonesia were limited because Indonesia's tariffs are set at very low levels (WTO, 2016). However, the high ratio of domestic to border prices, reflecting the importance of non-tariff barriers compared with formal tariffs, potentially as a result of the activities of BULOG, means that deeper price integration has large impact. Indonesia, as the region's most populous country,<sup>5</sup> overtakes the Philippines as the largest ASEAN importer in volume terms, in contrast with the zero tariff scenario, where the Philippines was the largest importer in ASEAN.

Rice exporting countries see a significant increase in intra-regional trade in the integration scenario relative to both the baseline and the zero tariff scenario. Viet Nam, Thailand and the least developed Asian countries are projected to increase exports to the region by 3.8 Mt, 0.5 Mt and 4.9 Mt respectively. About one-half of this, 5.2 Mt in total, is due to a re-direction of exports from global to regional markets. The volumes of extra-regional exports from Thailand, Viet Nam and the least developed Asian countries are projected to decrease by 1%, 26% and 40% respectively. The least developed Asian countries, an aggregate dominated by Myanmar and Cambodia, are expected to increase intra-ASEAN exports, with production in these countries responding to the higher producer price.

Producer prices for Viet Nam, Thailand and the least developed Asian countries, all of which are net exporters, increase by 13.3%, 8.5% and 16.8% respectively. Due to considerably higher demand from the region's rice importers, these price increases are greater than in the zero tariff scenario. For major importing countries producer prices fall, as imports become more competitive. In Indonesia, the Philippines and Malaysia, producer prices fall by 39.3%, 45.0% and 26.2% respectively relative to the baseline. In the case of Indonesia and the Philippines producer prices fall by much more than in the zero tariff scenario, reflecting greater import demand as producer prices converge to the trade price.

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5. The population of Indonesia and the Philippines were estimated to be 257.6 millions and 100.7 millions in 2015 and are projected to reach 284.5 millions and 116.2 millions in 2025 respectively according to OECD/FAO (2016).

### 4.3. Impact on self-sufficiency and welfare

Increases in regional trade naturally lead to lower self-sufficiency rates in the ASEAN importer countries. In the zero tariff scenario, the self-sufficiency ratio falls from 86% to 80% in the Philippines, and from 62% to 59% for Malaysia. In the integration scenario, the self-sufficiency rate in Indonesia falls from 99% under the baseline to 89%, from 86% to 73% in the Philippines and from 62% to 58% in Malaysia. On the other hand the overall self-sufficiency of all ASEAN countries combined is still maintained at a high level (over 113%) and the region remains one of the world's main exporter of rice.

As expected the main changes in the overall welfare for consumers and producers depend on the trade situation of the respective country. Producers in exporting countries and consumers in importing countries gain from tariff reduction and further integration. Conversely, consumers in exporting countries and producers in importing countries lose (Table 4). Tariff revenue falls under the zero tariff scenario and the tariff losses are similar under the integration scenario, where tariff elimination is one component of domestic and international price convergence. Adding up the effects reveals that the total impacts on welfare are positive in both scenarios, except for Indonesia and Malaysia under the zero tariff scenario, where the loss in tariff revenue outweighs the net gains in producer and consumer surplus. Welfare gains are considerably higher in the price integration scenario than in the zero tariff scenario because the former leads to much larger welfare gains from changes in production and consumption.. In addition, the effects under the integration scenario are larger due to the greater price effects.

**Table 4. ASEAN countries' changes in welfare compared to the baseline in 2025  
(Million USD)**

|                                 | Zero tariff scenario    |                            |                            |                           | Integration scenario    |                            |                            |                           |
|---------------------------------|-------------------------|----------------------------|----------------------------|---------------------------|-------------------------|----------------------------|----------------------------|---------------------------|
|                                 | Change in tariff income | Change in producer surplus | Change in consumer surplus | Overall change in welfare | Change in tariff income | Change in producer surplus | Change in consumer surplus | Overall change in welfare |
| Indonesia                       | -11.1                   | -137.8                     | 139.0                      | -9.9                      | -13.4                   | -5,966.6                   | 6,362.2                    | 382.2                     |
| Malaysia                        | -155.7                  | -186.8                     | 309.4                      | -33.2                     | -159.4                  | -241.5                     | 403.5                      | 2.6                       |
| Philippines                     | -347.2                  | -2,082.7                   | 2,510.3                    | 80.4                      | -350.0                  | -3,966.0                   | 5,012.9                    | 697.0                     |
| Thailand                        | -57.1                   | 170.6                      | -99.8                      | 13.6                      | -57.1                   | 884.1                      | -512.5                     | 314.5                     |
| Viet Nam                        | -8.7                    | 188.7                      | -125.4                     | 54.6                      | -4.5                    | 1,101.5                    | -719.6                     | 377.4                     |
| Asian Least Developed Countries | -12.0                   | 193.6                      | -162.4                     | 19.2                      | -10.8                   | 2,557.8                    | -2,086.1                   | 461.0                     |
| <b>ASEAN region</b>             | <b>-591.8</b>           | <b>-1,854.3</b>            | <b>2,570.9</b>             | <b>124.8</b>              | <b>-595.1</b>           | <b>-5,630.6</b>            | <b>8,460.4</b>             | <b>2,234.7</b>            |

*Note:* The surplus is simply calculated as "surplus = price change \* change in production or consumption". Change in tariff income is calculated with the assumption that all imports entering under the tariffs shown in Table 2.

*Source:* Scenario projections

## 5. Conclusions

This analysis of the market implications of greater integration of the ASEAN rice market finds that opening up the regional trade market will lead to greater overall production, consumption and trade across the region, with aggregate welfare gains to each country in the region. The impacts are considerably greater if there is more complete integration of markets, as opposed to just tariff reform.

The removal of all trade barriers, together with investments that improve access to markets, would reduce large price differences between the countries in the region and result in much bigger impacts. This is particularly the case for importing countries such as Indonesia and the Philippines, as well as the least developing composite region. With lower prices, production in importing countries decreases and consumption increases, causing intra-regional trade prices to rise by 11%. Major exporting countries, Thailand, Viet Nam and Myanmar increase intra-ASEAN exports, with about half this increase being diverted from exports to the rest of the world. Multilateral reforms extending beyond ASEAN would of course dampen the extent of trade diversion.

Any reduction in trade barriers for importing countries will inevitably lead to lower rates of national self-sufficiency. Those ratios are about ten percent lower with full price integration in Indonesia and the Philippines. However, despite this, the majority of rice consumed in these countries will still be sourced from domestic production – pointing to a large and competitive domestic rice sector remaining post reforms. Further, the offsetting effects of gains for consumers means that there are aggregate welfare gains to be reaped. With the region having an overall surplus of rice, producing over 10% more than its consumption needs in the scenario of full integration, the key issue for national policymakers is whether they can remain confident that exporters in the region will remain reliable suppliers. Economic integration across ASEAN seeks to foster such confidence.

These scenarios look at the implications of radical, not marginal, policy changes. If such reforms were to be introduced, there would be a need to consider how parallel policies can smooth the adjustment process. Areas for intervention across the region may include social policies to cushion producers and consumers exposed to immediate real income losses, structural policies to improve farm level competitiveness, infrastructure to develop links to markets, and the development of risk management tools.

## References

- AMIS (2015), AMIS Policy Database, <http://statistics.amis-outlook.org/policy/index.html>. Accessed October 2015.
- ASEAN (2008), *ASEAN Economic Community Blueprint*, [www.asean.org/archive/5187-10.pdf](http://www.asean.org/archive/5187-10.pdf).
- ASEAN (2015), *AEC 2015: Progress and Key Achievement*, [www.asean.org/storage/images/2015/November/aec-page/AEC-2015-Progress-and-Key-Achievements.pdf](http://www.asean.org/storage/images/2015/November/aec-page/AEC-2015-Progress-and-Key-Achievements.pdf).
- ASEAN (2016), *ASEAN Economic Community Blueprint 2015*, [www.asean.org/storage/2016/03/AECBP\\_2025r\\_FINAL.pdf](http://www.asean.org/storage/2016/03/AECBP_2025r_FINAL.pdf).
- Baldwin K., Childs N., Dyck J. and Hansen J. (2012), “Southeast Asia’s Rice Surplus”, RCS-121-01, U.S. Department of Agriculture, Economic Research Service, December 2012, [www.ers.usda.gov/webdocs/publications/38662/34535\\_rcs-121-01.pdf?v=41274](http://www.ers.usda.gov/webdocs/publications/38662/34535_rcs-121-01.pdf?v=41274).
- Calpe, C. (2006), Rice international commodity profile, Markets and Trade Division, Food and Agricultural Organization of the United Nations, [www.fao.org/fileadmin/templates/est/COMM\\_MARKETS\\_MONITORING/Rice/Documents/Rice\\_Profile\\_Dec-06.pdf](http://www.fao.org/fileadmin/templates/est/COMM_MARKETS_MONITORING/Rice/Documents/Rice_Profile_Dec-06.pdf).
- Clarete R., Adriano L. and Esteban A. (2013), “Rice Trade and Price Volatility -Implications on ASEAN and Global Food Security-”, *ADB Economics Working Paper Series* 368, ADB.
- Deuss, A. (2015), “Review of the performance and impacts of recent stockholding policies”, in OECD, *Issues in Agricultural Trade Policy: Proceedings of the 2014 OECD Global Forum on Agriculture*, OECD Publishing, Paris, <http://dx.doi.org/10.1787/9789264233911-5-en>.
- FAO, IFAD and WFP (2015), “The State of Food Insecurity in the World” (SOFI), FAO, [www.fao.org/publications/card/en/c/c2cda20d-ebcb-4467-8a94-038087fe0f6e/](http://www.fao.org/publications/card/en/c/c2cda20d-ebcb-4467-8a94-038087fe0f6e/).
- Ghoshray A. (2008), “Asymmetric adjustment of rice export prices: the case of Thailand and Viet Nam”, *International Journal of Applied Economics*, Vol.5, Iss.2, pp.80–91.
- Hoang, H. and Meyers, W., (2015), “Price stabilization and impacts of trade liberalization in the Southeast Asian rice market”, *Food Policy*, Vol.57, pp.26–39.
- Jayne, T.S. (1993), “Sources and Effects of Instability in the World Rice Market”, *MSU International Development Paper*, No.13, Michigan State University.
- John, A. (2014), “Price relations between international rice markets”, *Agricultural and Food Economics*, Vol.2, Issue 1, pp.1–16.
- Menon J. and A. C. Melendez (2015), “Realizing an ASEAN Economic Community-Progress and Remaining Challenges-”, *ADB Economics Working Paper Series*, No. 432.
- Myanmar Rice Federation (2016),” Myanmar Rice Federation”, <http://myanmarricefederation.org/content/about-myanmar-rice-federation-mrf>
- National Food Authority (2015), “Mandate, Mission, Vision and Core Functions”, the Philippine government under the Office of the President, [www.nfa.gov.ph/about-us/mission-vision-and-mandate](http://www.nfa.gov.ph/about-us/mission-vision-and-mandate).
- OECD (2015a), “Managing food security through agriculture-related policies: A stocktake of measures applied in ASEAN”, (OECD internal document).
- OECD (2015b), Aglink-Cosimo model documentation, [www.agri-outlook.org/about/Aglink-Cosimo-model-documentation-2015.pdf](http://www.agri-outlook.org/about/Aglink-Cosimo-model-documentation-2015.pdf).

- OECD (2016a), “The market impacts of Asian public stockholding policies related to rice: interim report”, [OECD internal document].
- OECD (2016b), “Producer and Consumer Support Estimates database”, [www.oecd.org/tad/agricultural-policies/producerandconsumersupportestimatesdatabase.htm](http://www.oecd.org/tad/agricultural-policies/producerandconsumersupportestimatesdatabase.htm) .
- OECD/FAO (2016), “OECD-FAO Agricultural Outlook 2016-2025”, OECD Publishing, Paris. <http://dx.doi.org/10.1787/agr-outl-data-en> .
- OECD (2017), “*Building Food Security and Managing Risk in Southeast Asia*”, OECD Publishing, Paris. DOI: <http://dx.doi.org/10.1787/9789264272392-en> .
- Rastegari-Henneberry, S. (1985), “The World Rice Market”, *Giannini Foundation Information Series*, No. 85-2, University of California.
- Tobias A, I. Molina, H.G. Valera, K.A. Mottaleb, and S. Mohanty (2012), Handbook on Rice Policy in Asia, International Rice Research Institute (IRRI), Philippines.
- United Nations Statistics Division (2016), UN Comtrade Database - International Trade Statistics, Import/Export Data, <http://comtrade.un.org/> .
- USDA (2015), Production, Supply and Distribution Online, <https://apps.fas.usda.gov/psdonline/> .
- World Bank (2012), “Raskin subsidized rice delivery”, Social assistance program and public expenditure review, No. 3, <http://documents.worldbank.org/curated/en/2012/02/15893857/raskin-subsidized-rice-delivery>.
- World Bank (2014a), “Myanmar-Rice price reduction and poverty reduction”, Economic and Sector Work Report No. 89687-MM, <http://documents.worldbank.org/curated/en/510031468287383757/Myanmar-Rice-price-reduction-and-poverty-reduction>.
- World Bank (2014b), “Myanmar-Capitalizing on rice export opportunities”, <http://documents.worldbank.org/curated/en/570771468323340471/Myanmar-Capitalizing-on-rice-export-opportunities>
- WTO (2016), “Trade and tariff data”, [www.wto.org/english/res\\_e/statis\\_e/statis\\_e.htm](http://www.wto.org/english/res_e/statis_e/statis_e.htm) .

## Annex Tables

Table A1. Relative difference between the zero tariff scenario and baseline projections in 2025 (%)

| Relative difference (%)         | Import        |               |               | Export        |               |               | Production | Consumption | Producer Price |
|---------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|------------|-------------|----------------|
|                                 | Total imports | Intra-Imports | Extra-imports | Total exports | Intra-exports | Extra-exports |            |             |                |
| Indonesia                       | 16%           | 21%           | -5%           | 2%            | 4%            | 1%            | 0%         | 0%          | -1%            |
| Malaysia                        | 12%           | 32%           | -81%          | 36%           | 35%           | 87%           | -3%        | 2%          | -20%           |
| Philippines                     | 50%           | 58%           | -85%          | 64%           | 70%           | 55%           | -3%        | 4%          | -23%           |
| Thailand                        | 89%           | 107%          | 4%            | 4%            | 47%           | -3%           | 0%         | 0%          | 2%             |
| Viet Nam                        | 26%           | 74%           | 4%            | 3%            | 41%           | -8%           | 0%         | 0%          | 2%             |
| Least Developed Asian Countries | -6%           | -7%           | 1%            | 2%            | 51%           | -1%           | 0%         | 0%          | 1%             |
| ASEAN                           | 31%           | 44%           | -27%          | 3%            | 44%           | -4%           | 0%         | 0%          | -              |

Source: Scenario projections.

Table A2. Absolute difference between the zero tariff scenario and baseline projections in 2025

| Absolute difference (1,000t)    | Import        |               |               | Export        |               |               | Production | Consumption |
|---------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|------------|-------------|
|                                 | Total imports | Intra-Imports | Extra-imports | Total exports | Intra-exports | Extra-exports |            |             |
| Indonesia                       | 87.6          | 93.5          | -6.0          | 0.0           | 0.0           | 0.0           | -47.2      | 41.9        |
| Malaysia                        | 152.3         | 333.6         | -181.3        | 21.0          | 19.2          | 1.8           | -64.0      | 67.2        |
| Philippines                     | 1,122.2       | 1,225.7       | -103.5        | 0.6           | 0.4           | 0.2           | -441.5     | 678.2       |
| Thailand                        | 290.1         | 288.2         | 1.9           | 384.5         | 706.0         | -321.5        | 52.0       | -42.6       |
| Viet Nam                        | 156.1         | 140.2         | 15.9          | 376.2         | 1,098.3       | -722.1        | 109.5      | -110.5      |
| Least Developed Asian Countries | -36.9         | -37.7         | 0.8           | 158.1         | 219.7         | -61.6         | 111.1      | -83.5       |
| ASEAN                           | 1,771.4       | 2,043.6       | -272.2        | 940.4         | 2,043.6       | -1,103.1      | -280.2     | 550.7       |

Source: Scenario projections.

Table A3. Relative difference between the integration scenario and baseline projections in 2025

| Relative difference (%)         | Import        |               |               | Export        |               |               | Production | Consumption | Producer Price |
|---------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|------------|-------------|----------------|
|                                 | Total imports | Intra-Imports | Extra-imports | Total exports | Intra-exports | Extra-exports |            |             |                |
| Indonesia                       | 1082%         | 1393%         | -77%          | 28%           | 0%            | 34%           | -5%        | 6%          | -39%           |
| Malaysia                        | 14%           | 37%           | -93%          | 6%            | 0%            | 176%          | -4%        | 3%          | -26%           |
| Philippines                     | 114%          | 126%          | -99%          | 77%           | 0%            | 194%          | -7%        | 10%         | -45%           |
| Thailand                        | 0%            | 0%            | 1%            | 4%            | 35%           | -1%           | 1%         | -1%         | 9%             |
| Viet Nam                        | 11%           | 0%            | 16%           | 10%           | 140%          | -26%          | 2%         | -3%         | 13%            |
| Least Developed Asian Countries | 8%            | 0%            | 64%           | 33%           | 1140%         | -40%          | 3%         | -3%         | 17%            |
| ASEAN                           | 157%          | 197%          | -30%          | 13%           | 197%          | -20%          | -1%        | 2%          | -              |

Source: Scenario projections.

**Table A4. Absolute difference between the integration scenario and baseline projections in 2025**

| (1,000t)                        | Import        |               |               | Export        |               |               | Production | Consumption |
|---------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|------------|-------------|
|                                 | Total imports | Intra-Imports | Extra-imports | Total exports | Intra-exports | Extra-exports |            |             |
| Absolute difference             |               |               |               |               |               |               |            |             |
| Indonesia                       | 6,015.3       | 6,106.1       | -90.8         | 0.2           | 0.0           | 0.2           | -2,769.4   | 3,244.9     |
| Malaysia                        | 179.2         | 388.2         | -209.0        | 3.7           | 0.0           | 3.7           | -85.5      | 90.0        |
| Philippines                     | 2,561.5       | 2,681.6       | -120.1        | 0.8           | 0.0           | 0.8           | -978.9     | 1,577.4     |
| Thailand                        | 0.3           | 0.0           | 0.3           | 460.7         | 514.5         | -53.8         | 255.4      | -207.3      |
| Viet Nam                        | 65.4          | 0.0           | 65.4          | 1,233.5       | 3,756.5       | -2,523.0      | 580.6      | -587.6      |
| Least Developed Asian Countries | 52.4          | 0.0           | 52.4          | 2,288.2       | 4,904.9       | -2,616.8      | 1,316.4    | -918.9      |
| ASEAN                           | 8,874.1       | 9,175.9       | -301.8        | 3,987.1       | 9,175.9       | -5,188.9      | -1,681.4   | 3,198.4     |

Source: Scenario projections.