Summary: Higher and more volatile world grain prices are the new realities of today, and tomorrow. This note explores some of the steps East Asia needs to take to rise to the challenge this poses. Raising the level and stability of rice production through more and better public investment remains the best long term solution. This must go hand in hand with strengthening regional coordination to restore trust in world rice markets and capture the gains from trade. In this, the role of a collective agreement to hold larger domestic buffer stocks merits further reflection, as does the development of the ASEAN+3 Emergency Rice Reserve Program. In bolstering supply, much progress can already be made by closing the yield gaps and reducing post harvest loss, in South East Asia currently estimated at 15 percent of the rice crop value. Finally, a beginning must be made to prepare agriculture for the increasing frequency of shocks and gradual shifts in the weather patterns.

Higher and more volatile world grain prices are today’s new realities. Over the past three years, world grain prices have on average been twice their 2000-2005 levels (Figure 1). At 2.2 times their average 2000–05 levels, world rice prices have risen even higher. These trends were punctuated with a very sharp increase in 2008. Pre-2005 price levels have not been attained since and no real abatement is expected in the coming years. Rising grain price variability, found to be twice as high during 2005–10, as during 1990–2005, is further compounding concerns about food price inflation. Price hikes may trigger political upheaval and cause long lasting damage, especially when they affect the nourishment of children during their first 1,000 days of life. Moreover, while higher prices usually induce a supply response, which is larger in the long than in the short run, unexpected price swings undermine the incentives for suppliers to react.

This new global reality follows from lagging and variable supplies in the face of steadily rising demand. Global grain consumption increased by 26 percent since 1998/99, driven by population and income growth, dietary shifts to protein rich foods, as well as new sources of demand following OECD agro-fuel policies. But production only increased by 20 percent and was volatile due to erratic weather. Drawing down stocks compensated for production shortfalls at first, but their decline to below 20 percent of consumption in 2007, and again today, has provided an inadequate cushion, causing prices to spike.

1 World Bank (2011a) predicts rice, wheat and corn prices to be only 10 (rice) to 20 (wheat, corn) percent below their current values (in constant 2000 US$).
2 Protracted periods of undernourishment occurring between conception and the age of two (i.e. the first 1000 days of life) can cause irreversible damage to brain development, learning ability, and schooling achievement, which together combine in reduced lifelong earning potential.
3 Several studies from Thailand, Cambodia and Vietnam report short run rice supply elasticities around 0.25. The long run supply elasticity is usually at least twice as high (0.59 on average across a series of studies in Thailand (Choeun et al., 2006) and estimated at around 1 in Cambodia (Yu and Fan, 2011)).
4 Global cereal demand growth (rice, wheat and coarse grains) rose from 1.6 percent per year in 1992-2001 to 1.9 percent per year in 2002–08. Excluding US agro-fuel related corn demand, global cereal demand growth actually dropped to 1.4 percent (Alexandratos, 2008).
Higher and more volatile world food price are also reflected in domestic markets, even though not fully. Real dollar nominated world rice prices have gradually increased since 2003. By the end of 2007, on average, only 30 percent of the increase was passed through to local consumers and producers (53 percent in Thailand and 11 percent in Vietnam). At first, this was largely a result of the depreciation of the dollar. Later on, especially during the 2007–08 global food crisis, governments increasingly reverted to trade policies to stem the price increase. Since mid 2010, food price inflation has resurfaced in most East Asian countries, partly driven by rice, year-on-year up 40, 25 and 7 percent in 2010 in Laos, Indonesia and Vietnam respectively, but also by meat (e.g. pork in China) and vegetable prices. The fight against food price inflation is now a priority for macro-stability.

Higher food prices provide challenges for consumers and opportunities for producers; more uncertainty hurts both. When shocks succeed each other rapidly, as food prices have done over the past 3 years, poor (net) consumers, including many in the rural areas, see their assets and savings erode, making it increasingly difficult to rebuild the necessary cushion when prices settle down again. This may put them on a downward spiral. On the other hand, higher prices benefit producers, provided price changes are transmitted to the farm gate. This has generally been the case in EAP, signaling decent domestic market integration. However, when prices today become poor predictors of prices tomorrow, i.e. when prices become amnesic, their incentivizing powers decline as farmers are increasingly uncertain whether the post harvest prices they will get will be sufficient to compensate for the input costs they have to incur now. This undermines the supply response, especially among poorer smallholders, who are less able to sustain debt burdens when prices go bust.

Raising the level and stability of food production remains the long term solution. While raising incomes of the poor and developing effective safety nets are critical to ensure individual access to adequate foods, including during crises, this presupposes an adequate and stable national and global supply, a challenge in need of more attention today. Four considerations are in play when designing national food security strategies. They should be efficient in ensuring an adequate national food supply at the lowest price (the economic perspective). This keeps labor cheap and economies competitive (food prices in effect setting the floor on wages in low income countries), thus fostering economic growth. National food security policies should also be equitable (the social perspective). They should ensure access to food by each individual, either through own production or purchase on the market. As economies develop and households specialize, the latter becomes the more important channel to ensure one’s access to food, shifting the emphasis on (income) poverty reduction, well functioning

5. It is low stocks-to-use ratios, especially those in the major exporting countries, that are the leading indicator of imminent price hikes, and not supply shocks per se (Wright, 2011). The US for example, which accounts for 55 percent of global exports of corn, presently has a domestic corn stock-to-use ratio of 5 percent, an all time low (USDA, 2011).

6. As countries isolate their markets, the world market becomes the residual, with domestic instability in effect exported to the world market (Abbott, 2010; Martin and Andersen, forthcoming). Another source of instability may come from the ongoing shift in world reliance on newer export regions (the Black Sea and Latin America), where the agro-ecological environment is less stable.

7. These included export restrictions/bans, import tariffs, and buffer stock policies.

8. Only in Cambodia and the Philippines were rice prices well contained, due to strong harvests in the former and bountiful stocks in the latter (World Bank, 2011).


markets and safety nets. In reducing poverty, (labor intensive) smallholder farming is often more effective than capital intensive commercial farming.\textsuperscript{12} Third, as the finite nature of natural resources (land and soil fertility, water, biodiversity) becomes clear, the need for more environmentally sustainable production systems in designing food security strategies increases (the environmental perspective). This requires accounting for environmental externalities from production (often resulting in higher production costs) and overcoming time lags between investment in greener production techniques and their production payoffs (especially problematic for poorer farmers). Fourth, optimal food security policies ensure a staple supply that is stable over time. This becomes increasingly challenging as climate change takes hold. Few policies do well on each of these criteria and trade-offs will have to be made. In designing sustainable country specific food security policies, acknowledging and articulating the potential trade-offs among the economic, social, environmental and security dimensions will be key. In what follows, the focus is on highlighting major entry points and concerns in boosting staple production, mainly from a South-East Asian perspective.\textsuperscript{13}

There remains substantial scope to raise production by closing the yield gap, also among smallholders, reducing post harvest loss, and adopting more environmentally sustainable production techniques. Better use of existing crop and nutrient management practices alone could increase rice yields in East Asian countries by at least 25 percent. About 15 percent of the value of the total rice crop in South East Asia could be saved through better post harvest technology (especially drying and milling).\textsuperscript{14} Irrigation efficiency (currently in the range of 46-65 percent compared with 85-90 percent in Australia and the US) could be bolstered through better water management, proper incentives and regulation. A shift from area based to volume based charges for irrigation water in the Tarim Basin in China resulted in a 17 percent decrease in water use. Just addressing poor land layout, for example, through adequate leveling and higher bunds to retain wet season water has been shown to increase yields in Cambodia by 27 percent. Over the past years, smallholder rice production has indeed gone up substantially in Cambodia,\textsuperscript{15} which now accounts for 3-4 percent of world rice trade, with its success in smallholder agriculture (as opposed to large scale estate farming) seen as an important factor in the rapid decline in poverty. Furthermore, high estimated marginal returns to fertilizer among smallholders underscore the remaining potential for profitable smallholder rice expansion in Cambodia.

This requires more investment, focused on public goods, also to expand the rice productivity frontier. An agronomic revolution focused on closing the yield gap and reducing post harvest loss, for example through a regional outreach initiative and large scale demonstration projects in a partnership between countries, the International Rice Research Institute (IRRI) and bilateral and international funding agencies, most likely provides the most powerful short to medium run intervention.\textsuperscript{16} Nonetheless, as changing climatic conditions are likely to exacerbate the many environmental challenges rice farmers already face, such as drought, salinity, flooding, heat, and cold, especially in non-core rice growing areas, even maintaining the frontier poses a considerable challenge, underscoring the need for investment in core research. This has led to the launch of the Global Rice Science Partnership (GRiSP) in November 2010. This US$ 600 million global rice breeding program over five years, brings together scientists from three CGIAR centers and focuses on the development of better drought and flood tolerant rice varieties through the use of genomics approaches. At the national level, the composition of increased spending on agriculture will be as important as its level.\textsuperscript{17} Moving support to domestic rice production away from inefficient (and probably inequitable) support to prices and input subsidies towards investment in technology, land development, and irrigation is the more efficient way forward. This will also require restoration of trust in market mediated food security (see Box).

\textsuperscript{12} Christiaensen, Demery, and Kuhl (2010). Deininger and Byerlee (2011). The existing economies of scale in cereal/rice production can usually already be captured by smallholders. However, to capture the existing economies of scale in marketing and processing (not production as such), which are large in higher value crops, more integrated entities are usually necessary, which can be facilitated through producer organizations, contract farming or commercial estate farms. In the first two institutional set ups, farmers can benefit directly from new domestic and international markets, while in the latter set up, they can benefit through the labor market.

\textsuperscript{13} China's net trading position for rice and wheat (its major staples) is not expected to change much in light of rapidly slowing population growth and fast urbanization (between 69-70% in 2025 compared with 54% in 2009). The latter goes along with a rapid shift away from rice base diets in China—annual per capita rice consumption of urban dwellers is only about one third of the rural population (70 kg per capita compared with 200 kg per capital). A prospective review of China's food security challenge, including the implications for the world, is prepared separately. For an introductory review of the key trends, see Huang, Yang and Rozelle (2010).

\textsuperscript{14} World Bank (2010).

\textsuperscript{15} Since 1994, Cambodia’s annual rice yield growth was 5.4 percent, from 1.6 ton/ha in 1994–97 to 2.3 ton/ha in 2003–08 (Yu and Fan, 2011).

\textsuperscript{16} Closing the yield gap and reducing post harvest loss occupied the first and second position in the 7-point Rice Action Plan proposed by the International Rice Research Institute and endorsed by ASEAN in 2008.

\textsuperscript{17} Keeping total expenditure on agriculture constant, a reallocation of 10 percent of subsidy expenditures to supplying public goods was found to increase agricultural per capita income by 5 percent. An increase in public spending on agriculture by 10 percent the other hand, keeping the spending composition constant, would increase per capita agricultural income only by 2 percent (Lopez and Galiano, 2007).
Box: The quest for food sovereignty.

Cheap food for all, when efficiency rules. Global food security requires that the global food supply suffices to feed everyone. Similarly, national food security requires an adequate supply of food to feed the nation. The latter could be attained by producing all the food a country consumes, which makes a country food self sufficient and presumably independent from other nations for its food, or by producing according to one’s agro-ecological comparative advantage and reliance on the world market for the remainder. Food self sufficiency may be expensive in agro-ecologically less favorable environments, while market mediated food security would (in principle) yield cheaper food, and thus higher economic growth and welfare, for all. Economic efficiency thus dictates market based food security as the better option.

But the black swans of market mediated food security instill fear. The purely economic view underplays the uncertainties involved in relying on world markets for food and thus the potential loss of control over one’s food destiny, i.e. one’s food sovereignty. In the face of low and downward trending global food prices for protracted periods of time, with investments in public goods for agriculture only paying off with a long lag, global price incentives may not suffice to induce exporting nations to invest sufficiently ahead of time. This sets the world up for a price spike. When supply starts to lag steady inelastic demand, stocks run low, and prices escalate. Because temporary export restrictions would hurt exporters’ markets in the long run, it is assumed that exporters will not lock out during these highly infrequent episodes of (perceived) low global stocks and peaking world food prices. This vastly underestimates the political nature of rice and the tension between the short term political gains from protecting domestic markets from rising world prices and long run economic losses from lost markets. Continuing one’s food exports in the face of rising world food prices, thereby in effect importing food price inflation, proves to be a politically very tenuous proposition. Eroding public investment in agriculture over time paves the way for exploding world food prices and potentially, market lock outs. These are the black swans of market mediated food security. They raise distrust in market mediated food security. In an attempt to regain food sovereignty, they also instigate a reversion back to the inefficient combination of food self sufficiency, buffer stocks and protectionist trade policies to stabilize food markets when they occur.

Coordinate regionally to overcome the prisoner’s dilemma of domestic food security policy making. As highlighted, food sovereignty and domestic price stabilization through food self-sufficiency, trade management and domestic buffer stocks can be very costly, especially in less suitable agro-ecological environments. For example, Indonesia’s rice price stabilization policy served the country well during the 2008 crisis, Indonesia being the only country in the region that didn’t see its rice prices go up. Yet, this came at a high cost with domestic rice prices in 2005-2007 on average US$232/ton above the international price. With food prices in effect setting the minimum wage rates, this increases the cost of labor, reduces competitiveness of labor intensive manufacturing, and slows down poverty reduction, as many of the (rural) poor are net rice buyers. Moreover, as the Earth warms up and weather becomes more volatile, so will domestic production, necessitating even larger domestic buffer stocks and rendering protectionist policies even more costly. The longstanding reluctance to rely more on world markets for food has further resulted in thin, quality segmented and concentrated rice markets (only 6-7 percent of global production is traded with protectionist policies even more costly. The longstanding reluctance to rely more on world markets for food has further resulted in thin, quality segmented and concentrated rice markets (only 6-7 percent of global production is traded with international rice trade by governments in both importing and exporting countries has further left little room for protectionist policies even more costly. The longstanding reluctance to rely more on world markets for food has further resulted in thin, quality segmented and concentrated rice markets (only 6-7 percent of global production is traded with international rice trade by governments in both importing and exporting countries has further left little room for efficiency gains through private sector participation. How to capture the gains from trade, while preventing black swan disruptions, is the prisoner’s dilemma of domestic food security policy making. It can only be overcome through trust building and regional coordination.

18 Taleb (2010) uses the metaphor of a black swan to describe events that are unexpected, highly unlikely to occur, but transformative when they do.

19 Timmer (2010) highlights that current food prices are often a poor guide to long-run opportunity costs, as investments in agricultural productivity only pay off in the long run. As a result, commodity prices often do not send signals with adequate incentives to decision makers, a key factor in the build up both to the 1972/3 and 2007/8 food crises. Collective neglect of agriculture by the development community during the 1990s into the mid 2000s, when food prices were low and trending downward, can be seen in the same context.

20 Stocks-to-use ratios, not supply as such, and increasingly stock-to-use ratios for the major individual exporters, are the leading indicators of price spikes (Bryan White, 2011, World Bank Lecture on Grain Price Volatility). The introduction of rice export restrictions by India and Vietnam and the resulting panic buying by the Philippines during the 2007-8 world crises are widely believed to have been a major factor in the tripling of world rice prices between October 2007 and April 2008.

21 Rice importing nations haven’t forgotten Thailand’s ban of rice exports for several months during the 1970s crisis. The announcement of similar measures in 2007 and 2008 by India and Vietnam (even though not fully enforced in practice by the former) further underscores that the fears for unexpected supply interruptions are not irrational. To be sure, it is not so much that there was a shortage of rice during the 2007/8 crisis (rice stocks were not abnormally low, even though perceived differently), or that all supplies were interrupted for long times—in 2007/8 Thailand continued its exports for example. It is the threat of this happening and of losing food sovereignty that drives countries to the more inefficient combination of food self sufficiency, trade protection and domestic buffer stocks.

22 Following the 2008 food crises, all major rice importers in ASEAN pledged to increase their food self sufficiency, the Philippines (from about 90 to 100%), Malaysia (from 65 to 90%), and even Brunei (from 7 to 20%). Indonesia which had been pursuing an increase in food self sufficiency for 25 years was food self-sufficient in rice for the first time in 2008 and again in 2009.

23 Rice exporters have traditionally been on the mainland, exploiting their river deltas with ample water and flat lands, very suitable for rice cultivation (Thailand, Vietnam), while importers have traditionally been on the islands or narrow peninsulas, with more varied landscapes, sometimes favoring corn, oil palm or coconut (Malaysia, Indonesia, Philippines) (Dave, 2008). These differences in agro-ecological conditions for rice cultivation have been consistently reflected in the trade patterns observed over the past decades.

24 Indonesia uses a mix of food self sufficiency, buffer stocks and managed trade to isolate its domestic market from the international market. For a summary of rice policies in the major ASEAN countries see World Bank (2010).
Climate proof agriculture. Climate change not only increases the frequency and severity of weather related shocks—fattening the tails in the weather distribution and making aggregate supply more volatile, but also causes gradual, long term shifts in the temperature and precipitation distributions themselves. Given the large uncertainty surrounding these shifts, especially at the local level, where action is needed, adaptation to the latter poses a particular, and much less talked about, challenge. Better tailored and accessible meteorological information about expected rainfall and seasonal temperature patterns will be at the heart of any strategy to help farmers adapt their production portfolio to a shifting and more volatile climate and to help them move towards more meteorologically based water and crop management (precision farming). The implementation challenges to broker such a shift are considerable. It also requires the development and widespread availability of flood-, heat-, and drought-resistant crops, the focus of the Global Rice Science Partnership. Weather-indexed insurance schemes, with payouts triggered if a specified weather event passes a given threshold (e.g. rainfall falls below a certain level), hold further promise to better manage weather related risks. These are currently being tested in a series of settings, with early experiments nonetheless raising concerns about potential take up and basis risk. Poorer households may for example not be willing to pay the premiums because they are credit or liquidity constrained, or because the weather pattern on their farms is different from the benchmark weather station. Lack of adoption by poorer farmers, who may need it most, has been observed in studies from India and Tanzania, as well as in other insurance markets in developed countries. Targeted subsidies may be considered, especially when insurance premiums are less costly than ex post assistance. Subsidies can also offset the fixed costs of establishing a market.

But increased and more resilient supply must go hand in hand with much better regional coordination to capture efficiency gains from trade. More efficient market based financial instruments, including future markets, could be developed to help countries maintain their fiscal balance and smooth domestic production stocks more efficiently. While providing liquidity more efficiently, these measures do however still not fully guarantee physical delivery in case of global price escalation. This has been a major reason for the continuing reluctance by major importers to rely on the rice world market to complement domestic supply and stabilize domestic prices (see box). Nonetheless, there are substantial efficiency gains from staple food trade. Capturing these will require coordinated multilateral actions to build the necessary trust among key importers and exporters. Improved information exchange on grain harvests and stocks is an important first step. Second, WTO regulations on export restrictions should be strengthened. Third, the role of buffer stocks needs to be revisited. The ASEAN+3 Emergency Rice Reserve Program provides one promising vehicle to monitor and build upon. In addition, a collective agreement for each country to hold larger domestic buffer stocks could be struck, to raise global stock-to-use ratios and reduce the likelihood of price escalations. On their own, countries would not be able to capture the positive externalities from larger domestic stocks, while bearing the full costs. These different measures, together with the emergence of new exporters (Cambodia, Myanmar), could reduce instability in the world rice market and enhance confidence of countries to complement their domestic supplies with trade. It could kick-start a virtuous circle of market thickening, which in turn would allow countries to better weather the supply shocks and shifts from climate change and to benefit from cheaper and more stable domestic rice prices, undisturbed by the occasional black swan of market mediated food security.

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26 Baez, Kronick, and Mason (2011).
27 Basis risk refers to the discrepancy in rainfall patterns between the fields of the insured and the weather stations on which the payouts are calibrated. A major USAID funded Index Insurance Innovation Initiative (I4) is examining these issues in more detailed through a series of field experiments in 8 countries (http://I4.ucdavis.edu/).
28 The thin and quality fragmented nature of the rice market has so far hindered the development of a rice future market beyond the Chicago Board Trade contract for long grain paddy. Thailand’s AFET futures contracts have not taken off.
29 Development Policy Loans with Deferred Drawdown Options (DPL-DDO) provide another option as does the creation of an Outside Guarantor Option whereby a developed country or major exporter (e.g. Thailand) guarantees delivery of a staple crop to another country at a certain price, which could be combined with a DPL-DDO to guarantee access to finance.
30 Rice stocks under this new system would increase substantially to a total of 787,000 metric tons, even though still only about 0.3 percent of the global rice trade. The price, terms and conditions of the rice distributed under the reserve would be set at the regional level, not bilaterally as before. The rice distributed under the scheme would also serve as a price stabilizer in the region, and not only for national emergencies. It could likely be made more effective by increasing its size, its reliability increased by according its management to an outside trustee and by enrolling an outsider guarantor to guarantee supply if prices exceed certain levels.
31 The large grain stocks held by the EU and the US as a consequence of its protective agricultural policies during the 1980s and 1990s have indeed contributed to market price stability, an important, but unintended side effect.
32 Cambodia is emerging as a new exporter, providing 3-4 % of global rice trade over the past couple of years. Myanmar also has the potential to generate 1 to 3 million tonnes of exportable surplus.
Literature


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