

2012-13
FULL-YEAR UPDATE

RICE BOWL INDEX



Achieving
Food Security
Robustness

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A MESSAGE FROM THE CHAIRMAN

Food security remains high on the policy agenda and governments are becoming increasingly aware that no one person or organization has all the answers needed to solve the issue. Here in Asia Pacific, rapid urbanization and changing diets are exerting tremendous strain on our ability to provide safe and nutritious food for a growing population in a sustainable way. The Rice Bowl Index recognizes that in order to meet this challenge we require productive dialogue, collaboration and action between governments, the private sector and other key stakeholders.

In October 2012, the Rice Bowl Index Advisory Board was formed to strengthen the Index and further its mission of advancing public dialogue on food security. The Board brings together many of the region's leading intellects on food security to provide strategic direction and guidance to the Index. In creating this body, Syngenta and Frontier Strategy Group—the two organizations that originally conceived and launched the Index—are reducing their day-to-day role in administering the effort and instead ceding way to an independent panel of experts. After an initial conference call in January 2013, the Board convened in May for a day-long conference to discuss the Index, its progress to-date and future direction, and initial findings for the content of this white paper.

As Chairman of the Board, I am happy to report that significant progress has been made in just over 12 months since the formal launch of the Index in May 2012. While still in its infancy, the Index is receiving growing recognition from stakeholders for its approach

to food security. In April of this year the Index was presented at the G-8 International Conference on Open Data for Agriculture in Washington DC, where it demonstrated how it uses open data to highlight the key enablers and disablers of food security. One recurring theme of the sessions at the G-8 conference was that it is not a lack of data, but instead its sheer volume and disparate nature that makes its interpretation complicated for policy makers and other stakeholders around the world. Several attendees described the Index as a 'refreshing' and 'welcome' example of a tool that distills a large volume of data into simple terms, allowing for more focus on finding solutions.

The Rice Bowl Index aggregates data into four rubrics that together comprise the overall Index: Demand and Price, Policy and Trade, Environmental Factors and Farm-Level Factors. In doing so, the Index has been able to demonstrate the importance of a balance when addressing food security: only through this balanced approach can food security endeavor to be sustainable.

In addition to reviewing and interpreting the latest results of the Index, this white paper also addresses the sometimes-contentious issue of food self-sufficiency. We encourage policymakers and other stakeholders to think in terms of food security 'robustness' and to move away from the notion that self-sufficiency inevitably implies food security. Going forward, we will continue to convey the important role of robust systems in achieving sustainable food security, able to withstand the myriad of challenges that will inevitably present themselves in the future.

A MESSAGE FROM THE CHAIRMAN CONTINUED

As we move forward the Index continues to develop and grow stronger, both in terms of its recognition amongst stakeholders and in terms of the data behind the platform. In the coming months the Board intends to incorporate climate change into the Environmental Factors rubric of the Index; with this development, the Index will better reflect the short-term impacts that climate change can have on a country's food security system. Following a year that saw drought and other extreme weather conditions take their toll on food security, not only in Asia but globally, it is important that this be reflected within the Index. This will not only allow us to visually represent the effects of short-term climactic impacts, but will also enable us to better understand how to plan for and mitigate these effects in the future.

We continually strive to strengthen the data within the platform and to seek out new areas for improvement. As we move into our second year, we hope to identify more opportunities for action amongst stakeholders, and as always, we welcome all opportunities for discussion. We believe that together we can find the solutions needed to make Asia more food secure.



Dr. Ramon Clarete
Rice Bowl Index Advisory Board Chairman

EXECUTIVE SUMMARY

The Rice Bowl Index was first released in May 2012. Over the last 14 months the Index has successfully contributed to improving the debate and dialogue around food security in the Asia Pacific, shifting discussion from being problem centric to solutions focused.

Since May 2012, food security robustness has in general improved across the Asia-Pacific Region. Of the 15 Asian countries comprising the Index, 13 showed improvement in overall food security robustness. Countries generally maintained or improved their food security robustness in 2013 relative to 2012, while the 2012 results showed weaker performance relative to 2011.

A key differentiator of the Index when compared to other indices that look at food security is that the Index assesses how robust a country's capacity is to address the challenges of food security in a sustainable manner, over time.

Following the food crisis of 2007-08 governments have tended to focus on either food self-sufficiency which seeks to meet a country's food security needs from domestic supplies or on food self-reliance which advocates both domestic production and trade as a means of improving food security. The Index clearly supports the idea that a focus on food self-sufficiency may negatively impact of the achievement of food security robustness.

Rather than food self-sufficiency, governments should aim to improve food security robustness because this refers to the ability of a country to withstand perturbations to its food security system by having a balanced capacity in: making food available; ensuring that production is sustainable; providing the necessary infrastructure and policies to support domestic production and promote trade; while managing food demand and affordability. In other words, food security and stability.

Food security robustness is present when there is balance between the four rubrics contained in the Index:

- Farm-Level Factors;
- Demand and Price;
- Policy and Trade; and
- Environmental Factors.

EXECUTIVE SUMMARY CONTINUED

It can be achieved if demand and supply can be brought into balance, people have access to safe and nutritious food, farmers have the means to be productive, innovation and private sector initiative is encouraged and the environmental prerequisites exist for long-term sustainability.

Correlation analysis of the Index results over the period 2000 – 2013 highlight the following:

- The importance of irrigation, access to information and to credit for improving Farm-Level Factor productivity across the region;
- Personal disposable income, food consumption per capita and population growth are crucial metrics that drive Demand and Price results. Higher incomes clearly lead to greater consumption of better quality and more nutritious food;
- The metrics that drive Environmental performance are not statistically significant in the short term, reinforcing the findings of 2012 that Environmental Factors while important for robustness, take time to manifest; and
- Short term political ratings, intellectual property rights and net agricultural trade are positively correlated to food security robustness, underscoring the point that trade in agricultural commodities clearly influences food security and that liberalizing trade in specific commodities, especially staple crops, helps mitigate food price increases.

Turning to the results for the past year, it is important to remember that Index results are relative, in that they represent comparisons between the entire set of countries included within the Index. This means that in absolute terms all countries may improve in a particular rubric, but the relative performance when comparing to other countries can show a decline, or underperformance. We believe this approach is best-suited to helping policymakers learn from the experiences of others, both positive and negative. This is also why the focus of the Index is not on "good" or "bad" results, but rather what can be done to improve overall performance.

EXECUTIVE SUMMARY CONTINUED

Combined Index Scores

	2012	2013	% change
Australia	53	58	9.4%
Bangladesh	28	36	28.6%
China	48	54	12.5%
India	33	31	-6.1%
Indonesia	34	37	8.8%
Japan	59	70	18.6%
South Korea	45	54	20.0%
Malaysia	40	43	7.5%
Myanmar	38	34	-10.5%
New Zealand	60	61	1.7%
Pakistan	15	18	20.0%
Philippines	30	38	26.7%
Taiwan	52	57	9.6%
Thailand	38	44	15.8%
Vietnam	40	43	7.5%

Significant improvements in overall food security robustness were seen in Bangladesh, Japan, South Korea, Pakistan and the Philippines, with slight negative shifts seen in only Myanmar and India. Changes in the Policy and Trade as well as Demand and Price rubrics were the major drivers.

The policy and trade environment across Asia Pacific became more conducive to food security robustness in the last 12 months. Substantial improvement was seen in Bangladesh, Philippines and Vietnam along with Indonesia and Malaysia. The situation in Japan and New Zealand remained unchanged, while in relative terms Pakistan, Thailand and Myanmar underperformed. It is notable that Policy and Trade emerged as a major cause of volatility in the past year in contrast to its generally benign effect over the past decade.

EXECUTIVE SUMMARY CONTINUED

Driving changes in the Demand and Price rubric have been reasonably widespread shifts in consumer price indices, changes in disposable incomes and increased energy consumption (growth in oil imports). 11 countries trended downward over the period.

Changes in the unit cost of labor drove most of the movement in Farm-Level Factor results. New Zealand, Australia and China were negatively affected by higher labor costs, while improvements in Malaysia, India, Indonesia, Pakistan, Philippines and Thailand were driven by better access to household credit. Overall farm production improved across the region.

There was negligible movement in Environmental Factors over the period.

Grouping country results into quartiles shows that across the period, the countries that perform strongly—that is, countries that can be considered robust—prove to be consistently so and while the aggregate level of robustness does change over time, the balance between the rubrics remains quite stable, delivering better results overall, over time.

The results also show that to achieve food security robustness, a country need not depend entirely on Farm-Level Factors. In fact, over-reliance on Farm-Level Factors may serve to increase volatility and variability. When agriculture is a large or dominant part of the economy and society, incremental change may not be sufficient to precipitate immediate improvements in food security robustness. The more robust a country's food security system is, the greater the capacity to recover from any system wide shocks. A robust food security system is a resilient one.

Intervention in seeking to achieve food security via self-sufficiency can have negative impacts on robustness—and it is robustness that is essential for achieving sustainable food security over the longer term. The debate needs to shift from food self-sufficiency to food security robustness, because as this year's results show, the policy and trade environment will impact robustness directly.

A robust food security regime pursues a pragmatic approach of sourcing food supplies from wherever is most advantageous to a given population in terms of cost. At parity prices between locally sourced and imported food supplies, the country becomes robustly food secure, regardless of whether it is fully or partially self-sufficient of its food requirements.

Over the next 12 months, the Rice Bowl Index Advisory Board will continue to improve and develop the Index, looking particularly at Environmental Factors, food safety and nutrition. The Index will be supported by an ongoing program of engagement with governments and other key stakeholders across the region to stimulate more informed debate around the robustness of countries food security systems, and to translate the complexity of the issues into an opportunity for action.

INTRODUCTION

Food security remains high on the policy agenda of most countries, as well as public and private entities, NGOs and in many cases the general public—an awareness that has endured since the 2007–08 food crisis. While there is near-universal consensus on the importance of food security, debate on the issue remains fragmented, problem-centric and opinion-driven. Meanwhile the dynamics of, and potential solutions to, food security are increasingly complex, and the food production landscape in Asia continues to change rapidly.

The Rice Bowl Index (RBI), developed and launched in mid-2012, is a tool designed to facilitate dialogue, collaboration and action between governments, the private sector and other key stakeholders involved in food security. It is not a measure of a country's level or status of food security, but rather assesses how robust a country's capacity is to address the challenges of food security in a sustainable manner.

The broader initiative surrounding the Index consists of three components:

Quantitative: A diagnostic platform examining key enablers and disablers of food security.

Qualitative: A series of white papers that interprets the data and identifies areas warranting increased attention.

Advisory: Representatives from the public, private, and non-profit sectors, who together comprise the Rice Bowl Index Advisory Board.

This white paper, the third in the series of such papers,¹ is issued to highlight findings from quantitative analysis of results over the last 12 months, and to provide insight intended to further inform dialogue on how to improve food security across the Asia-Pacific region.

There are some important points to bear in mind while reading this white paper:

- 1) The Index is not a measure of a country's actual state of food security. It is a measure rather of how robust the overall system involved in maintaining and improving a country's overall food security is. In this way the Index draws focus on possible areas of intervention, encouraging a dialogue focused on solutions, not symptoms.
- 2) A simple league table ranking of aggregate food security is not helpful on its own because it serves only to prompt debate around who rates well and who scores poorly, instead of identifying the steps a country can take to improve its capacity to achieve food security. An outcome far more valuable than a mere ranking is being able to answer the questions “why” and “how”, instead of simply posing the “what”.
- 3) Most ranking systems are static, point in time snapshots, when in fact food security is determined largely by dynamics that take years if not decades to evolve. Herein lies the value of the Index, in that it encompasses data over a rolling multi-year period, allowing the results to capture developments over time, reflecting shifts in markets, policy environments, productivity systems, investments and environmental outcomes, many of which are slow to manifest.

¹ The first white paper was issued on 30 May 2012 when the Index was first launched. A half-year update report for results up to the end of 2012 was issued in February 2013.

INTRODUCTION CONTINUED

A year in the life of the RBI

The Rice Bowl Index was launched in May 2012 to coincide with World Economic Forum's East Asia Summit in Bangkok.

Since its launch, the Index has been the subject of debate, discussion and analysis across Asia and around the world, highlighting the importance of genuine dialogue on food security and reflecting the valuable contribution the Index can make to the debate. A full list of engagements over the last 12 months is included in Appendix 1.

The Rice Bowl Index Advisory Board was formally convened in October 2012 and held its first face-to-face meeting in Singapore on 29 May 2013. The Advisory Board's responsibilities² are to:

- Refine, review, and challenge the Index and its findings on an ongoing basis;
- Provide insight and commentary underpinning half- and full-year reviews;
- Facilitate engagement with peers in respective fields and;
- Ensure transparency and credibility.

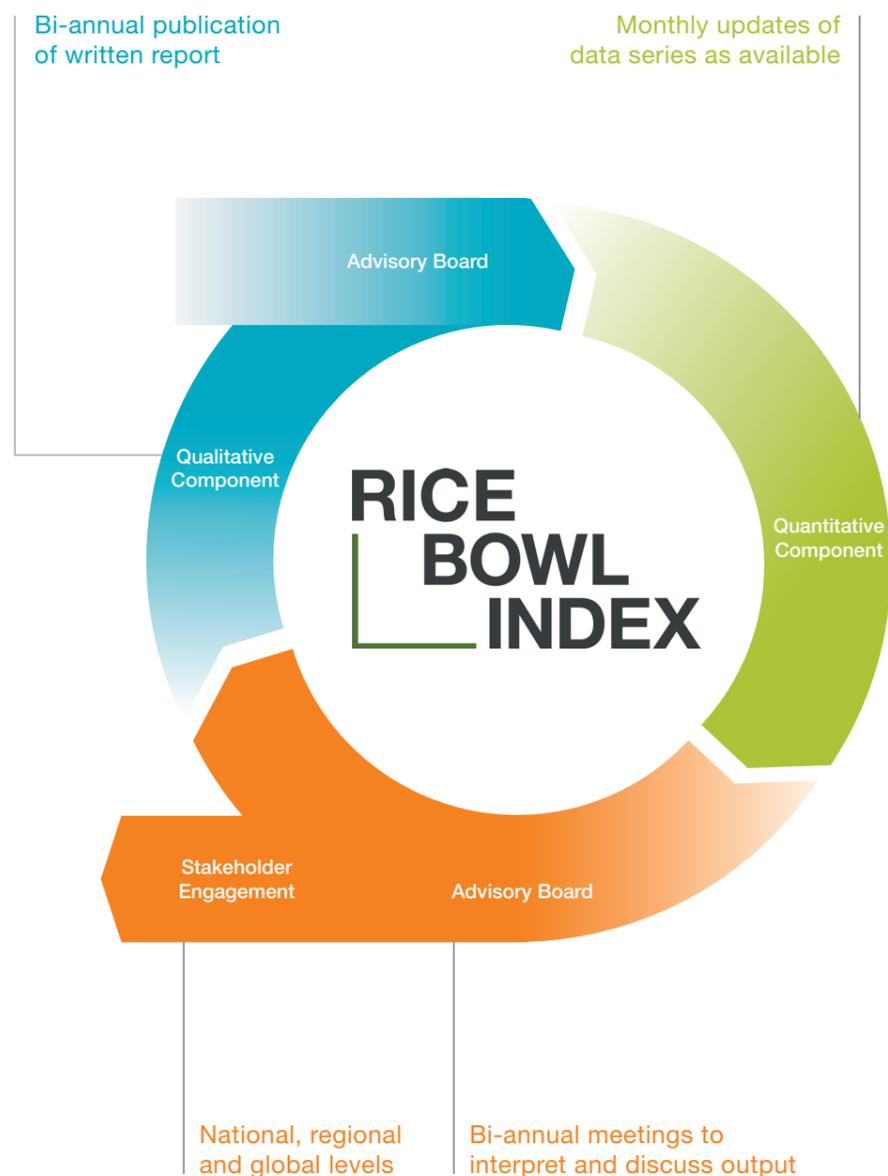
Current membership includes resource experts from the following organizations³:

- Australian Centre for International Agricultural Research
- Asia Bio Business Pte. Ltd
- Cargill Ltd
- Frontier Strategy Group.
- The Gates Foundation
- University of the Philippines
- Nestle AG
- Nanyang Technological University, Singapore
- Rabobank
- Syngenta Asia Pacific Pte. Ltd., and
- Yara International ASA

The current cycle of Index engagement and governance is reflected in the diagram overleaf. This framework has supported an extremely encouraging first year for the Index as a tool to promote dialogue and to help shift the debate around food security in Asia from problem-centric to solutions-focused.

² A copy of the Rice Bowl Index Advisory Board Terms of Reference can be downloaded from the website: www.ricebowlindex.com

³ Specific Board Member profiles can be viewed at <http://www.ricebowlindex.com/Pages/AdvisoryBoard.aspx>



THE CONCEPT OF “FOOD SECURITY ROBUSTNESS”

The Index distinguishes itself from other indices related to food security in that instead of reflecting the symptoms of the issue for a given country, it enables the diagnosis of a country's food security **robustness**: the Index helps a country to consider how capable it is of achieving and sustaining food security, rather than simply assessing whether a country is food secure or not. Or put another way food security robustness considers both food security and the stability or sustainability of that state.

The theme of food security robustness was first presented in the Index white paper of May 2012. It is discussed here in more detail to provide context and a framework by which to interpret the outcomes and implications of the Index from the last 12 months.

Food security, as defined by the Food and Agricultural Organization (FAO), “exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life.”⁴ This comprehensive definition of food security comprises dimensions of availability, access—both physical and economic—utilization, and stability, all of which are captured in the conceptual model presented in the Index white paper of May 2012. By today's understanding of food security, no country is food secure unless it can satisfy all four dimensions.

Prior to the 2007–08 financial and food crisis most nations had for several decades enjoyed access to an ample supply of affordable food, principally as a result of the Green Revolution. The increase in food prices during 2007–08 revealed that the global food system is fragile and subject to the new reality of increased connectedness and vulnerability to destabilizing factors such as weather shocks, market speculation and government policies such as decisions to temporarily halt food exports.⁵ It was in 2007–08 that instability was introduced to the food security equation.

During the 2007–08 crisis, export restrictions by a few countries ultimately precipitated significant price hikes which drove many people to become food insecure. Disruptions in the supply of food as a result of export restrictions imposed by net food exporting countries also led to reported incidents of civil unrest in some 14 countries. Civil unrest in turn may also be linked to the fact that those most affected by the high food prices are low-income groups who may spend between 50 and 70 percent of their income on food. The Asian Development Bank (ADB) estimates that in Asia, a 10 percent increase in food prices could push 64 million more people into poverty.⁶

After the 2007–08 crisis, many governments, academics and multilateral organizations advocated ways to ensure price and supply **stability** as an important means of assuring food security. These approaches have tended to fall into one of two policy camps: achieving food self-sufficiency—so-called ‘food sovereignty,’ either in total or for key selected commodities—or seeking to achieve food self-reliance, both of which are important to understand when moving to consider food security robustness:

⁴ World Food Summit 1996. Rome Declaration on World Food Security, (Rome: FAO, 1996).

⁵ Paul P.S. Teng and Maria C.S. Morales, ‘Rethinking Food Security: Robustness as a Paradigm for Stability’, RSIS Commentaries No. 111, (Singapore: RSIS, 2013), 1.

⁶ Asian Development Bank, Food Security and Poverty in Asia and the Pacific: Key Challenges and Policy Issues, (Manila: ADB, 2012), 8.

THE CONCEPT OF “FOOD SECURITY ROBUSTNESS” CONTINUED

- **Food self-sufficiency:** meeting food needs, as far as possible, from domestic supplies and minimizing dependence on international trade; Advocates diets that are simple, natural and that can be produced domestically⁷.
- **Food self-reliance:** advocates reliance on the international market for the availability of food in the domestic market; implies maintaining some level of domestic food production plus generating the capacity to import from the world market as needed. International trade is an essential component (Konandreas, 2000)

As noted by Teng and Morales (2013), when self-sufficiency is implemented to its extreme, it would mean that there are no imports at all of the designated self-sufficiency food items. Some countries, such as Indonesia and the Philippines, have proposed rice self-sufficiency policies consequent to the 2007–08 period, with these policies often difficult to justify solely on economic grounds.

Food self-reliance, on the other hand depends on the utilization of trade as a means of securing and stabilizing food supplies recognizes the opportunity costs of incremental investments to meet self-sufficiency targets. International trade is used as an instrument to supplement domestic sources for food security, as practiced by countries like Malaysia.⁸

No approach to food security ensures the total alleviation of uncertainty and vulnerability that is inherent with food supply. A self-sufficiency approach is still largely vulnerable to factors such as the volatile prices of production inputs, availability of land, labor and capital and natural disasters and hazards such as flooding

and drought. Food self-reliance and resilience are also vulnerable to the hazards faced by the various sources of food supply as well as the trade policies of partner countries. Despite the disaggregated risk through the food self-reliance approach, its success is dependent upon the capacity of the country as well as the policies and conditions of food supply sources (Teng & Morales, 2013). This approach is also dependent upon the import capacity of the country which in turn relates to the income generating goods and services that can finance food imports.⁹

Understanding both food self-sufficiency and self-reliance and given the increasing complexity of food security and the pressing challenges posed by an increasing population, rapid urbanization and climate change, there is a need for a new concept towards achieving long term sustainable food security: **food security robustness**.

Food security robustness involves four basic dimensions of food security: availability, physical access, economic access and utilization, underpinned by **stability**.¹⁰ All four dimensions contribute to assuring food security and each is in turn influenced by sets of factors, some of which may be common to those affecting other dimensions. Given the multidimensionality of food security, countries should aim for food security robustness which refers to the ability to withstand any perturbations to its food security system by having a balanced capacity in making food available, ensuring that production is sustainable, providing the necessary infrastructure and policies to support domestic production and promote trade and managing food demand and affordability. In other words, food security *and* stability.

But how can governments determine their country's ability to achieve food security robustness?

⁷ Panos Konandreas, 'Trade and food security: Options for developing countries', in Food and Agriculture Organization of the UN (FAO), Multilateral trade negotiations on agriculture: A resource manual (Rome: FAO, 2000), <http://www.fao.org/docrep/003/x7353e/x7353e10.htm>

⁸ Ibid. <http://www.fao.org/docrep/003/x7353e/x7353e10.htm>.

⁹ Alexander C. Chandra and Lucky C. Lontoh, 'Regional Food Security and Trade Policy in Southeast Asia: The Role of ASEAN', (Series on Trade and Food Security Policy Report 3, Manibato: International Institute for Sustainable Development, 2010), 3.

¹⁰ Paul Teng and Margarita Escaler, 'The Case for Urban Food Security: A Singapore Perspective', NTS Perspectives No. 4, (Singapore: RSIS Centre for Non-Traditional Security Studies, 2010), 4.

THE CONCEPT OF “FOOD SECURITY ROBUSTNESS” CONTINUED

This determination is made possible if the factors influencing the food security dimensions are translated into specific enablers and disablers that are measurable and have publicly-accessible metrics. The Rice Bowl Index is designed to do this by explicating the concept of food security robustness for a country through analysis of the set of enabling/disabling metrics grouped into four rubrics:

- Farm-Level Factors;
- Demand and Price Factors;
- Environmental Factors and;
- Policy and Trade Factors.

The Index considers robustness to be present when there is a balance between the four rubrics.¹¹ Each rubric in turn consists of a number of indicators (metrics) that address the four dimensions of food security¹²:

- **Farm-Level Factors:** These include metrics such as the availability of arable land, access to basic infrastructure such as irrigation, roads and bridges, cost of rural labor, access to information and extension services, and access to credit which helps determine the availability of food in a country. This rubric addresses the question: *Do farmers have the capability and means to be productive over the longer term?*

- **Demand and Price Factors:** This rubric focuses on the factors that influence physical and economic access to food as well as its utilization. It is comprised of metrics such as inflation (consumer price index), per capita consumption of food, personal disposable income, population, urban population and oil imports (as a proxy for food processing). *This rubric addresses the question: How are food security needs in the country likely to evolve in terms of quantity, affordability and access?*

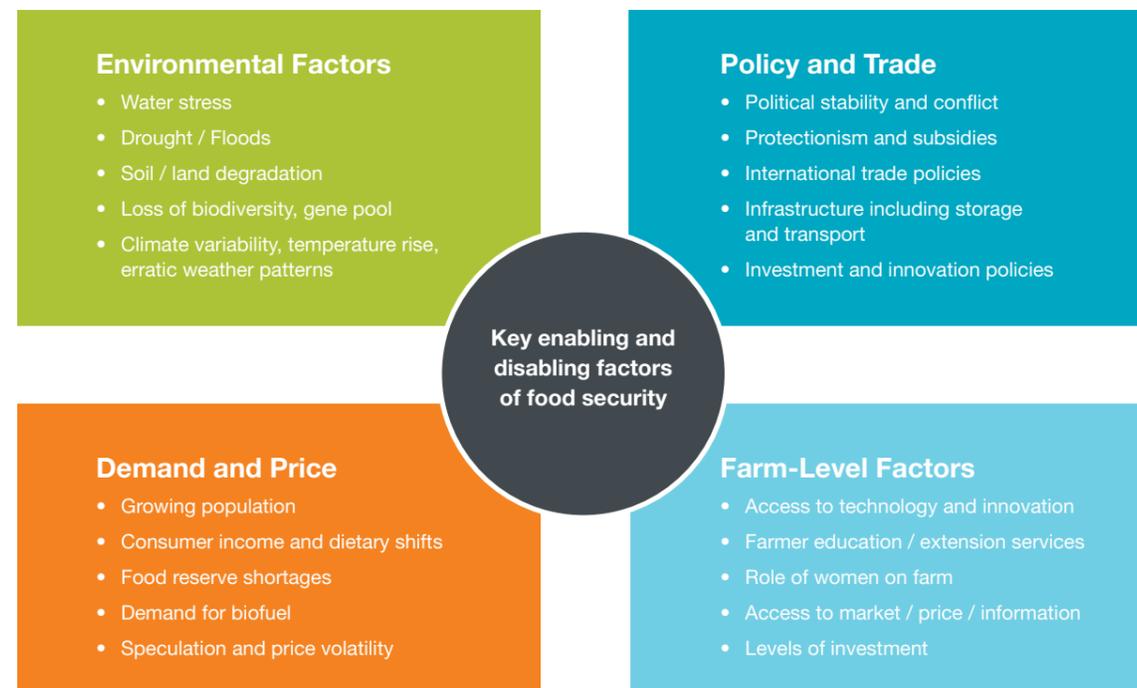
- **Environmental Factors:** Under this rubric, metrics such as total internal renewable water resources, annual change in forest area, electricity consumption and change in water quantity are considered because of their effects on sustainable agricultural productivity. This rubric addresses the question: *Does the environmental capacity in the country provide for long-term agricultural productivity and sustainability?*

- **Policy and Trade:** This rubric can be considered to gauge the stability dimension of food security as it addresses policies that influence the demand and supply of food within a country. It includes factors such as the net agricultural trade, transportation industry value, intellectual property rights, government spending, short-term political rating and the ease of doing business in the country. This rubric addresses the question: *Does the trade and policy environment encourage open markets, investment and innovation on an on-going basis?*

¹¹ Ibid, <http://www.ricebowlindex.com/Pages/Methodology.aspx>.

¹² These were originally outlined in the first RBI white paper published in May 2012.

THE CONCEPT OF “FOOD SECURITY ROBUSTNESS” CONTINUED



Food security robustness can be achieved if demand and supply can be brought into balance, people have access to safe and nutritious food, farmers have the means to be productive, innovation and private sector initiative is encouraged and the environmental prerequisites exist for long-term sustainability.¹³

Analysis of the time series data which have been identified for 15 Asian countries shows that countries that can be considered as the most robust overall—Australia, New Zealand and Japan for example — and are able to achieve a balance between the four rubrics, whereby variation in one rubric is typically offset by variation in other rubrics to maintain an overall relatively high score for robustness. Disaggregation of each country’s rubric set further allows identification of the key factors determining robustness, either positively or negatively meaning that the Index can therefore help provide a means for identifying the areas where intervention is most needed.

The results also imply that achieving food security requires the effective management of both short and long term dynamics. Moreover, this also indicates that while agricultural production and commodity prices may be highly volatile in the short term, they are also influenced by the longer term nature of policy change and the sustainability of agricultural production, reflected through various Environmental Factors.

¹³ Syngenta. (2012). Rice Bowl Index white paper: Translating Complexity into an Opportunity for Action. Available at (<http://www.ricebowlindex.com/SiteCollectionDocuments/ricebowl-whitepaper.pdf>).

WHAT CONTRIBUTES TO ROBUSTNESS?

The Index was designed to identify the factors that are crucial in attaining food security robustness, i.e. the capacity to withstand any destabilizing factors to food security by having a balanced capacity in making food available. Correlation analysis was used on the 2000 – 2012 data to determine the relationship of the indicators with the aggregate food security robustness scores of the Asian countries in the series. Only indicators or metrics that are significant at the five percent level are presented in this analysis.

At the Macro Level

Considering the four rubrics which comprise the Index, correlation analysis establishes that three were found to be positively correlated to the food security robustness levels of the countries in the series viz:-, Demand and Price Factors, Farm-Level Factors and Environmental Factors.

	Overall	Farm-Level	Demand and Price	Environmental	Policy and Trade
Overall	1				
Farm-Level	0.393257	1			
Demand & rice	0.808834	0.271828	1		
Environmental	0.128726	0.767721	0.146521	1	
Policy & Trade	-0.00111	0.618482	0.069895	0.739707	1

TABLE 1: CORRELATION ANALYSIS OF THE FOUR RUBRICS ACROSS ALL COUNTRIES. VALUES PRESENTED ARE CORRELATION COEFFICIENTS.

Among the three rubrics with positive correlation, the rubric with the strongest significant correlation to overall food security robustness is Demand and Price. This implies (perhaps as expected) that key metrics such as population growth, income levels, prices and urbanization are strong influencers on food security robustness in most countries. It also reflects the volatile nature of commodity prices and underlines that their impact is felt immediately compared to other rubrics such as Policy and Trade and Environmental Factors.

The analysis of the Index output shows that 12 of the 15 countries currently included in the Index were strongly influenced by Demand and Price factors. Specifically, these are Australia, Bangladesh, China, Indonesia, Malaysia, Myanmar, New Zealand, Pakistan, South Korea, Taiwan, Thailand and Vietnam. This is consistent with literature that states food security in these countries is influenced by their growing populations, increasing incomes and rapid urbanization. Several of these countries are also very dependent upon trade within their food systems (either export or import) and hence susceptible to immediate variations in either (or both) demand for and price of food.

WHAT CONTRIBUTES TO ROBUSTNESS? CONTINUED

The remaining three countries in the Index (India, Japan and the Philippines) have been shown to be strongly affected by the Farm-Level Factors of arable land, labor costs, irrigation and access to information. A closer look at these countries establishes that they are rich in natural resources (e.g. land, labor). At the same time, these countries impose trade barriers (i.e. quantitative restrictions) on certain commodities such as rice. India and Japan have high farm input subsidies while the Philippines provides price support to its rice farmers.¹⁴ This suggests that market interventions can directly affect a particular rubric in one direction, but it can also result in adverse (or perverse) impacts on other rubrics (in this case a dependence on Farm-Level Factors which can be very susceptible to climatic shocks which are beyond any government's control), reinforcing the interconnected nature of food security robustness and the need for a comprehensive approach to its achievement.

At the Factor-Rubric Specific Level

In order to determine possible areas for intervention when considering the Index results for the last 12 months, an analysis of the different metrics in each rubric, and their relationship to overall food security robustness has been undertaken.

Farm-Level Factors

Among the nine indicators currently contributing to Farm-Level Factors, metrics such as mobile phone subscription (as a proxy for access to information), roads and bridges network, short-term household credit (as a proxy for access to credit) and irrigation were statistically significant.¹⁵ The results of the correlation analysis highlight the importance of irrigation in particular for contributing to food security robustness. Similarly, access to information is a crucial factor for improving productivity. Both metrics have a positive correlation to food security robustness.

Roads and bridges infrastructure registered a negative but weak correlation to food security despite its potential benefits of improving market access for farmers. The World Bank highlighted in its 2008 World Development Report that efficient road networks were crucial for decreasing marketing costs for the farmers.¹⁶ At the same time, the availability of such infrastructure also improves their access to low cost production inputs. This can be attributed to the fact that the impact of such structures may take time and that data is not readily available.

¹⁴ See Acharya, 2009 (for India), Yamashita, 2006 (for Japan) and Cororaton, 2008 (for the Philippines).

¹⁵ All references to statistical significance refer to the p-value significant at 5%

¹⁶ World Bank, World Development Report 2008: Agriculture for Development, (Washington, D.C.: World Bank, 2008): 119.

WHAT CONTRIBUTES TO ROBUSTNESS? CONTINUED

The same result was obtained for short-term household credit. Access to credit is an important factor for increasing overall production. However, in most countries currently part of the Index, credit systems especially for the rural sector are limited and procedures for borrowing are complex (e.g. China, Myanmar, Philippines).

	Overall	Labor	Mobile	Roads & Bridges	ST HH Credit	Arable Land	Irrigation	Adult Literacy	Cereal Yield	Rural Electrification
Overall	1									
Labor	0.6892	1								
Mobile	0.410045	0.11217	1							
Roads & Bridges	-0.16245	-0.2431	-0.24423	1						
ST HH Credit	0.183973	0.196348	-0.24423	-0.20007	1					
Arable Land	0.812519	0.344827	0.36581	0.028094	0.205604	1				
Irrigation	0.679889	0.231379	0.185448	-0.05476	0.07547	0.914659	1			
Adult Literacy	0.730152	0.231379	0.213847	-0.06168	0.104401	0.534358	0.488908	1		
Cereal Yield	0.184	0.044931	-0.25803	-0.1749	-0.00872	0.012092	0.179743	0.052063	1	
Rural Electrification	6.17E-16	3.38E-16	5.62E-16	-4E-17	-2.8E-17	4.69E-16	1.54E-16	-4.4E-17	0	1

TABLE 2: CORRELATION ANALYSIS FOR FARM-LEVEL FACTORS ACROSS ALL INDEX COUNTRIES. VALUES PRESENTED ARE CORRELATION CO-EFFICIENTS.

WHAT CONTRIBUTES TO ROBUSTNESS? CONTINUED

Country Case: India

In the case of India, the availability of arable land, irrigation, access to information and labor are positively correlated to its food security robustness. The result affirms the findings of several studies on the contribution of irrigation, labor and access to information to India's agricultural productivity.¹⁷

The results also show that roads and bridges infrastructure has a negative correlation to food security robustness in India. This may be attributed to inefficiencies in infrastructure and distribution systems as documented by Acharya (2009). The author highlights in his analysis of Indian food security that the reduction of hunger is dependent upon the expansion of the network of the public distribution system as well as its road networks.¹⁸

Despite the positive correlation of arable land, irrigation, adult literacy and cereal yield to food security robustness, the metrics were not statistically significant. This is largely attributed to the availability of data and definition or scope of these indicators.

	Overall	Unit Labor Cost	Mobile Phone	Roads & Bridges Infra	Arable Land	Irrigation	Adult Literacy	Cereal Yield	Rural Electrification
Overall	1								
Unit Labor Cost	0.658573	1							
Mobile Phone	-0.58714	-0.17527	1						
Roads & Bridges Infra	-0.89708	-0.37503	0.805948	1					
Arable Land	0.825411	0.468889	-0.40703	-0.7681	1				
Irrigation	0.825411	0.468889	-0.40703	-0.7681	1	1			
Adult Literacy	0.693869	0.308768	-0.37469	-0.63487	0.533863	0.533863	1		
Cereal Yield	0.391583	-0.01587	-0.06769	-0.31626	0.5131	0.5131	0.217231	1	
Rural Electrification	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	1

TABLE 3: CORRELATION ANALYSIS FOR FARM-LEVEL FACTORS, INDIA. VALUES PRESENTED ARE CORRELATION COEFFICIENTS.

¹⁷ See Darshini, 2012, Kannan and Sundaram, 2011 and Acharya, 2009.

¹⁸ Shabd S. Acharya, 'Food Security and Indian Agriculture: Policies, Production Performance and Marketing Environment', Agricultural Economics Research Review 22 (2009): 5.

WHAT CONTRIBUTES TO ROBUSTNESS? CONTINUED

Demand and Price Factors

Under this rubric, correlation analysis confirms that personal disposable income, food consumption per capita, population and oil imports (as a proxy for processing demand) are crucial metrics in determining food security robustness. This finding supports the current literature on indicators that influence physical and economic access to food. From the consumer's perspective, particularly in the case of low income countries, a higher income leads to greater consumption of better quality and more nutritious food. This is because improved incomes can lead to a shift in diets, because as incomes improve, consumers are likely to consume more protein (meat) and a wider array of better quality vegetables, moving away from lower priced staples such as rice. At the same time, population growth will result in greater demand for food in an absolute sense.

	Overall	Personal Disp Income	Food Cons'n Per Capita	Population	CPI	Urban Pop	Oil Imports	Meat Cons'n
Overall	1							
Personal Disp. Income	0.564593	1						
Food Cons'n Per Capita	0.183909	0.51562	1					
Population	0.243038	-0.3019	-0.52804	1				
CPI	0.797289	0.234019	0.081226	0.219265	1			
Urban Pop	0.548955	0.40511	0.164155	-0.06912	0.394527	1		
Oil Imports	0.675955	0.491857	-0.00356	0.37295	0.437964	0.138224	1	
Meat Cons'n	0.068761	0.030488	-0.00789	-0.04544	-0.30822	-0.24397	-0.1494	1

TABLE 4: CORRELATION ANALYSIS FOR DEMAND AND PRICE FACTORS. VALUES PRESENTED ARE CORRELATION COEFFICIENTS.

WHAT CONTRIBUTES TO ROBUSTNESS? CONTINUED

Country Case: Bangladesh

Bangladesh is one example that explicates the influence of demand on food supplies. Given that it has a growing urban population, maintaining stable prices of food is a crucial factor as well. Results showed that indicators such as urban population, consumer price index (CPI) and meat consumption are the drivers of demand for food. In particular, food prices, urbanization and meat consumption are positively correlated to food security robustness.

	Overall	Pop	CPI	Urban Pop	Meat Consumption
Overall	1				
Population	0.025773	1			
CPI	0.157128*	0.030874	1		
Urban Pop	0.470415*	-0.32689	0.192465	1	
Meat Consumption	0.208291*	-0.07384	-0.66753	-0.32427	1

Note: * indicates that p-value is <0.05

TABLE 5: CORRELATION ANALYSIS OF DEMAND AND PRICE FACTORS, BANGLADESH. VALUES PRESENTED ARE CORRELATION COEFFICIENTS.

WHAT CONTRIBUTES TO ROBUSTNESS? CONTINUED

Environmental Factors

A closer analysis of the Environmental Factors rubric revealed that the four metrics chosen for the Index are not statistically significant over the 12 month period. This supports the previous findings of the Index that the impact of such metrics take time to manifest.

	Overall	Electricity Consumption	Total Renewable Water Resources	Forest Area	Water Quantity
Overall	1				
Electricity Consumption	0.237915	1			
Total Internal Water Resources	0.612584	-0.31976	1		
Forest Area	0.950375	0.088964	0.475617	1	
Water Quantity	N.A.	N.A.	N.A.	N.A.	1

Note: * indicates that p-value is <0.05

TABLE 6: CORRELATION ANALYSIS FOR ENVIRONMENTAL FACTORS. VALUES PRESENTED ARE CORRELATION COEFFICIENTS.

At the country level, metrics chosen for the Environmental Factors were also found to be statistically insignificant. This may be attributed to the availability and accuracy of environmental related data, which in itself should serve as a point for possible policy focus – how do we ensure that adequate environmental performance data is available to help guide policy thinking and decision making? Based on the results of the analysis, there is a need to review the metrics currently used for this rubric and in all likelihood this review will lead to the selection of more relevant indicators (e.g. precipitation levels, frequency and magnitude of extreme weather events). This result is considered in more detail in later discussion.

WHAT CONTRIBUTES TO ROBUSTNESS? CONTINUED

Policy and Trade Factors

Among the six metrics for this rubric, four are statistically significant: short-term political rating, intellectual property rights (IPR), net agricultural trade and ease of doing business rankings. Short-term political rating, IPR and net agricultural trade registered positive correlations with food security robustness.

	Overall	ST Pol Rate	Transport Infra	IPR	Net Trade	Govt Spending	DB Rank
Overall	1						
ST Pol Rate	0.619663*	1					
Transport Infra	-0.16751	0.33556	1				
IPR	0.402183*	-0.19314	-0.25436	1			
Net Trade	0.408473*	0.534914	0.152507	-0.57658	1		
Govt Spending	0.357991	-0.22319	-0.56497	0.490986	-0.23945	1	
DB Rank	-0.558*	-0.00741	0.201617	-0.6695	0.211025	-0.42029	1

Note: * indicates that p-value is <0.05

TABLE 7: CORRELATION ANALYSIS FOR POLICY AND TRADE FACTORS. VALUES PRESENTED ARE CORRELATION COEFFICIENTS.

The results of the correlation underscore the important point that trade in agricultural commodities clearly influences food security and that liberalizing trade in specific commodities, especially staple crops, helps mitigate food price increases.¹⁹ In addition, the positive correlation of intellectual property rights to food security robustness affirms the importance of agricultural R&D and technology in helping to improve outcomes.

The negative correlation obtained for the Ease of Doing Business metric may seem counterintuitive since we would normally expect that the easier it is to do business in a country, the more supportive this would be for system robustness. A possible explanation is that as a country's ease of doing business ranking improves, the benefits accrue to the wider economy as investment and innovation occurs in sectors outside of agriculture and food production. Furthermore as business conditions improve and as the economy grows, the overall contribution of agriculture to GDP actually declines in relative terms.

¹⁹ Martine Rutten, Lindsay Shutes and Gerdien Meijerink, 'Sit down at the ball game: How trade barriers make the world less food secure', Food Policy 38, (2013): 9.

WHAT CONTRIBUTES TO ROBUSTNESS? CONTINUED

Country Case: Vietnam

Looking at the 15 countries included in the Index, each has a unique indicator under the Policy and Trade Factors that influences its level of food security robustness. In the case of Vietnam, net agricultural trade is a crucial metric that influences its food security robustness. It is a net exporter of agricultural commodities and this is supported by the data. Specifically, net agricultural trade has a positive correlation with food security robustness and hence open markets and the capacity to trade is crucial for Vietnam.

	Overall	ST Pol Rate	Transport	IPR	Net Agri Trade	DB Rank
Overall	1					
ST Pol Rate	-0.01559	1				
Transport	0.572231	-0.46863	1			
IPR	-0.36795	-0.23972	-0.171	1		
Net Agri Trade	0.578392*	0.48605	0.174372	-0.76683	1	
DB Rank	0.111755	-0.11169	0.079157	0.054548	-0.20283	1

Note: * indicates that p-value is <0.05

TABLE 8: CORRELATION ANALYSIS FOR POLICY AND TRADE FACTORS, VIETNAM. VALUES PRESENTED ARE CORRELATION COEFFICIENTS.

INDEX RESULTS FROM 2012-13

In considering the results of the last 12 months, the Index uses as its anchor point the notion of *food security robustness*. This chapter provides an update on the results for the 15 Asian countries included in the Index; the countries have been grouped by into quartiles, with the top quartile countries showing the most consistently high scores for food security robustness over the period 2000–2013.

It is important to note that the results here are relative, in that they represent comparisons between the entire set of countries included in the Index. This means that in absolute terms all countries may improve in a particular rubric, but the relative performance when comparing to other countries can show a decline, or underperformance. We believe this approach is best-suited to helping policymakers learn from the experiences of others, both positive and negative. This is also why the focus of the Index is not on “good” or “bad” results, but rather what can be done to improve overall performance.

General Observations

Since the first Index white paper was published at the end of May 2012, food security robustness has in general improved across the Asia-Pacific Region. Of the 15 Asian countries comprising the Index, 13 showed improvement in overall food security robustness. These results are shown in Table 9.

INDEX RESULTS FROM 2012-13 CONTINUED

Combined Index Scores

	2012	2013	% change
Australia	53	58	9.4%
Bangladesh	28	36	28.6%
China	48	54	12.5%
India	33	31	-6.1%
Indonesia	34	37	8.8%
Japan	59	70	18.6%
South Korea	45	54	20.0%
Malaysia	40	43	7.5%
Myanmar	38	34	-10.5%
New Zealand	60	61	1.7%
Pakistan	15	18	20.0%
Philippines	30	38	26.7%
Taiwan	52	57	9.6%
Thailand	38	44	15.8%
Vietnam	40	43	7.5%

TABLE 9: SHIFTS IN INDEX AGGREGATE SCORES FROM MAY 2012 TO JUNE 2013

INDEX RESULTS FROM 2012-13 CONTINUED

In many countries, the shifts in overall robustness were marginal, although specific metrics in some cases did show relatively higher shifts that were then offset by shifts in other metrics. These results are shown in Table 10. Over the 12 month period we observed significant movement in three of the four rubrics—Policy and Trade, Demand and Price, and Farm-Level Factors—while the impact of Environmental Factors is, not surprisingly, is likely to manifest over a longer period.

May 2012 - June 2013 shifts in RBI scores by rubric by country

	Demand and Price	Farm-Level Factors	Environmental Factors	Policy and Trade
Australia	-2%	-16%	0%	9%
Bangladesh	-18%	0%	0%	214%
China	-2%	-2%	0%	13%
India	-28%	13%	0%	11%
Indonesia	-6%	13%	0%	50%
Japan	-3%	0%	0%	1%
South Korea	2%	0%	0%	9%
Malaysia	-5%	19%	0%	22%
Myanmar	-32%	0%	0%	>
New Zealand	0%	-26%	0%	2%
Pakistan	18%	12%	0%	-30%
Philippines	-6%	7%	0%	144%
Taiwan	-7%	-7%	0%	27%
Thailand	-2%	3%	0%	-2%
Vietnam	0%	0%	0%	100%

TABLE 10: SHIFTS IN INDEX RUBRIC SCORES FROM MAY 2012 TO JUNE 2013

INDEX RESULTS FROM 2012-13 CONTINUED

Policy and Trade, was the most volatile rubric over the period, with the balance of movement being positive — in other words, the policy and trade environment across Asia Pacific became more conducive to food security robustness in the last 12 months. Substantial improvement was seen in Bangladesh, Philippines and Vietnam while Indonesia, Malaysia and Taiwan were also very positive. The situation in Japan and New Zealand remained unchanged, while in relative terms Pakistan, Thailand and Myanmar underperformed.

The large improvement in Bangladesh's Policy and Trade rubric was attributable to the maintenance of political stability, improvements in the ease of doing business, and a positive shift in government spending. The Philippines maintained its improved values in political stability and ease of doing business, while also increasing overall government spending and investing in transport infrastructure. Vietnam's improvement comes on the back of increased government spending and transport infrastructure investment.

Pakistan and Myanmar posted weaker results partly because other countries posted more significant improvements in this rubric; as such, Pakistan and Myanmar underperformed relative to the other countries in the Index. Thailand's relatively poor performance was due primarily to a weaker result in the 'ease of doing business' metric.

When comparing findings of the past year with the longer-term time series analysis using data for 2000–2015, it is notable that Policy and Trade emerged as a major cause of volatility in the past year in contrast to its generally benign effect over the past decade. This outcome highlights the importance of taking both

short and long term views of a country's food security robustness, as in the longer term, other rubrics could also be key to sustaining robustness.

Demand and Price volatility is driven by many of its constituent indicators tracking changes over very short intervals, some on a daily basis. The main drivers of change over the last 12 months have been a shift in consumer price indices, changes in personal disposable income (often linked to changes in the CPI) and growth in oil imports (included in the Index to gauge countries' reliance on external sources of energy). 11 countries trended downwards over the period, two showed no discernible change (New Zealand, Vietnam) and two showed increases (Pakistan, South Korea).

Pakistan experienced a relatively large decline in its CPI in contrast to Australia, Indonesia, Malaysia and Myanmar which increased. Personal disposable income increased noticeably in Australia, China, South Korea, Malaysia, Philippines and Taiwan, which is likely to have contributed to increases in demand for food, observed in each of these countries except Australia.

Farm-Level Factor results have, in the last 12 months, been affected mostly by changes in the unit costs of labor, a key farm input. Three developed countries—New Zealand, Australia, and Taiwan—as well as China were negatively affected by higher labor costs.

Improvements in Malaysia, India, Indonesia, Pakistan, Philippines and Thailand were driven by better access to household credit, while all countries in the Index benefitted from improvements in cereal yield (as a proxy for overall farm production).

INDEX RESULTS FROM 2012-13 CONTINUED

Environmental Factors showed little if any variation over the period, reflecting the longer term nature of environmental outcomes on food security robustness. The indicators included in this rubric measure long-term dynamics and/or attributes that do not change at a rapid pace—for example, ‘total internal renewable water resources (per-capita)’.

Assessment by Quartile

Countries generally maintained or improved their food security robustness in 2013 relative to 2012, while the 2012 results showed weaker performance relative to 2011. Figure 1 below shows the dispersion of annual results across all countries for the 15 years from 2000–2015, and reinforces the point that there is a wide variation in the robustness of countries capacity to achieve food security.

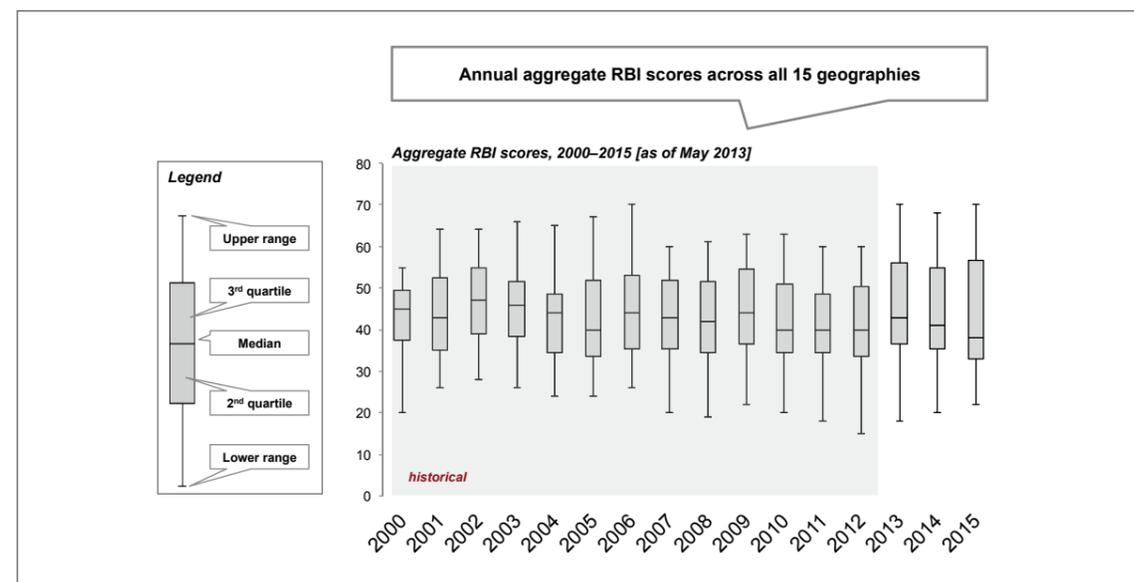


FIGURE 1: SPREAD OF AGGREGATE RBI RESULTS ACROSS ALL COUNTRIES 2000-2015

INDEX RESULTS FROM 2012-13 CONTINUED

In the 15 year period currently covered by the RBI there was variation of some 30 – 50 percentage points in any given year. Given this wide variation we have for ease of analysis and discussion grouped findings into quartile groups.

4th Quartile Assessment and Review

Across the period, countries that perform strongly – that is can be considered robust, prove to be consistently so, suggesting that achieving food security robustness also helps deliver food security stability. Figure 2a shows that Australia, Japan, New Zealand and Taiwan have consistently achieved results which place them in the 4th quartile.

Each of these countries is dependent upon trade and there would appear to be some similarity in results movements as a reflection of this – generally they tend to trend in the same direction over time. It is also worth noting that while the aggregate level of robustness does change over time, the balance between the rubrics remains quite stable, delivering better results overall, over time.

The results also show that to achieve food security robustness, a country need not depend entirely on Farm-Level Factors. In fact over reliance on Farm-Level Factors may serve to increase volatility and variability as seen in some of the lower quartile results discussed below.

Turning specifically to the results of the last year, shown in Figure 2b, Australia experienced a mid-year dip in food security robustness before recovering some ground in the first half of 2013. The decline observed in December 2012 is explained through growth unit labor costs which had a negative impact on farm productivity. In 2013, this has been offset by improvements in short term political stability²⁰ delivering a stronger Policy and Trade rubric score.

New Zealand, while firmly in the top quartile, saw its 2013 score decline gradually over three periods, attributable to a rise in the country’s unit labor cost growth, which like Australia, reduced the score for Farm-Level Factors.

The forecast results for Japan are also interesting with quite a sharp rise in the last 12 months. We believe this reflects Shinzō Abe’s Liberal Democratic Party having a more clearly-articulated agricultural policy agenda, along with increased budget allocations to the agricultural sector to support productivity growth, improved export performance and rural restructuring.

²⁰ This may seem counter-intuitive given the current political climate in Australia at the time of writing (July 2013) – but in fact when one considers leadership issues have been resolved and election dates are set, business may be able to ascertain a general direction within the political landscape which was previously absent.

INDEX RESULTS FROM 2012-13 CONTINUED

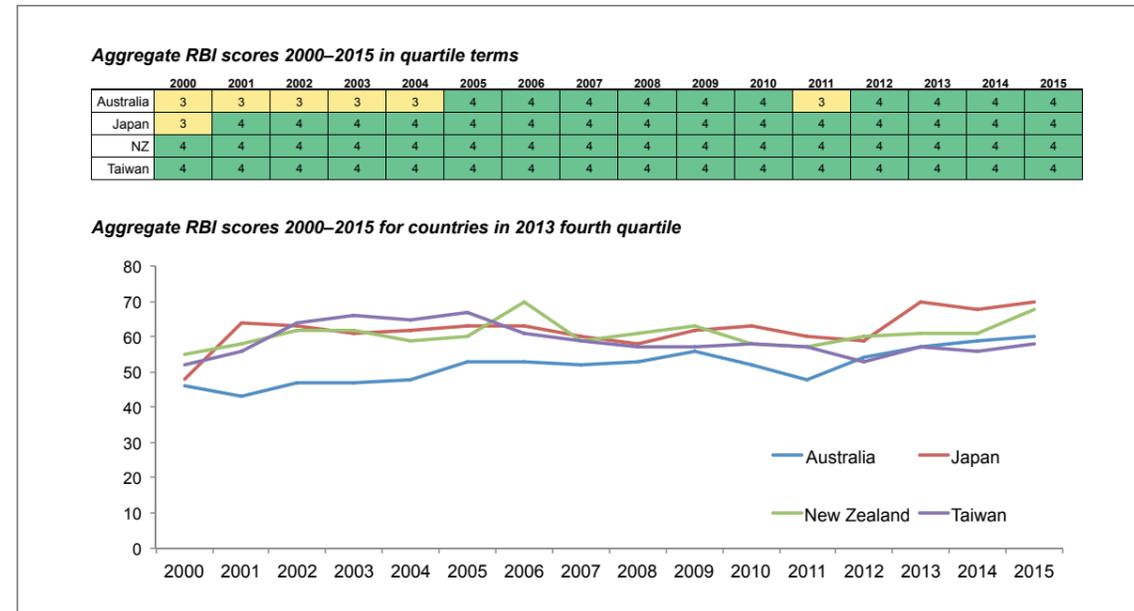


FIGURE 2A: TOP QUARTILE RESULTS FOR FOOD SECURITY ROBUSTNESS 2000-2015

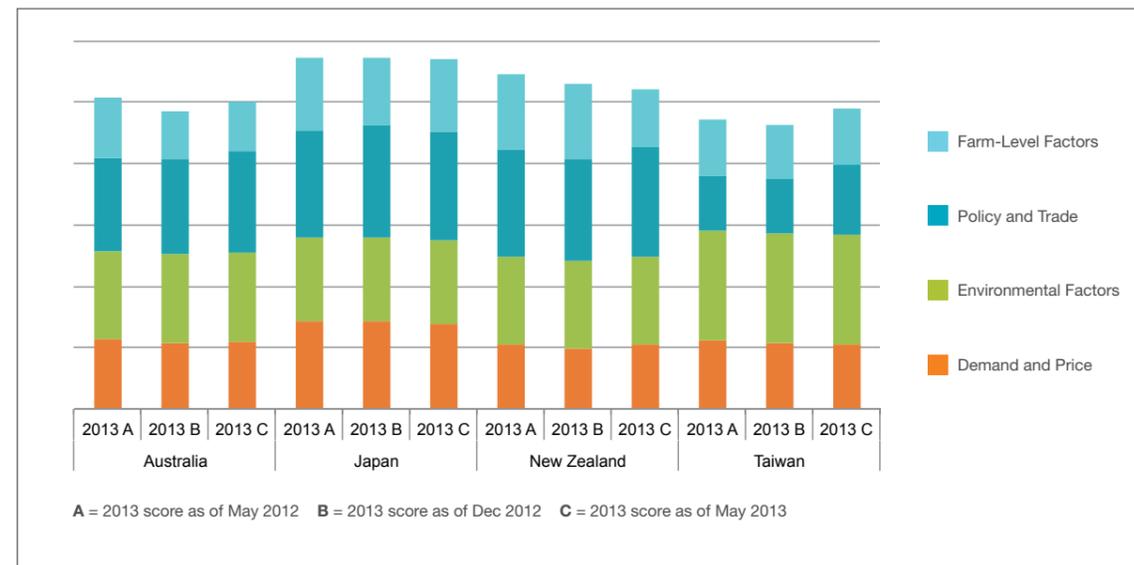


FIGURE 2B: 2013 TOP QUARTILE WITHIN-YEAR TRENDS

INDEX RESULTS FROM 2012-13 CONTINUED

Third Quartile Assessment and Review

Countries represented in the third quartile show greater variation both in aggregate and within rubrics as shown in Figure 3a below. Later in the assessment period there appears to be a greater correlation between results, indicative of a tendency to move in similar directions albeit at different absolute levels. This could in part reflect the increasingly interconnected nature of markets and other key determinants of food security. There also appears to be some lag effects across all countries, with the impacts of the food price crisis in 2007–08 extending forward into early 2010.

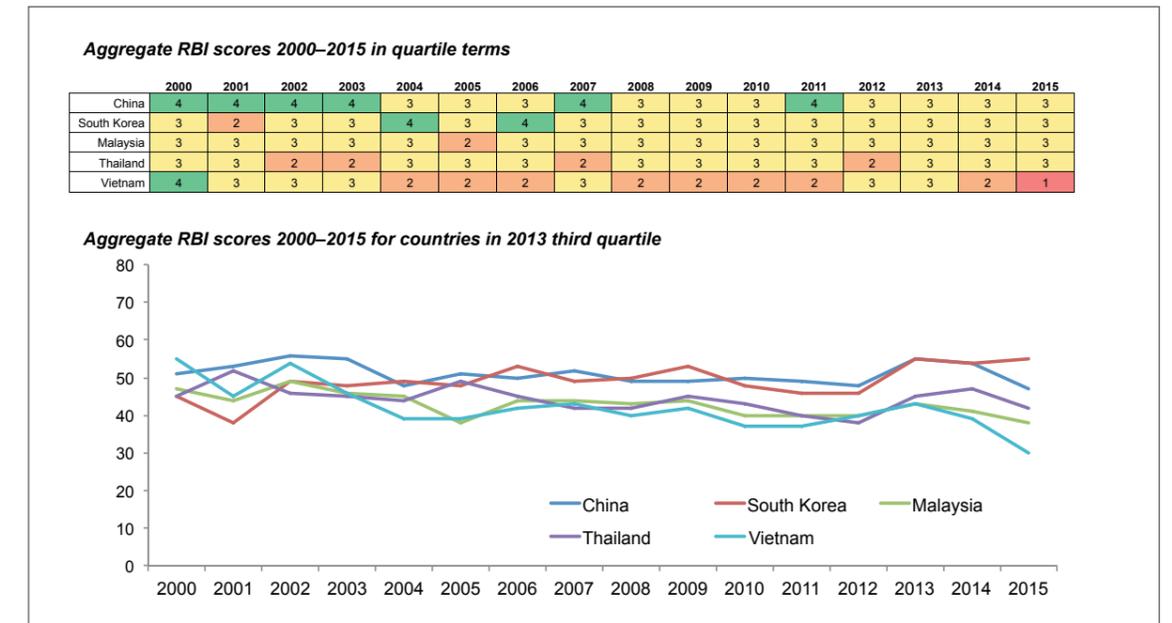


FIGURE 3A: THIRD QUARTILE RESULTS FOR FOOD SECURITY ROBUSTNESS 2000-2015

INDEX RESULTS FROM 2012-13 CONTINUED

Since May 2012 Vietnam has experienced a significant improvement in its Policy and Trade rubric, with the country's short-term political stability almost on par with that of South Korea. Malaysia's improving Farm-Level Factors can be attributed to a more modest rate of increase in unit labor costs in 2013. Third quartile countries generally experienced a greater fluctuation in the same year across all four rubrics than countries in the top quartile, but it is worth noting that Farm-Level Factors provided only a relatively small contribution to aggregate scores across the most recent 12 months, underlining the importance of a holistic approach to improving robustness.

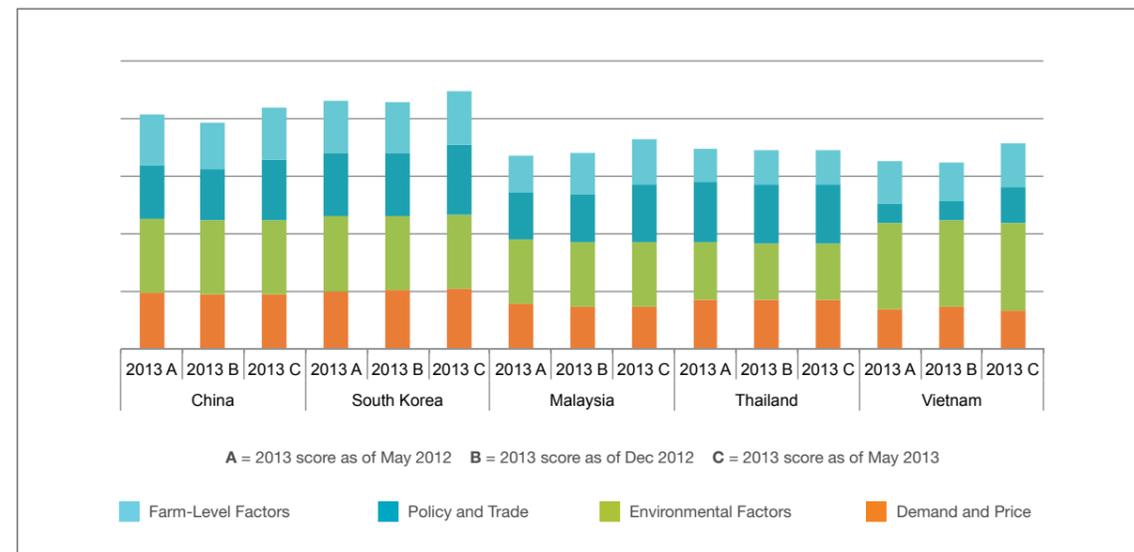


FIGURE 3B: 2013 THIRD QUARTILE WITHIN-YEAR TRENDS

INDEX RESULTS FROM 2012-13 CONTINUED

Second Quartile Assessment and Review

Figure 4a shows Indonesia's recent improvement in its food security robustness, which is likely a reflection of stability in both its economy and its political system. The Philippines has experienced greater fluctuation across the review period, while both tend to score poorly in the realm of Policy and Trade. Improvements in this rubric tend to lag improvements in Farm-Level Factors and Demand and Price—suggesting that change is more difficult to enact and sustain in countries where agriculture accounts for an outsized share of the overall economy. When agriculture is a large or even dominant part of the economy and society, incremental change may not be sufficient to precipitate immediate improvements in food security robustness.

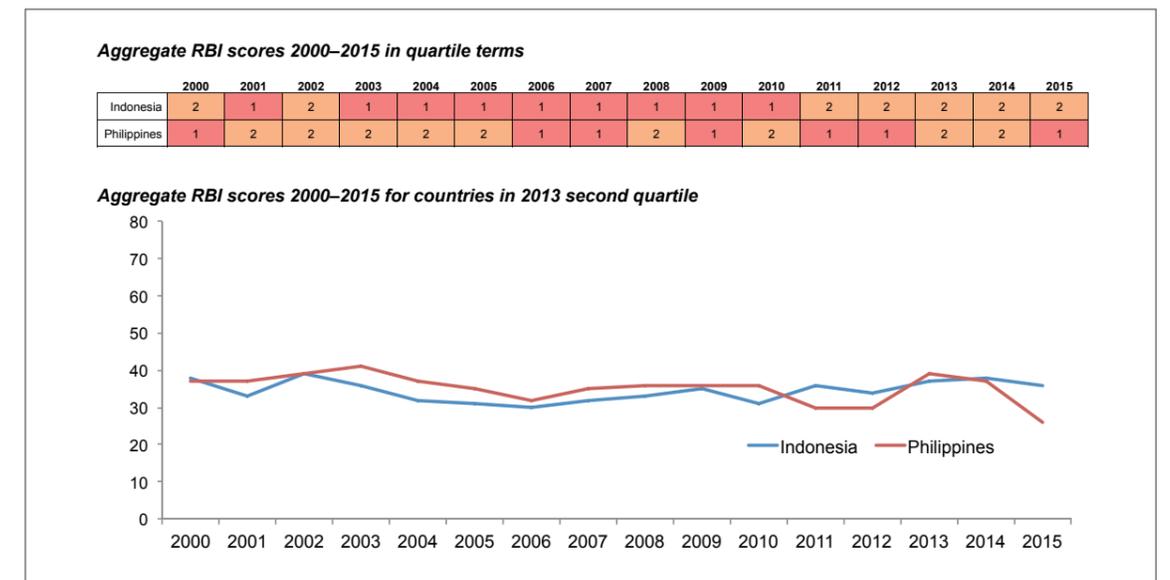


FIGURE 4A: SECOND QUARTILE COUNTRIES FOR FOOD SECURITY ROBUSTNESS 2000-2015

INDEX RESULTS FROM 2012-13 CONTINUED

In the last 12 months, improvements in the Philippines have predominantly been in the Policy and Trade arena, driven largely by improved intellectual property rights protection. Indonesia's results strengthened due to its Policy and Trade result, driven by continuing improvements in short-term political stability which has more than doubled since 2007 (Figure 4b).

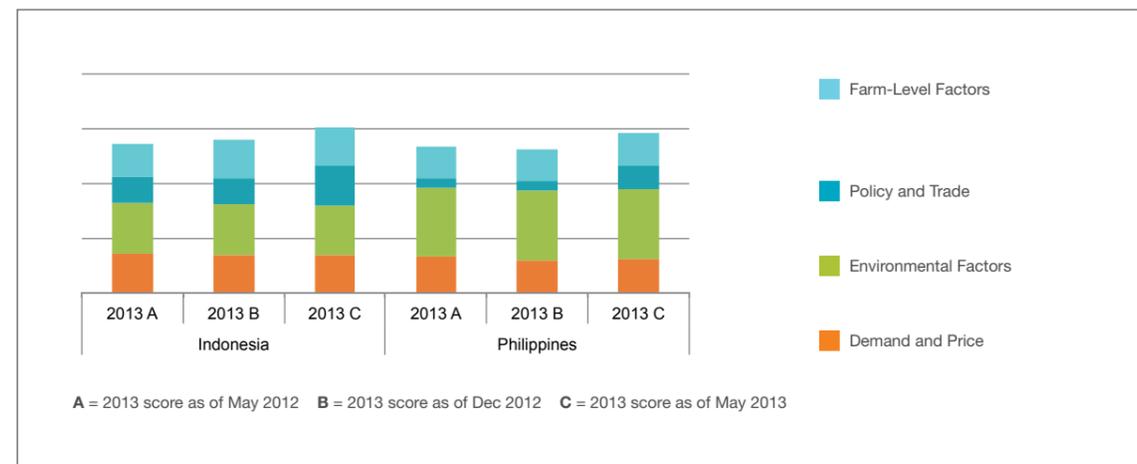


FIGURE 4B: 2013 SECOND QUARTILE WITHIN-YEAR TRENDS

INDEX RESULTS FROM 2012-13 CONTINUED

First Quartile Assessment and Review

First quartile countries—Bangladesh, India, Myanmar and Pakistan—have the lowest food security robustness and therefore the most opportunity for improvement. A key point made in the Index 2012 white paper was that lower levels of food security robustness tend to result in greater volatility, which can be challenging to address from a production and policy perspective. Figure 5a shows that the variation over time of the first quartile countries is greater than for other quartiles; similarly, the variation between countries within the quartile is also significant. The chart also shows that these countries have taken longer to recover from the impacts of the 2007–08 food crisis, suggesting that the more robust a country's food security system is, the greater the capacity to recover more quickly from any system wide shocks. In short: a robust system is also a resilient one.

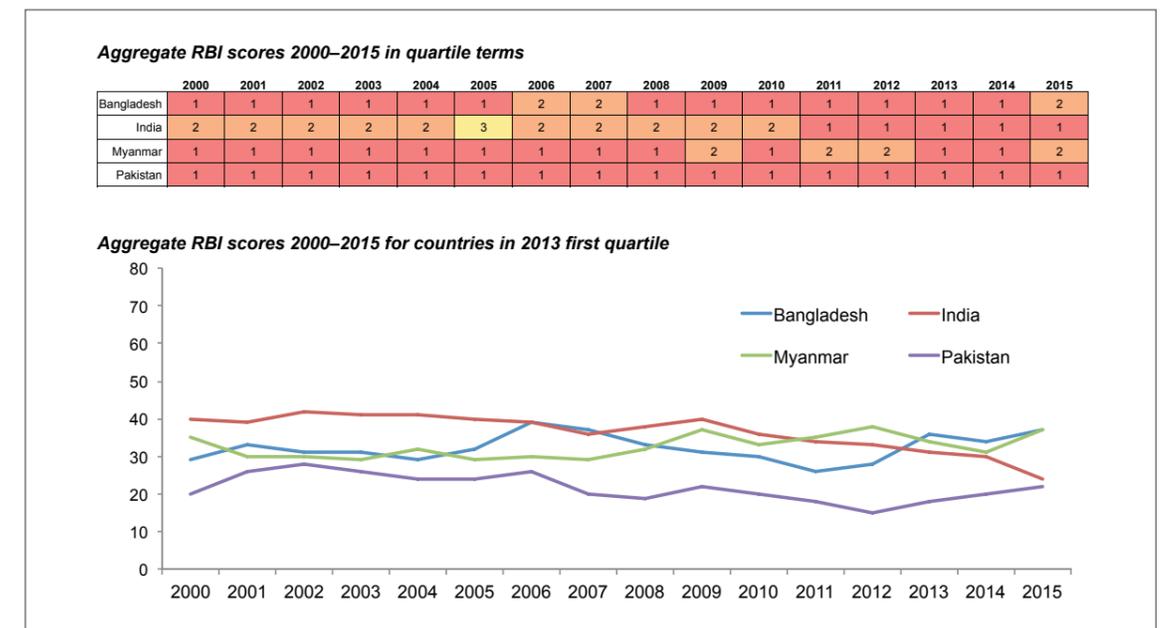


FIGURE 5A: FIRST QUARTILE RESULTS FOR FOOD SECURITY ROBUSTNESS 2000-2015

INDEX RESULTS FROM 2012-13 CONTINUED

During the 2012–2013 period Bangladesh experienced a deterioration in its Demand and Price rubric as inflation and population growth increased—both in absolute terms and when compared to other countries in the Index. Increasing inflation was also responsible for a drop in India’s Demand and Price rubric. Myanmar’s Policy and Trade conditions have continued to improve since late 2012 in line with the government’s ongoing efforts to open the economy to investment and normalize relations with the international community. The decline in the Policy and Trade rubric in Pakistan most likely reflects political uncertainty arising from elections and simmering conflict during the period. The low score for Environmental Factors reflects Pakistan’s performance relative to other countries in the Index and does not suggest no environmental performance at all.

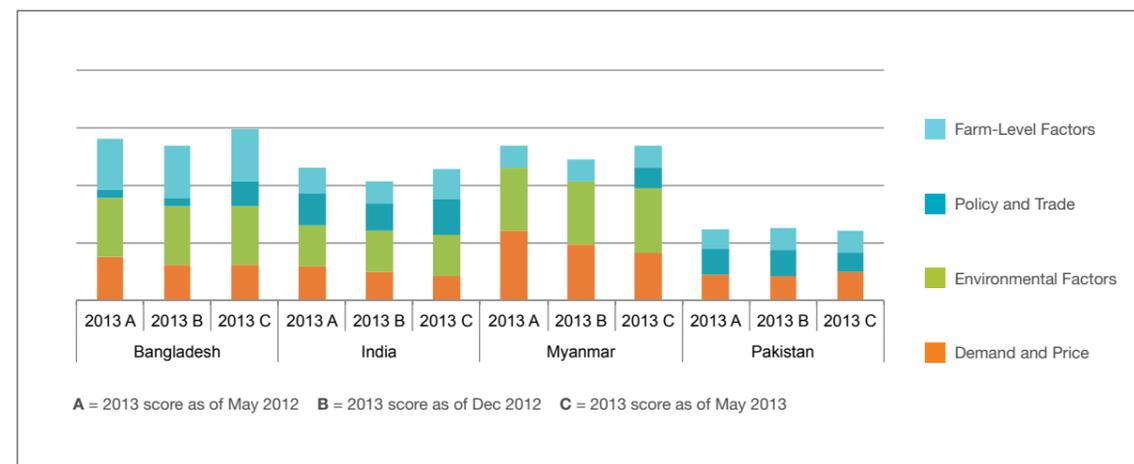


FIGURE 5B: 2013 FIRST QUARTILE WITHIN-YEAR TRENDS

CONCLUSION

The Rice Bowl Index is a tool designed to stimulate debate on the robustness of countries’ food security systems. It is solutions focused, not problem centric. As with the 2012 white paper, the purpose of the discussion here is to illustrate that through the development of a tool that focuses not on the extent of the problem but rather on its contributing factors and their respective “levers”, a more productive dialogue can commence. Such a dialogue is likely to foster far greater levels of collaboration between all parties involved in helping to improve food security.

In the last year, the Policy and Trade environment has become far more volatile, exerting a greater impact on what we have termed food security robustness. Given the increasing complexity of food security and the pressing challenges posed by increasing populations, rapid urbanization and climate change, there is a need for such a concept and the comprehensive, system-wide approach it entails.

In 2013 outcomes have improved relative to 2012, while the 2012 results showed weaker performance relative to 2011. Over the period 2000–2015 the Index results show a wide variation in the robustness of countries’ capacity to achieve food security.

This development also underpins an important conclusion of this white paper: intervention in seeking to achieve food security via self-sufficiency can have negative impacts on robustness—and it is robustness that is essential for achieving sustainable food security over the longer term. Food security robustness effectively equals food security with stability. The debate needs to shift from food self-sufficiency to food security robustness, because as this year’s results show, the policy and trade environment will impact robustness directly.

Food security robustness, which depends on the utilization of trade as a means of securing food supplies is a more pragmatic approach because it recognizes the opportunity costs of incremental investments to meet self-sufficiency targets, which make such policies self-defeating if the goal is true robustness. International trade must be used as an instrument to supplement domestic sources for food security.

Results from the last year have also confirmed our previous observations that countries that can be considered as the most robust overall are able to achieve a balance between the four rubrics, whereby a variation in one is typically offset by variation in other rubrics, thereby maintaining a relatively high result overall. Disaggregation of each country’s rubric set further allows identification of the key factors driving robustness, either positively or negatively; the Index can therefore help provide a means for identifying the areas where intervention is most needed.

CONCLUSION CONTINUED

The results of 2013 also imply that achieving food security requires the effective management of both short and long term dynamics. While we expect agricultural production and Demand and Price to have short term impacts, the results show that Policy and Trade can also quickly affect food security robustness. In the longer term environmental sustainability can also be expected to exert significant influence.

It is the intention of the Advisory Board to continue to improve and develop the Index. The Index was never intended to be a static tool, and as new or better information becomes available, and as our thinking on food security evolves in light of this information, so too will the Index evolve. This will include additional metrics to better reflect the reality of the situation on the ground, and to more accurately predict how robustness will be affected.

The Board has requested work to be undertaken to support integration of public-facing Index interface on the Index website as well as adjustments to the framework underlying the Index to better incorporate climate change into the 'Environmental Factors' rubric and adding fish as a dietary component in 'Demand and Price'.

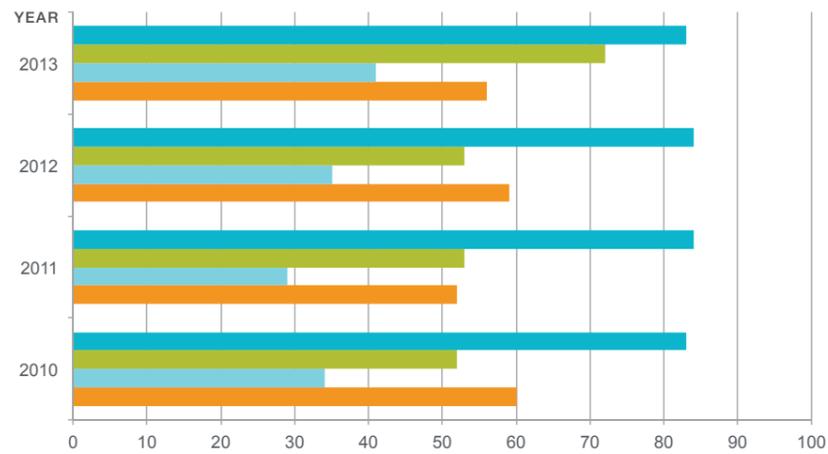
Over the coming year, members of the Board will continue an extensive program of public and stakeholder engagement in support of the Index's underpinning rationale: to stimulate more informed debate around the robustness of countries food security systems, and to translate the complexity of the issues into an opportunity for action.

APPENDIX 1 – 2012-13 ENGAGEMENT

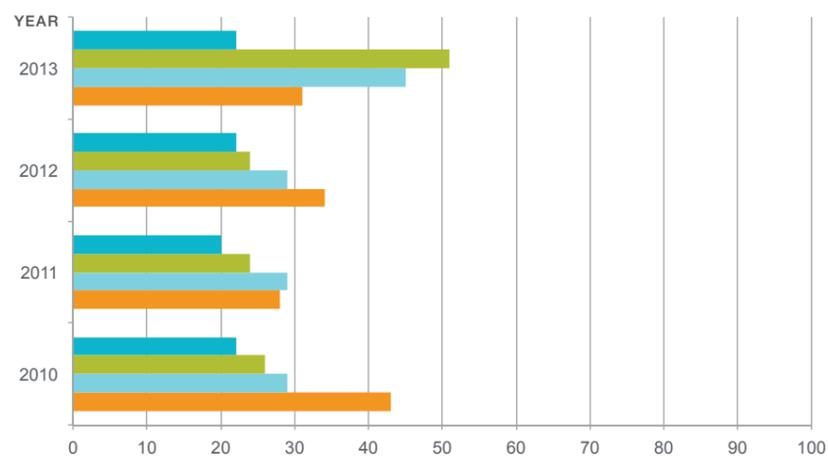
- A two day workshop with the National Economic Development Authority, Philippines
- Roundtable discussions with government officials (MOA, CAAS, MofCom, MoFA, State Council), China
- Panel discussion as part of the Responsible Business Forum on Sustainable Development, Singapore
- Discussions with the Australian Centre for International Agricultural Research
- Academic review sharing at an Index Luncheon at Nanyang Technological University, Singapore
- Index 'launch' event hosted by Confederation of Indian Industry, India
- Detailed discussions and debate with senior officials from the Ministry of Agriculture, India
- Presentations to senior IFPRI Officials in Japan
- Discussions with leading government and opposition MPs in Japan
- Discussions with senior government officials and bureaucrats from the Ministry of Agriculture and Resources Development, Vietnam
- Presentation to the ASEAN Agriculture Ministers Senior Officials Meeting, Bangkok
- Various discussions and presentations to the ASEAN Economic Ministers Meetings, Siem Reap Cambodia
- Overview presentations to USDA Officials, Washington DC, USA
- Presentation to a gathering of government, NGO and business leaders at the 2012 Asia Sharing Value Conference
- Presentation at the G8 conference on Open Data for Agriculture, Washington DC, USA
- Presentation to the National Assembly, Seoul, Korea, and
- Extensive media engagement (see www.ricebowlindex.com).

APPENDIX 2 – COUNTRY CHARTS

Australia



Bangladesh

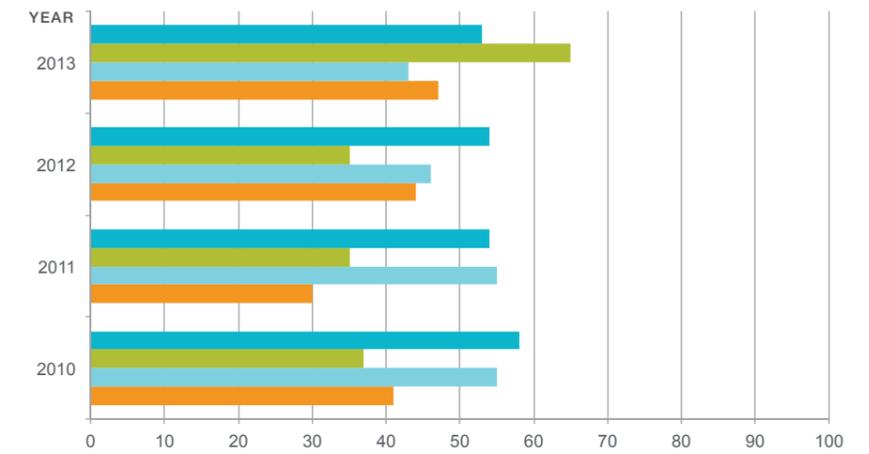


■ Policy and Trade ■ Environmental Factors ■ Demand and Price ■ Farm-level Factors

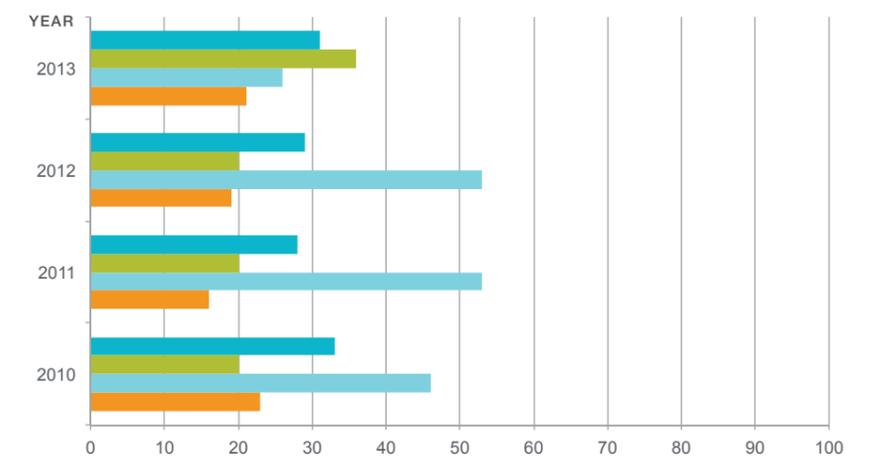
The spike in 2013 Environmental Factors scores is due to one indicator, Total Internal Renewable Water Resources (qm, per-capita), having values available only through 2012. As a result, starting in 2013 the Environmental Factors scores are a function of only the other three indicators in the rubric—percent change in forest area, electricity consumption per-capita, and percent reduction in water quantity.

APPENDIX 2 – COUNTRY CHARTS CONTINUED

China



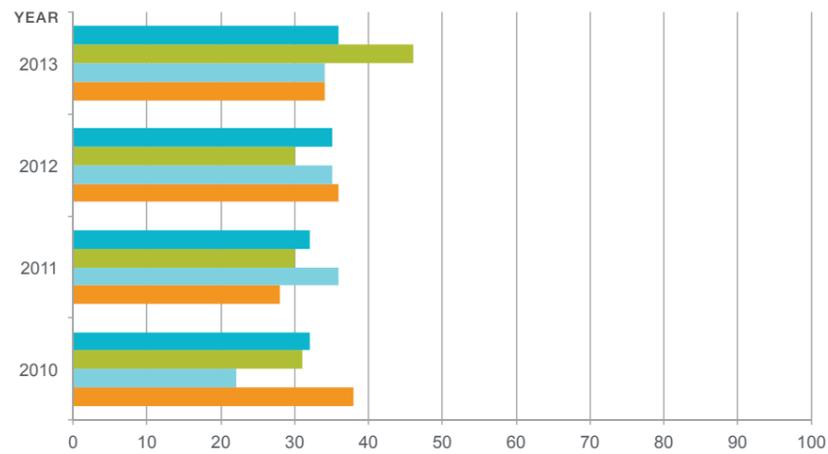
India



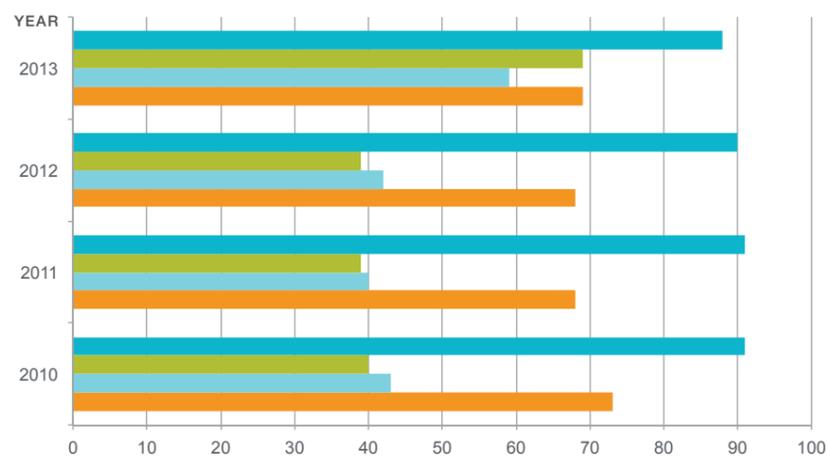
■ Farm-Level Factors ■ Policy and Trade ■ Environmental Factors ■ Demand and Price

APPENDIX 2 – COUNTRY CHARTS
CONTINUED

Indonesia



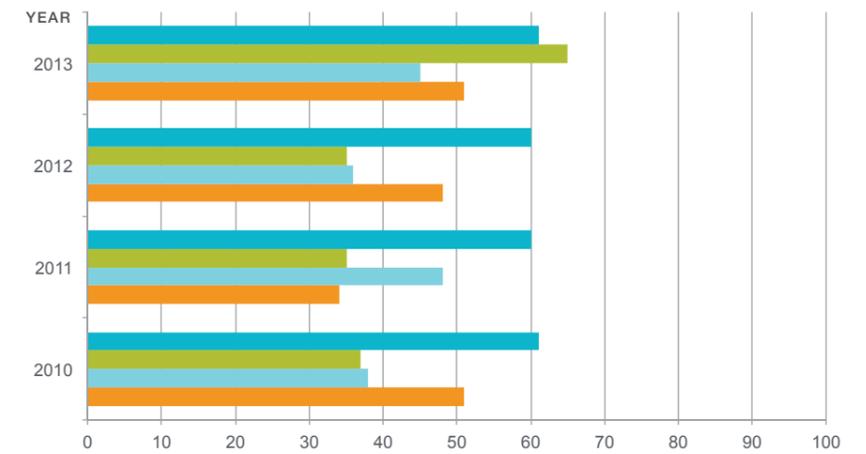
Japan



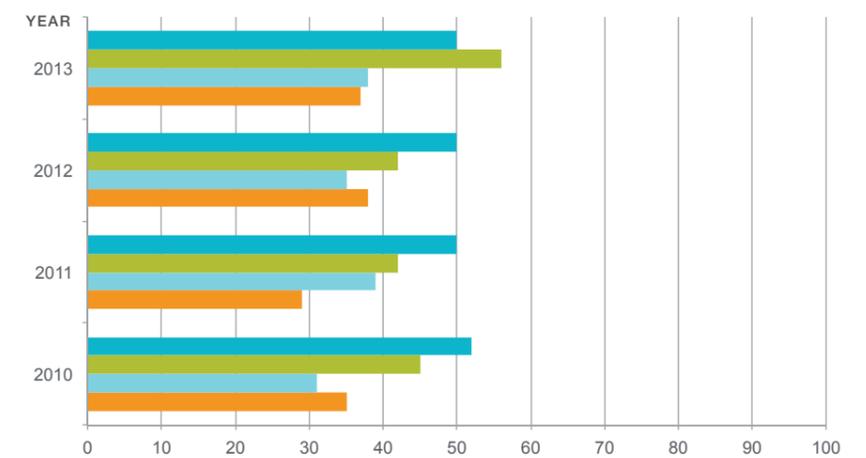
Policy and Trade Environmental Factors Demand and Price Farm-level Factors

APPENDIX 2 – COUNTRY CHARTS
CONTINUED

South Korea



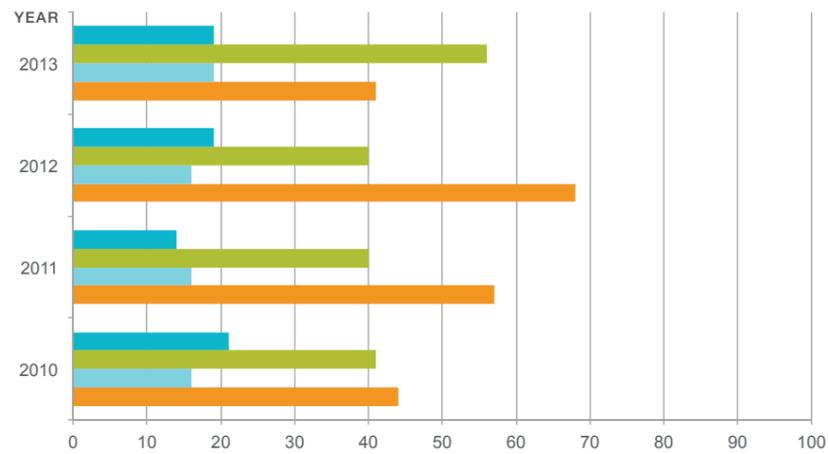
Malaysia



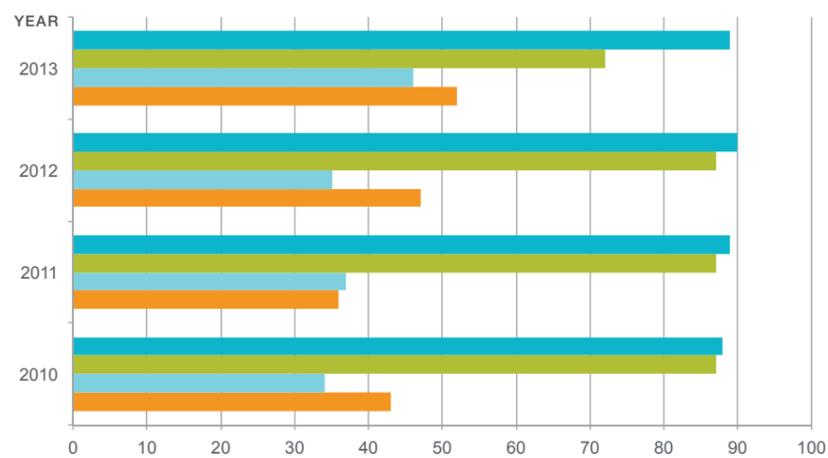
Farm-Level Factors Policy and Trade Environmental Factors Demand and Price

APPENDIX 2 – COUNTRY CHARTS
CONTINUED

Myanmar



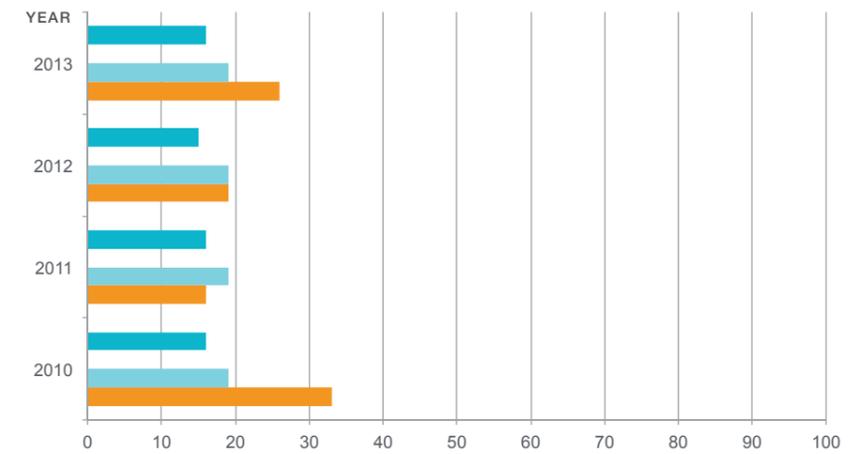
New Zealand



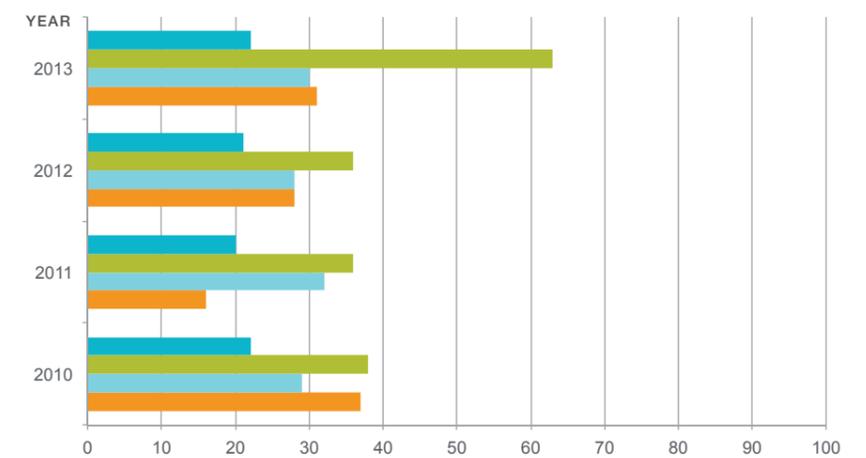
Policy and Trade Environmental Factors Demand and Price Farm-level Factors

APPENDIX 2 – COUNTRY CHARTS
CONTINUED

Pakistan



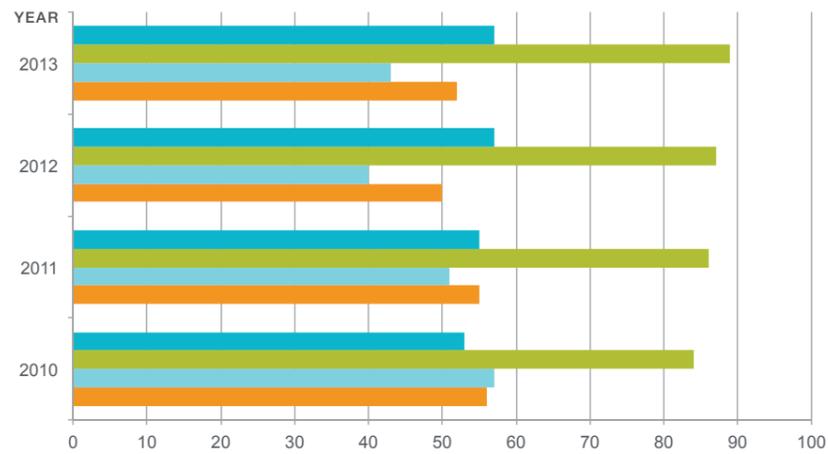
Philippines



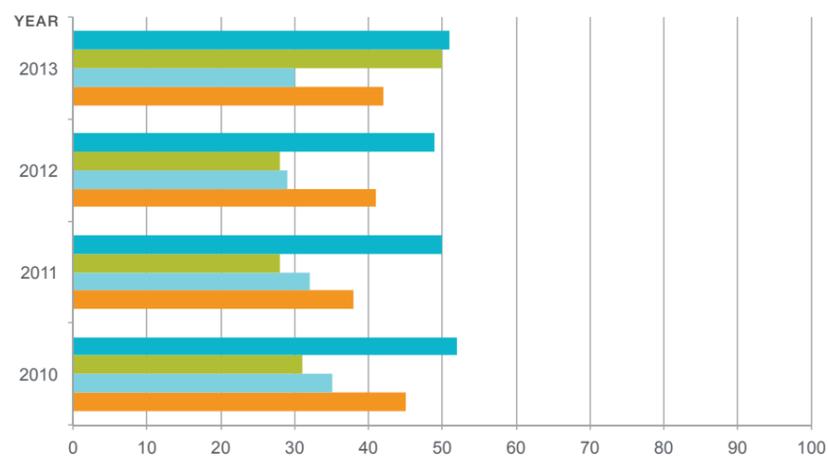
Farm-Level Factors Policy and Trade Environmental Factors Demand and Price

APPENDIX 2 – COUNTRY CHARTS
CONTINUED

Taiwan



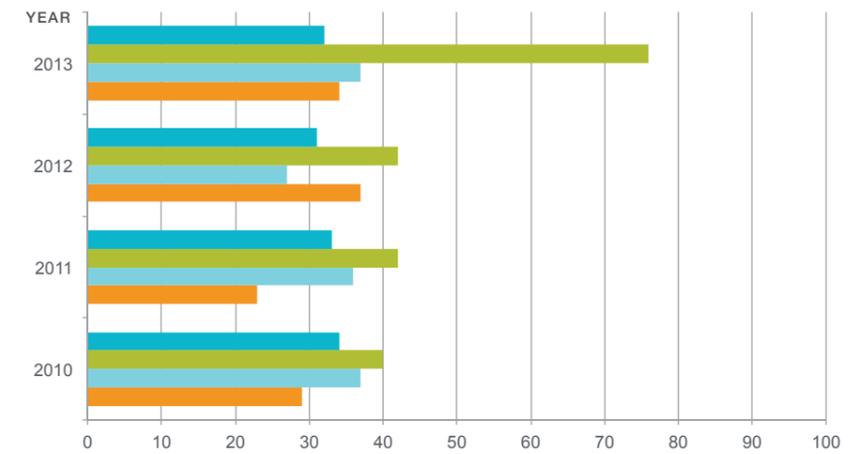
Thailand



Policy and Trade Environmental Factors Demand and Price Farm-level Factors

APPENDIX 2 – COUNTRY CHARTS
CONTINUED

Vietnam



Farm-Level Factors Policy and Trade Environmental Factors Demand and Price

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