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## Introduction

### Overview of CIMMYT

The International Maize and Wheat Improvement Center (CIMMYT) works throughout the developing world to improve livelihoods and foster more productive, sustainable maize and wheat farming. Through collaborative research, partnerships and training, CIMMYT targets the challenges of food insecurity and malnutrition, climate change and environmental degradation.

Over the past 50 years, CIMMYT has worked with hundreds of partners, including many organizations from Australia, to improve agricultural production and rural livelihoods. The continuing impact of this collaboration effort provides evidence that science, technology and innovation for sustainable development yield results that exceed the investment many times over.

For example, CIMMYT's work directly serves Australia's interests as an agricultural producer and food consumer. Australian economists have estimated that wheat developed by CIMMYT has increased the value of outputs from the Australian wheat industry by at least \$750 million.<sup>1</sup> Furthermore, according to a 2013 study from the Australian Center for International Agricultural Research (ACIAR), 98 percent of the wheat currently grown in Australia has ancestry originating from CIMMYT's genebank.<sup>2</sup>

CIMMYT is one of the founding and leading centers of CGIAR – the only worldwide partnership that applies agricultural research for development (R4D) in a global effort to alleviate poverty, hunger, major nutritional imbalances and environmental degradation.

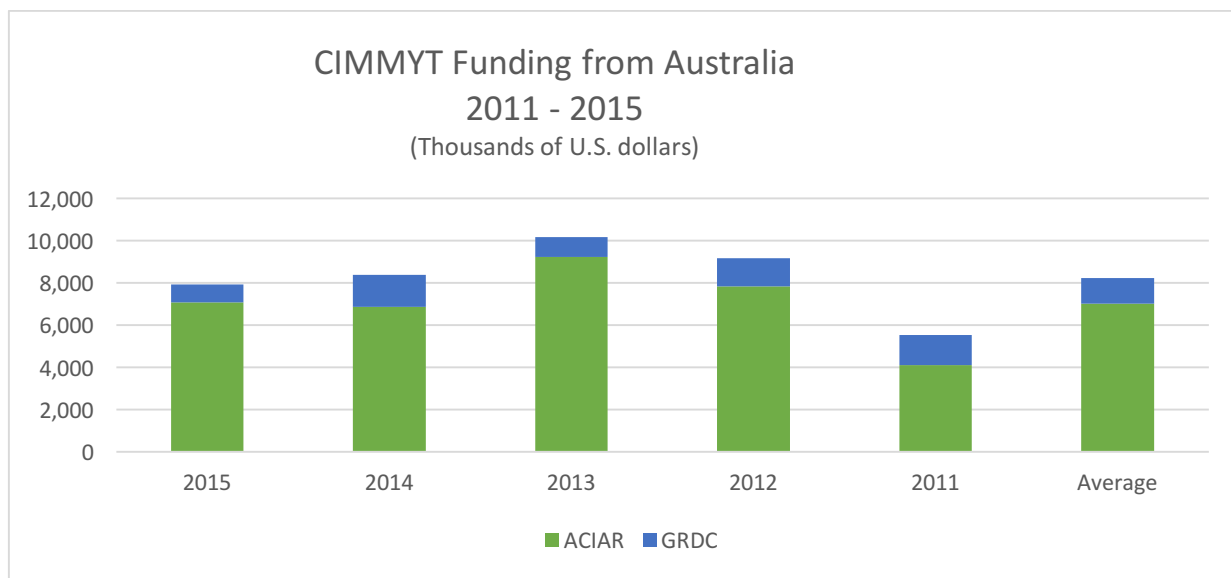
Australia has been a major funder of CIMMYT with ACIAR being 6<sup>th</sup> among CIMMYT's top funders in recent years, with an average of US\$7 million per year over 2011-2015. The Grains Research and Development Corporation is also a strong supporter of CIMMYT contributing an average funding of US\$1.2 million per year over the same period (see figure below).

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<sup>1</sup> Australian Government. 2012. Australian Multilateral Assessment: Consultative Group for International Agricultural Research (CGIAR). Web: <https://dfat.gov.au/about-us/publications/Documents/cgi-ar-assessment.pdf>

<sup>2</sup> Braidotti, Gio. The international nature of germplasm enhancement. *Partners in Research for Development*, Nov 2013: 27-29. Web: [http://aci-ar.gov.au/files/partners\\_1309\\_p27-29\\_the\\_international\\_nature\\_of\\_germplasm\\_enhancement.pdf](http://aci-ar.gov.au/files/partners_1309_p27-29_the_international_nature_of_germplasm_enhancement.pdf)





This long-standing partnership with Australia is of great importance to CIMMYT and we welcome the opportunity to participate in this consultation and would like to share our thoughts on several relevant questions to be addressed by this Foreign Policy White Paper.

CIMMYT's submission complements the one provided by CGIAR.

## 2. AUSTRALIA HAS DIVERSE INTERESTS THAT SPAN THE GLOBE

- **Which countries will matter most to Australia over the next 10 years? Why and in what ways? How should we deepen and diversify key relationships?**

We would recommend that Australia focus its development aid efforts in areas where the majority of the world's poor and hungry live: Africa, Asia and poverty hotspots in Latin America. Greater focus could also be considered in Sub-Saharan Africa and South Asia where Australia could have significant development impacts.

- **Which global trends, such as developments in technology, environmental degradation and the role of non-state actors, are likely to affect Australia's security and prosperity? How should Australia respond?**

**Population growth. Migration. Political instability. Food and nutritional insecurity. Climate change. Inequality. Environmental degradation. Economic development.** These are the major challenges of the 21<sup>st</sup> century. Though great strides have been made to pull millions out of poverty in recent decades, a daunting challenge lies ahead – how to feed more than 9 billion people by 2050.



Research on maize and wheat agri-food systems lies at the heart of the solution. These two staple grains account for a quarter of the total crop area harvested globally<sup>3</sup> and provide 19 percent<sup>4</sup> of the total calories available. Experts forecast that farmers will need to produce at least 60 percent more grain to feed a growing world population, using fewer nutrients as well as less land and water. Lloyd's of London's Food System Shock<sup>5</sup> predictive model suggests that, under current production scenarios, crop failures in multiple breadbaskets could result in estimated global losses of up to 7 percent for wheat and 10 percent for maize. The consequences of such shocks on prices could be dramatic, as occurred in 2008 and 2011, with devastating effects for the poor.

In 2008, after decades of stability, food prices jumped more than 80 percent<sup>6</sup> in some regions. Higher prices for key commodities such as maize and wheat adversely affected low-income consumers and created political and social instability in food-importing countries. As food prices have stabilized in recent years, concern about the fragile global food system has diminished, but food price volatility remains a threat. At any time, events like drought or a major crop disease outbreak could send prices skyrocketing anew. In fact, such shocks are already taking place with increasing regularity. In southern Africa, for example, millions have been affected by droughts brought on by the 2015-2016 El Niño, a climate phenomenon that causes extreme weather worldwide and whose impacts have been made more severe by climate change.

**Wheat is in growing demand as a staple food.** Projections regarding wheat demand growth to 2050 vary widely around an average of approximately +50%, relative to 2010. The bulk of increased consumption is expected to occur in developing countries where studies predict demand growth of 34-60% by 2050.<sup>7</sup> Of particular urgency is demand growth to 2030, when world population growth is predicted to peak. China and India, which are home to half the world's poor,<sup>8</sup> already produce and consume 30% of the world's wheat. In rapidly urbanizing sub-Saharan Africa, wheat consumption is expected to grow 38% by 2023, with imports at 24 M tons in 2015 at a cost of \$8 billion (USDA, Index Mundi, 2016). By 2023, demand for wheat is expected to grow by 22% in India, 20% in Pakistan and 19% in North Africa<sup>9</sup> (OECD-FAO 2014). Wheat-based agri-food systems prevail in North Africa and West Asia; in both areas wheat prices and food insecurity, coupled with import dependency, have triggered civil unrest and

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<sup>3</sup> OECD-FAO. (2014). Statistical annex.

<sup>4</sup> FAO. (2015). Save and grow in practice. A guide to sustainable cereal production; maize, wheat and rice.

<sup>5</sup> Lloyd's of London (2015). Emerging risk report: Food System Shock.

<sup>6</sup> The Guardian. (2008, April 09). Food price rises threaten global security – UN.  
<http://bit.ly/2cgdous>.

<sup>7</sup> Valin, H. et al. The future of food demand: understanding differences in global economic models. *Agricultural Economics* 45.1 (2013): 51-67. Web.

<sup>8</sup> Sumner, Andy. Where Do the World's Poor Live? A New Update". *IDS Working Papers* 2012.393 (2012): 1-27. Web.

<sup>9</sup> OECD-FAO. (2014). Statistical annex.



massive migration to Europe. In North Africa, and in West and Central Asia, wheat provides between 35 and 50% of daily calories (FAOSTAT).

The main climate change threats to wheat are warming and the increased frequency of droughts and flooding. Estimates of crop-growth compensation from rising CO<sub>2</sub> vary widely, but climate change will likely reduce wheat yields significantly, overall.<sup>10</sup>

At the same time newly-emerging or evolving wheat pathogens are intensifying in virulence, overcoming the genetic resistance of many widely-sown wheat cultivars. They are also adapting to warmer climates and spreading or poised to spread from their native areas to other important wheat production zones. Recent stem rust outbreaks have caused major upheavals in wheat farmlands of Eastern Africa. In early 2016 wheat blast, a deadly disease heretofore confined to Latin America, appeared for the first time in Asia (Bangladesh); it could pose a major threat to wheat and food security in South Asia.

**Growing demand for maize.** Maize is one of the three leading global cereals that feed the world<sup>11</sup>. Maize rice and wheat together, dominate human diets<sup>12</sup> and provide at least 30% of the food calories of more than 4.5 billion people in 94 developing countries. Maize alone contributes over 20% of total calories in human diets in 21 low-income countries, and over 30% in 12 countries that are home to a total of more than 310 million people. Of the 22 countries in the world where maize forms the highest percentage of caloric intake in the national diet, 16 are in Africa<sup>13</sup>. Maize's central role as a staple food in Africa and Central America is comparable to that of rice or wheat in Asia, with consumption rates being the highest in eastern and southern Africa (ESA).

With its multiple uses, maize is the world's most multi-purpose crop. Aside from its staple food use, it makes a significant contribution to animal feed (especially poultry) as well as bio-fuel and industrial uses. Population growth, changing diets and a rapidly growing poultry sector are contributing to a sharp increase in maize demand. During 1991-2011, total utilization of maize almost doubled in Asia. Rising income levels and a growing urbanized population (especially in populous developing countries) that eats an increasingly diversified diet, will dramatically increase and change the demand for food and feed – and influence and compete with alternative uses such as industrial and biofuel.

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<sup>10</sup> Lobell, D. B., W. Schlenker, and J. Costa-Roberts. "Climate Trends and Global Crop Production Since 1980". *Science* 333.6042 (2011): 616-620. Web.

<sup>11</sup> Shiferaw, B., Prasanna, B.M., Hellin, J., Banziger, M. (2011). Crops that feed the world 6. Past successes and future challenges to the role played by maize in global food security. *Food Security* 3: 307-327

<sup>12</sup> Ignaciuk, A., and Mason-D'Croz, D. (2014). "Modelling Adaptation to Climate Change in Agriculture", OECD Food, Agriculture and Fisheries Papers, No. 70, OECD Publishing

<sup>13</sup> Nuss E.T., and Tanumihardjo, S.A., (2011) "Quality Protein Maize for Africa: Closing the Protein Inadequacy Gap in Vulnerable Populations" *Advances in Nutrition* 2: 217-222



Global cereal production is expected to increase by almost 370 million tonnes through the next decade, reflecting a growth of 15% by 2023<sup>14</sup>. By 2050, the global demand for maize could increase by 50%<sup>15</sup>. Timsina et al. (2011)<sup>16</sup> suggested that, by 2020, maize demand in Asia may increase by as much as 87%. Developing regions will account for more than 75% of additional agricultural output over the next decade<sup>17</sup>.

### 3. AUSTRALIA IS AN INFLUENTIAL PLAYER IN REGIONAL AND INTERNATIONAL ORGANISATIONS

- **Which regional and global organisations matter most to us? How should we support and shape them? How can we maximise our influence?**

*(copied from Introduction as the content applies to this question)*

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<sup>14</sup> OECD-FAO. (2014). Statistical annex.

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<sup>16</sup> Timsina, J., Buresh, R. J., Dobermann, A. and Dixon, J. 2011. Rice-maize systems in Asia: Current situation and potential. Los Banos (Philippines): International Rice Research Institute and International Maize and Wheat Improvement Center. 232 pages.

<sup>17</sup> OECD-FAO. (2014). Statistical annex.

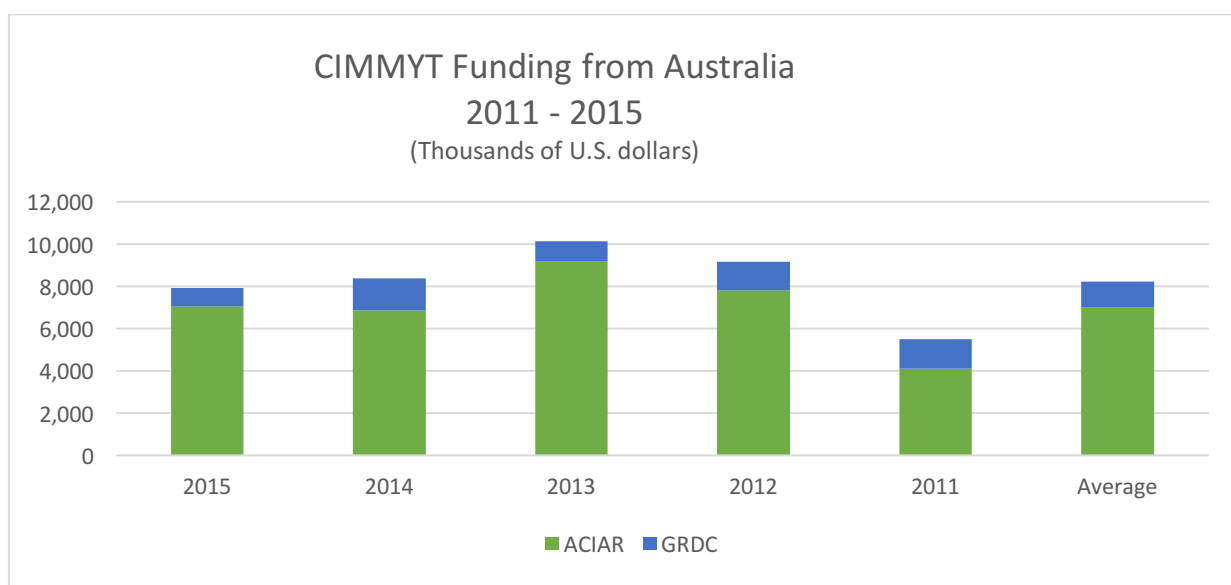
<sup>18</sup> Australian Government. 2012. Australian Multilateral Assessment: Consultative Group for International Agricultural Research (CGIAR). Web: <https://dfat.gov.au/about-us/publications/Documents/cgiar-assessment.pdf>



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Furthermore, Australia has been a long-time supporter of CGIAR. Continued collaboration and support to this global organization should also be considered, as described in CGIAR submission.

#### **4. AUSTRALIA NEEDS TO BE AMBITIOUS IN GRASPING ECONOMIC OPPORTUNITIES**

- **What steps should be taken to maximise our trade and investment and expand commercial opportunities for Australian business? How can we ensure Australia is**

<sup>19</sup> Braidotti, Gio. The international nature of germplasm enhancement. *Partners in Research for Development*, Nov 2013: 27-29. Web: [http://aciar.gov.au/files/partners\\_1309\\_p27-29\\_the\\_international\\_nature\\_of\\_germplasm\\_enhancement.pdf](http://aciar.gov.au/files/partners_1309_p27-29_the_international_nature_of_germplasm_enhancement.pdf)



**positioned to take advantage of opportunities in the global economy? What are the key risks to Australia's future prosperity and how should we respond?**

Given Australia's major role in global wheat markets, it would be in its interest to ensure a stable and well-functioning wheat market across the world, including stability of production and using trade to even out shortfalls.

## **5. AUSTRALIA CONFRONTS A RANGE OF STRATEGIC, SECURITY AND TRANSNATIONAL CHALLENGES**

- **How can Australia best deal with instability beyond our borders? How can our foreign policy, including our overseas development assistance program, support a more prosperous, peaceful and stable region? How should our international engagement work to protect Australia against transnational security threats, such as terrorism?**

There is a clear correlation between food security and national security. Ensuring food security will positively contribute to global stability and sustainability. Investment in agricultural research therefore should be considered as high priority by the Australian Government.

Agricultural research for development provides strong value for money, compared to other development interventions. Recent studies have demonstrated this advantage, particularly for research conducted by CGIAR<sup>20</sup>, including a recent impact study (2015) commissioned by CGIAR Research Program on Wheat (led by CIMMYT)<sup>21</sup>. This study noted yearly economic benefits of CGIAR wheat breeding research (led by CIMMYT) ranged from \$2.2 to \$3.1 billion (in 2010 dollars). Given that these benefits result from annual funding of just \$30 million per year, the benefit-cost ratio is very high: between 73:1 and 103:1.

The new scientific technologies, tools and knowledge delivered by agricultural research not only benefit developing countries but also Australia, which shares similar ecosystems, crops, and diseases and pests.

To support the application of this new science, CIMMYT works closely at the local level in target countries, particularly with local national agricultural research systems. These capacity building activities contribute to the positive impacts in developing countries and support bridging the gap between research and development.

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<sup>20</sup> CGIAR. (2016). CGIAR Fund Securing Investments for a Food Secure Future.

<https://library.cgiar.org/bitstream/handle/10947/3903/CGIAR%20Impact%20Brief%20Returns%20to%20Investment.pdf?sequence=1>

<sup>21</sup> CIMMYT and WHEAT. (2016). Impacts of International Wheat Improvement Research 1994-2014.

<http://wheat.org/wheat-global-impacts-1994-2014-published-report-available/>; <http://www.cimmyt.org/global-wheat-breeding-provides-billions-in-benefits-cimmyt-study-shows/>





## 6. AUSTRALIA USES A RANGE OF ASSETS AND CAPABILITIES TO PURSUE OUR INTERNATIONAL INTERESTS

- **What assets will we need to advance our foreign policy interests in future years? How can we best use our people and our assets to advance Australia's economic, security and other interests and respond to external events?**

Australian agricultural research and agri-business have created a global network, including CGIAR and CIMMYT. This is a strength to build on, as benefits go both ways. Some examples:

- Australian private sector breeders and public sector agricultural scientists benefit from CIMMYT's breeding research on wheat (via the CAIGE initiative, funded by GRDC among others), because CGIAR germplasm is valuable for Australia.
- Southern Australia's rain fed agricultural techniques around wheat, pulses and sheep are a very important source of learning for many North African and West Asian countries. Several CGIAR Centers, including CIMMYT, often funded by Australia (ACIAR), have achieved technology transfer successes. There is room for further advancements.
- **How can Government work more effectively with non-government sectors, including business, universities and NGOs, to advance Australia's interests?**

**Co-funding secondment of Australian experts** from different sectors (private sector, universities) at various stages of their career (e.g., post-doc; mid-career) to participate in research for development, and development programs and projects to develop skills and experience that could benefit Australia. CIMMYT could be a non-governmental organization where such skills and experience could be gained.

**Building a stronger coordination and collaboration** between Australia's international development and its domestic agriculture-focused programs. CIMMYT's mandate focuses on supporting developing country research and ultimately poor farmers in those countries, most developed country research and breeding organizations, including Australia's, make use of this material as well. Therefore, international agricultural research for development on wheat led by CIMMYT and supported by Australian international assistance comes back to the country in the form of improved wheat lines. These are released as new varieties sown by Australian farmers, who select them because of their improved yield, greater tolerance or resistance against a disease and other benefits.

