INTERNATIONAL AGRICULTURAL RESEARCH CENTERS AND JAPAN

Masa Iwanaga
International Maize and Wheat Improvement Center (CIMMYT)
Texcoco, Mexico

ABSTRACT

The world is divided, rich and poor, and that disparity continues to increase. This is especially true for Sub-Sahara Africa. On the other hand, the world is interdependent. Plant or animal diseases originating in one country can easily affect other countries. Avian flu and mad cow disease (BSE) are good examples. Major harvest losses in some countries would affect world food prices and availability (hence food security). The use of food crops for biofuels, driven by a global move toward renewable energy, affects food availability and prices worldwide.

International Agricultural Research Centers (IARCs) and Japan share a common vision for the role of agricultural research in the world. They both believe in the importance of agriculture as an engine of socio-economic development. The world needs to be food-secure. We want a peaceful and prosperous world.

Japan has the second largest economy in the world and its investment in research and development is also the second largest. In fact, the total amount of research money spent by Japan (private and public) is bigger than the total sum spent by 44 countries in Sub-Sahara Africa. Japan is endowed with huge resources of human capital, knowledge and technology that have potential value for developing countries.

There are some good examples of the application of Japanese agricultural research talent and products for developing countries through collaborative research schemes between Japan and IARCs. The use of DREB (dehydration responsive element binding protein) for developing drought-tolerant crops represents an excellent test case of innovative, win-win, collaborative research with direct implications for developing countries. Biological nitrification inhibition (BNI) for increased efficiency of plant nitrogen use and for reduced emissions of nitrous oxide, a powerful greenhouse gas, is another emerging example of collaboration with global impacts.

Many research and educational organizations in Japan have set up offices for research and technology transfer to link their research outcomes to practical applications. Their view, however, is often limited to the Japanese market. By expanding this view to the developing world there are many more opportunities for practical applications. The major function of IARCs' is to link the needs of the resource poor with technological innovations and practical solutions for improving their livelihoods. Therefore active linkages between Japanese organizations and IARCs would enhance the probability that Japanese knowledge and technology would be properly linked with the needs of the poor. This, in turn, benefits Japan which depends on large food imports and a peaceful and prosperous world for its own food and national security.

IARCs also present excellent opportunities for Japanese students and scientists to get direct hands-on experience in international agriculture. Experience with IARCs would expand the horizons of students and scientists and offer opportunities to identify interesting and meaningful research challenges.

International Agricultural Research Organizations and Japan

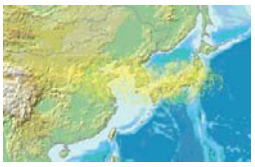
Masa Iwanaga 岩永勝
Director General,
CIMMYT-Mexico

CIMMYT

The world is interconnected!

CIMMYT

Global Problems



CIMMYT

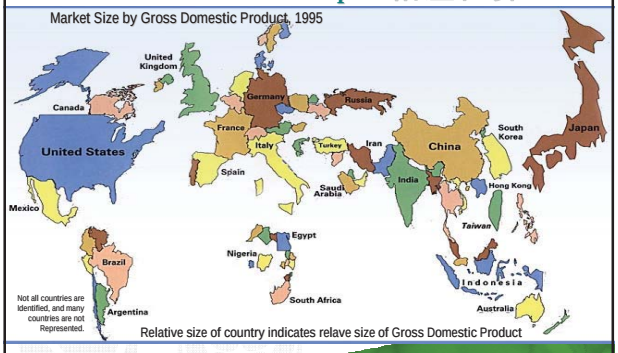
Flat fact: Interdependence

- Sustainable use of natural resource base
- Food production and trade
- Agricultural research for global change

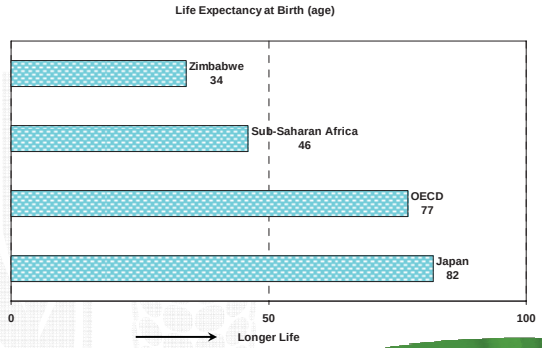
Japan in the world

CIMMYT

World is divided: rich and poor 格差世界



CIMMYT



CIMMYT

Global Priority Spending (2004)

Global Priority !?	US $ billion
Military spending--World	780
Alcoholic drinks in the EU	105
Total Overseas Dev. Assistance 先進国からの政府開発援助総額	70
Cigarettes in the EU	50
Business entertainment in Japan 接待費	35
Cosmetics in the USA	18
Clean drinking water for all ($ required)	10
CGIAR	0.425

CIMMYT

Bridge: International collaboration

CIMMYT

Contributing to the world (and Japan) through collaboration with IARCs

- Remarkably similar objectives (mutual benefit)
- Value of working with IARCs（国際農業研究センター）
- Examples of valuable collaboration

CIMMYT

Remarkably similar objectives (mutual interest/benefit)

- Stable food production (food security and stable price)
- Agriculture development driven socio-economic development
- Peaceful, prosperous world (production and access)

CIMMYT

Value of working with IARCs

- Global network on the ground
  - Impact orientation: Integrating products and key elements
  - Interfacing partnership
  - Sources of information
  - Logistics support for research activities
  - Research for development (overview)
  - On-the-ground education

CIMMYT

Some examples

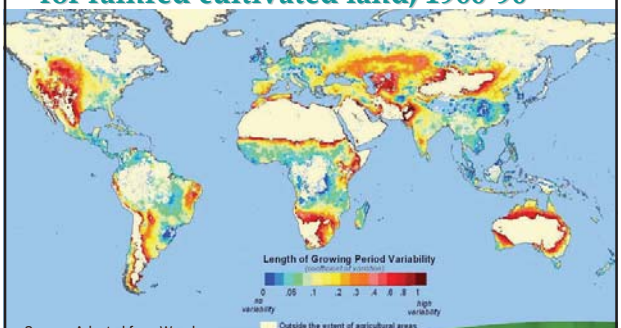
- DREB
- Biological Nitrification Inhibition (BNI)
- Sweet Wheat
- Conservation agriculture

CIMMYT

Agriculture and Climate Change

CIMMYT

Variability in moisture availability for rainfed cultivated land, 1960-90



Source: Adapted from Wood, Sebastian and Scherr (2000).

CIMMYT

Engineering of drought tolerance

Drought responsive element transcriptional factor and stress inducible promoter (partnership with JIRCAS, Japan)

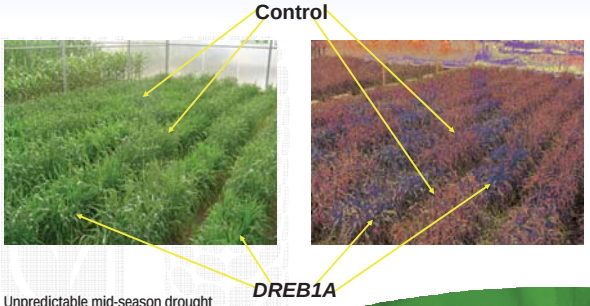
CIMMYT

Photosynthetic performance of GM-Bobwhite with *DREB* gene (with extreme water stress)

	Evapo-transpiration (mm/m2/s)	Conductance (mm/m2/s)	Assimilation rate (umol CO2 m-2 s-1)	Sub-stomatal CO_2 (ppm)	Chlorophyll spad
% Difference	29%	35%	90%	-8%	-4%

CIMMYT

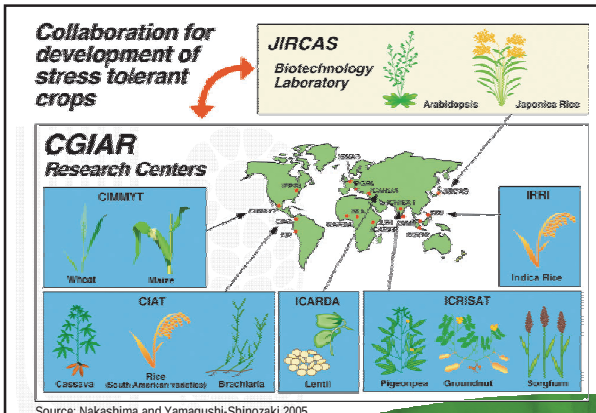
Substantially Lower Canopy Temperature Under Contained Field Trials



Unpredictable mid-season drought

CIMMYT

Collaboration for development of stress tolerant crops



Source: Nakashima and Yamagushi-Shinozaki 2005

CIMMYT

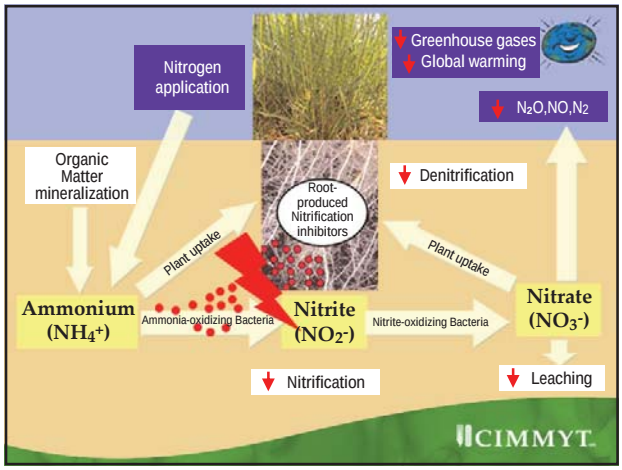
Agriculture and GHG emissions

CH_4 Methane
7.5 Gt CO_2 eq/yr

N_2O Nitrous Oxide
4.5 Gt CO_2 eq/yr

Source: IPCC, 2007

CIMMYT

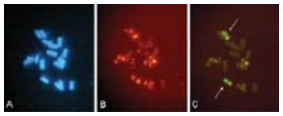


CIMMYT

Genetic resources research that addresses climate change

- 1/3 of world nitrogen fertilizer applied to wheat crops and only 1/3 is effectively use by the crop
- The rest is wasted or damaging environment (water, greenhouse gases)
- Biological nitrification inhibition (BNI) to reduce N_2O emissions and increase nitrogen use efficiency (annual US$ 19 billion loss).

- Chromosomal location of genes for nitrification inhibitory activity in root exudates of *Leymus racemosus* using wheat x *L. racemosus* chromosome substitution and addition lines



- *L. racemosus* chromosomes in wheat detected by FISH (arrows) (Subbarao et al. in preparation)

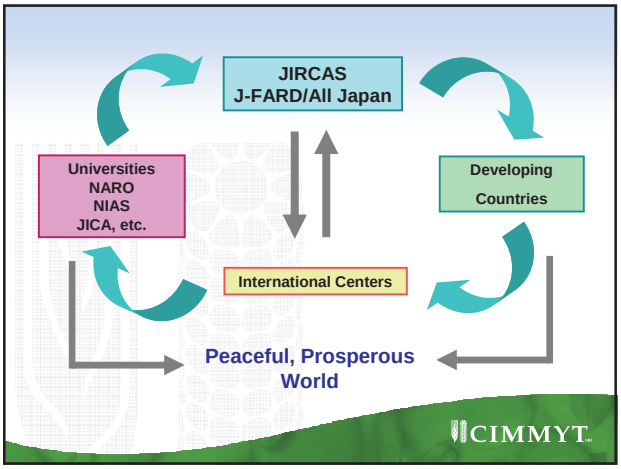
CIMMYT

What is needed?

International research-business-product development enterprise 産学官連携・国際版

- Identify needs of the international community, particularly developing countries
- Identify Japanese research outcomes and product developments that are relevant for international agriculture
- Develop a platform for collaborative arrangements

CIMMYT



CIMMYT

CIMMYT