‘A Doubly Green Revolution for the 21st Century’

Tropentag 2011: Development on the Margin
Bonn, 5-7 October 2011

Gordon Conway,
Professor of International Development, Imperial College
We Face Three Interconnected Challenges

About 1 billion people, or 1 in 6 of the world’s population, are hungry

We have to increase food production by 70-100% by 2050

The food price spikes of 2007/08 and 2010/11 will most likely be repeated.
The Ongoing Food Price Spikes
Underlying the spikes is a chronic crisis which is getting worse

- The Drivers
  - Rising populations
  - Rising per capita incomes
  - Growing demand for livestock products
  - Rising fuel and fertiliser prices
  - Growing demand for biofuels
  - Increasing water and land scarcity
  - Impact of climate change
  - Slowing of productivity increases
Who are the marginalised?

‘To be marginalized is to be placed in the margins, and thus excluded from the privilege and power found at the centre’

Smallholders - under 2 ha

- 400 – 500 million smallholders
- 2 billion people
- 33 million in Africa
- 80% of farms in Africa
In Sub-Saharan Africa

- 240 million people chronically hungry
- 380 million people live on less than $1.25 a day.
- 80 million small farms produce 80% of agricultural goods.
- In a number of small countries, agriculture represents 80% or more of export earnings.
- Women 60-80% of the labour used to produce food.
- 25% Africans live in water-stressed countries.
- Only 4% of African cultivated land is irrigated.
- 30-50% women do not have access to modern family planning methods.
The Multiplier Effect of Agriculture

A 1% gain in GDP from agriculture will generate a 6% increase in overall expenditure of the poorest 10% of the population.
Mrs. Namarunda

A single mother farming a hillside in western Kenya
An Insecure Farm

Potential harvest (tons/ha)

Survival line

1 2 3

Weeds
Pests
Drought

Months
Doubly Green Revolution

• The aim
  • repeat the success of the Green Revolution
  • on a global scale
  • in many diverse localities

• and be
  • equitable
  • sustainable
  • and environmentally friendly
Sustainable Intensification

• **More with Less**

• Increased yields but with minimal negative impact on the environment, and without using more land for cultivation.

• **Greater productivity but smaller footprint**
  – Land, water, carbon and other GHGs
We need appropriate interventions
How do we judge an intervention is appropriate?

• Does it work?
• Does it add significant value?
• Is it resilient?
• Is it equitable?
• Are there downsides?
• What is the counterfactual?
Appropriate Technologies

- Traditional
- Intermediate
- Conventional
- New Platform Technologies
A Javanese Home Garden
Treadle pump and drip irrigation
Wamalwa Farm, Siritanyi FFS, Kanduyi. Maize-groundnut intercrop providing 5330 kg maize and 1203 kg groundnut per ha. These results indicate that MBILI can produce significant food surpluses.

Rasike Farm, Chililila WG. MBILI maize-soyabean intercrop providing 1215 kg maize and 545 kg soyabean per ha when conventional intercrops failed. These results indicate that MBILI is a means toward greater food security.
Conventional Technologies

but more precise
Microdosing in Niger
Controlling Striga

- 2.4 m ha
- $380m loss
- Maize resistant to Imazapyr
- Coat seed, herbicide kills Striga
- BASF, Weismann. CIMMYT, IITA, NARS, NGOs
New Platform Technologies

Biotechnologies

Nanotechnologies

Information and Communication Technologies
The New Rices for Africa

Monty Jones
2004
Uganda
GM Bananas resistant to wilt in Uganda

- $500 million losses a year in Uganda
- Academia Sinica provided sweet potato gene
- Successfully transferring to bananas in Uganda government laboratory
Part of the answer lies in Appropriate Science and Technology

But there are no silver bullets

Must be combined with an enabling environment and appropriate governance
An Enabling Environment consists of the sum total of:

- the macroeconomic policies that favour markets and trade,
- the provision of inputs
- related **physical infrastructure** (such as roads and irrigation) and
- **social infrastructure** (education, research etc),
- and accompanying **institutions and regulations.**
- etcetera
An Enabling Environment

**Rural Economy**

- National trade
- Regional trade
- Local trader
- Connectivity
- Seed Co
- Fertiliser Co
- Agro dealer
- Banks for microcredit

Farm Household in the local community

Model of Alliance for a Green Revolution for Africa (AGRA)
Governance for Enabling Environments

• Appropriate macroeconomic policies
• Significant investment in infrastructure, research, extension, education
• Security of tenure
• Minimal corruption
• Efficient and fair markets
• Supportive environment for SMEs
We also need to cope with Climate Change
All this progress is threatened by Climate Change

- Higher temperatures
- Greater & more intense rainfall
- Greater droughts
- River bank erosion
- Rising sea levels
- More intense cyclones
- Salt water incursions
More than 5% reduction in length of growing period

Ave. Annual Max Temp > 30°C

By 2050

Options to Combat Drought

- **Drought tolerant varieties and breeds**
- **Drought resilient cropping and farming systems**
- **Drought resilient livelihoods**
- **Small-scale sustainable water supplies**
Chaperone Genes to the Rescue

• Genes from Bacterial RNA

• Confer tolerance of stress – cold, heat and water

• Allow plants to rapidly recover from stress

• No yield penalty when stress free

• No water 10-14 days before flowering
  
  – 50% reduction in growth compared to well-watered
  – 12% - 24% increase in growth for those with chaperone gene
Agriculture as a Mitigator

Figure 7.1 GHG emissions in 2000, by source

- Industry (14%)
- Power (24%)
- Other energy related (5%)
- Waste (3%)
- Transport (14%)
- Agriculture (14%)
- Buildings (8%)
- Land use (18%)

Total emissions in 2000: 42 GtCO2e.
Energy emissions are mostly CO2 (some non-CO2 in industry and other energy related).
Non-energy emissions are CO2 (land use) and non-CO2 (agriculture and waste).

Source: WRI (2006)
Win-win Solutions
Conservation Farming in Zambia
THIS IS THE FUTURE

2-4 tonnes C /ha

Maize farming in a *Faidherbia* agroforest in Mbarali District, Southern Highlands, Tanzania. 2008

Photo: Saidi Mkemwe
How do we build Resilient Livelihoods?
The Virtuous Circle

• As agriculture develops – greater yields and production of subsistence and cash crops – smallholders become more prosperous. The landless also benefit through wage labour. Chronic hunger decreases.

• The rural economy also grows – through the creation of small rural businesses - providing more employment and improved rural facilities, especially schools and health clinics. Roads and markets develop. The rural economy connects to the urban economy and to the growing industrial sector.

• Free trade provides opportunities for greater imports and exports. High value agricultural exports accelerate agricultural development, further intensifying the virtuous circle.
Thank you

For more info on Ag4Impact, go to: www.imperial.ac.uk/africanagriculturaldevelopment

Contact: g.conway@imperial.ac.uk

Conway, G. ‘A Billion Hungry: Can we feed the world sustainably?’
To be published in summer 2012