

# Fertilizer and Global Food Security

By  
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Presented at the  
**6<sup>th</sup> National Fertilizer Conference**  
***“Towards Increased Use of Fertilizer and Improved Seed  
for Food Security and Economic Growth”***  
August 20-21, 2009  
Nairobi, Kenya

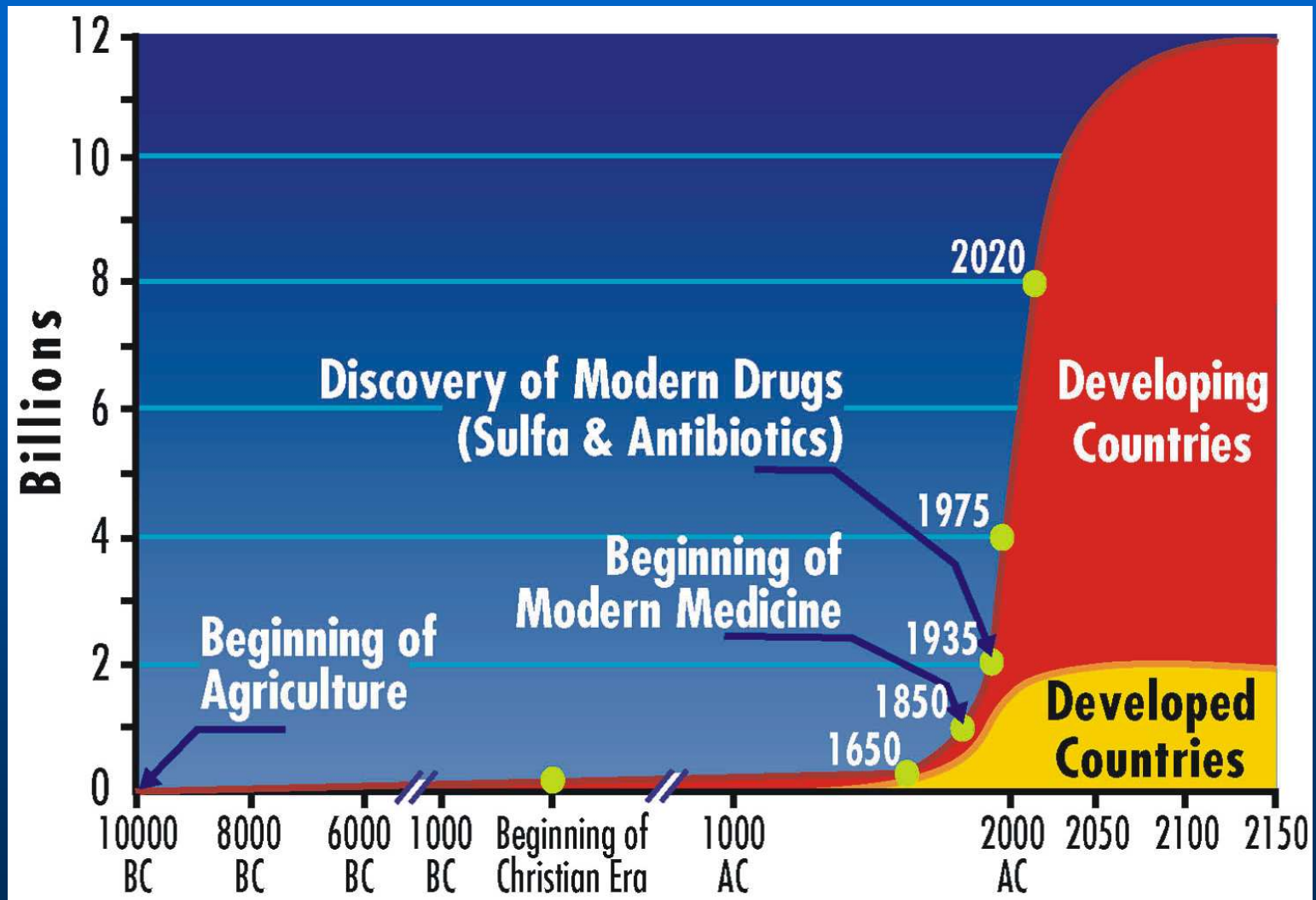
# Contents

- Population, Fertilizer and Food
- Population and Diet
- Resource Constraints
- Biofuels
- Africa
- Short- and Long-Term Options for Africa
  - Fertilizer procurement and distribution
  - Site & Crop Specific Nutrient Management
  - Policy Interventions—Rwanda Auction/Voucher
- Conclusions

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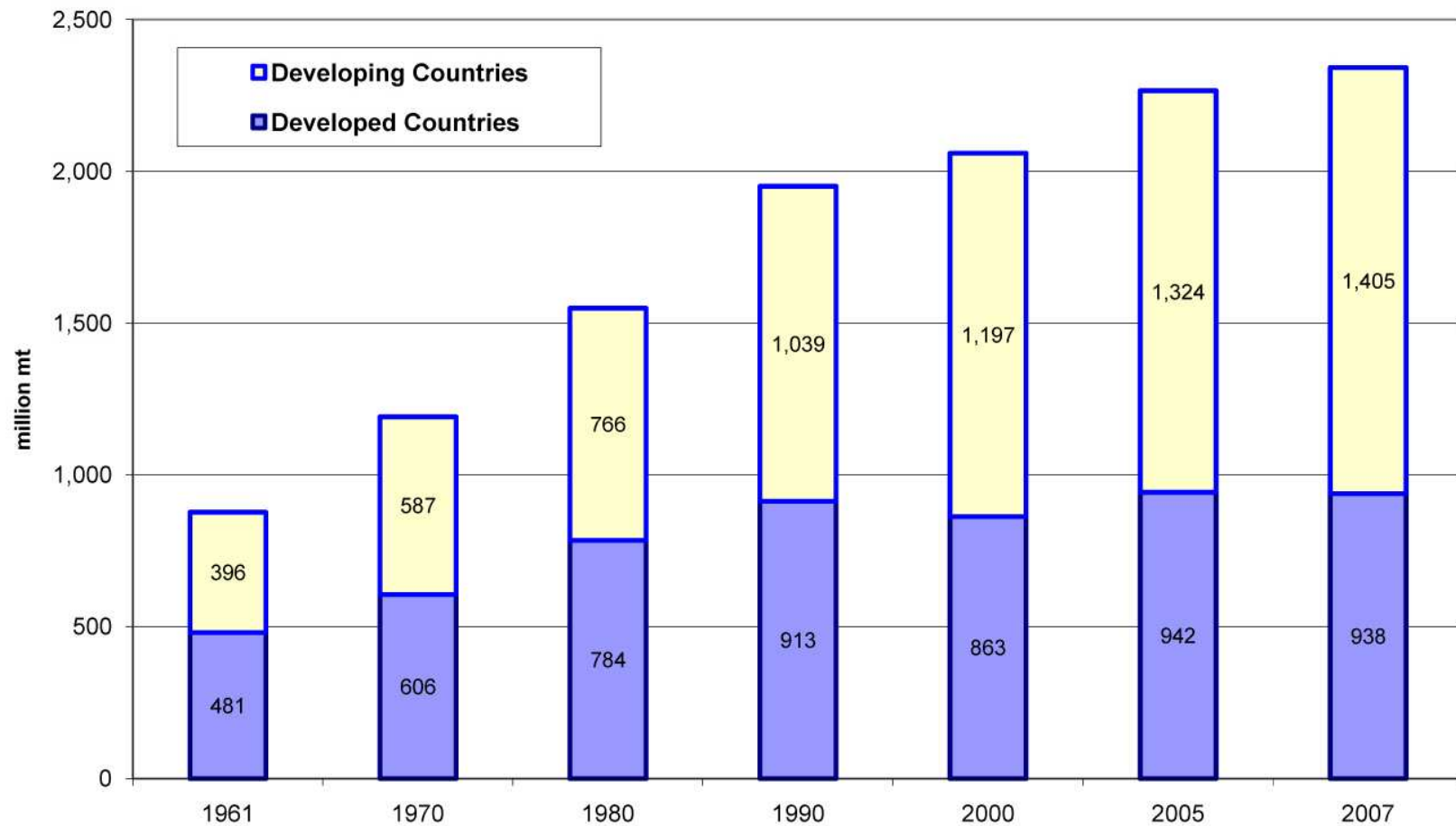
# World Population Growth



# Fertilizer(s)

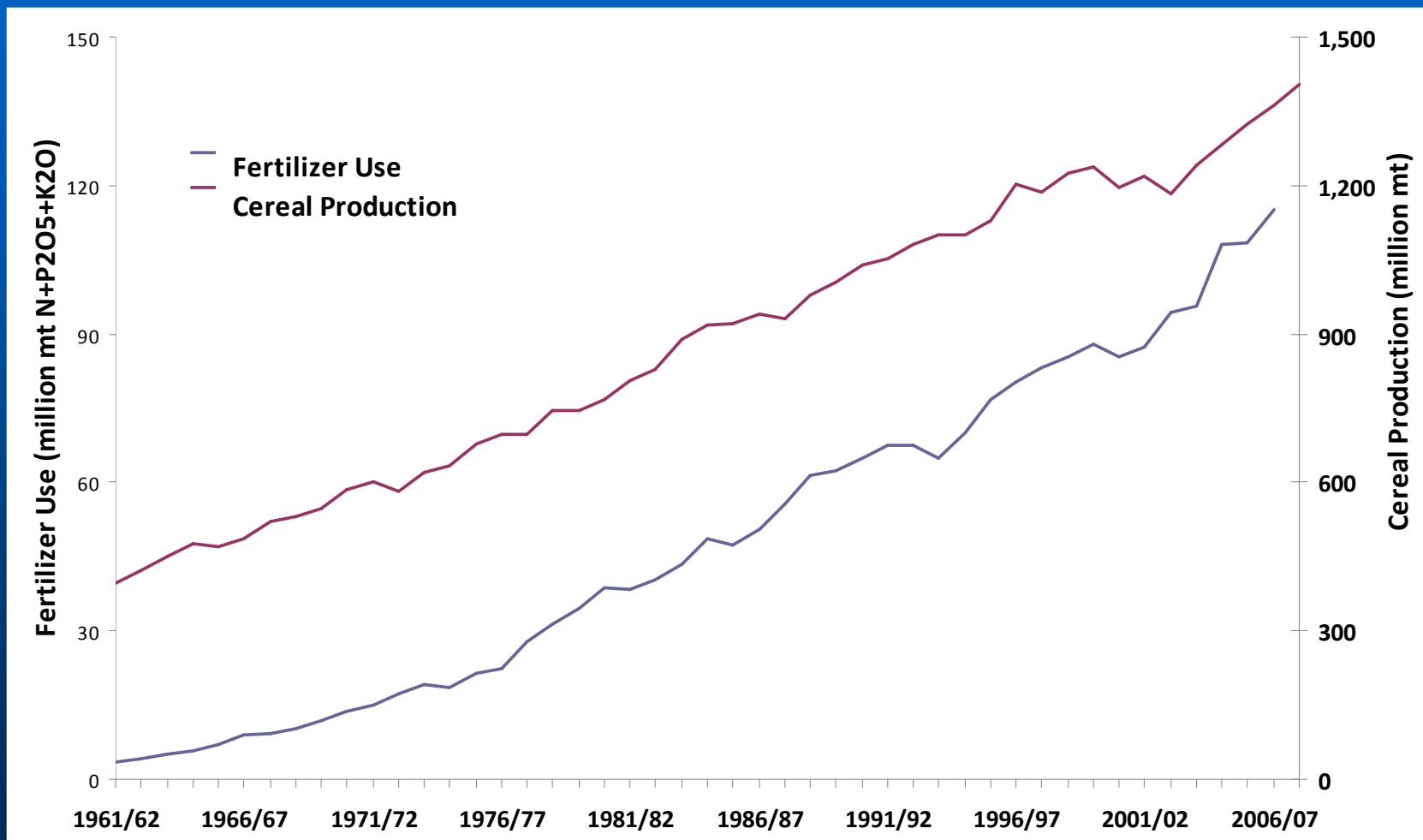
- Provide plants with nutrients for growth and development
- Increase agricultural outputs, soil organic matter
- Result in less extensive land use
- Integral part of 'Green Revolution'
- Catalyst for economic growth and development

# Cereal Production in Developed and Developing Countries, 1961-2007



Source: Derived from FAO data.

# Developing Countries: Total Cereal Production and Total Fertilizer Use, 1961/62–2007/08



# Looking Back

- Food production per person increased by 30% over past 5 decades, despite doubling of population
- Discontinuous productivity rise
- Major role for technology
  - Variety improvement (rice, wheat, maize)
  - Fertilizers
  - Mechanization
  - Irrigation
  - Biocides
- Proper institutions in place



**But Can We Sustain and  
Provide for 9 Billion...?**

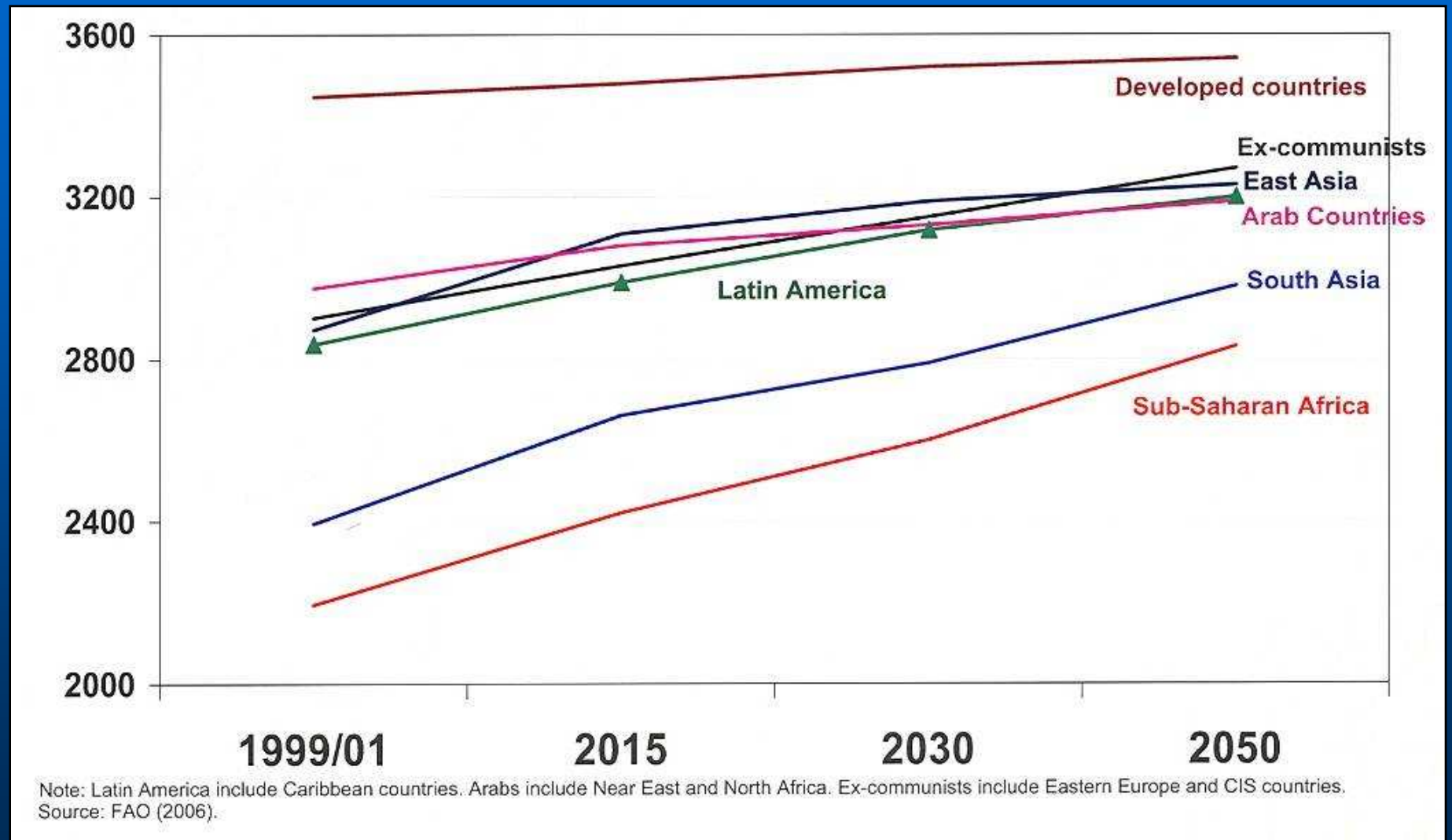
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# Growth and Changes in Demand for Food

- **Population growth**
  - 75 million per year
  - Over 9 billion by 2050
  - 95% of growth in developing countries
  - Highest growth: absolute in Asia, relative in sub-Saharan Africa
  - Urban population in developing world to double in 25 years

# World Per Capita Food Consumption (kcal/person/day)



# Global demand for food

World population increase

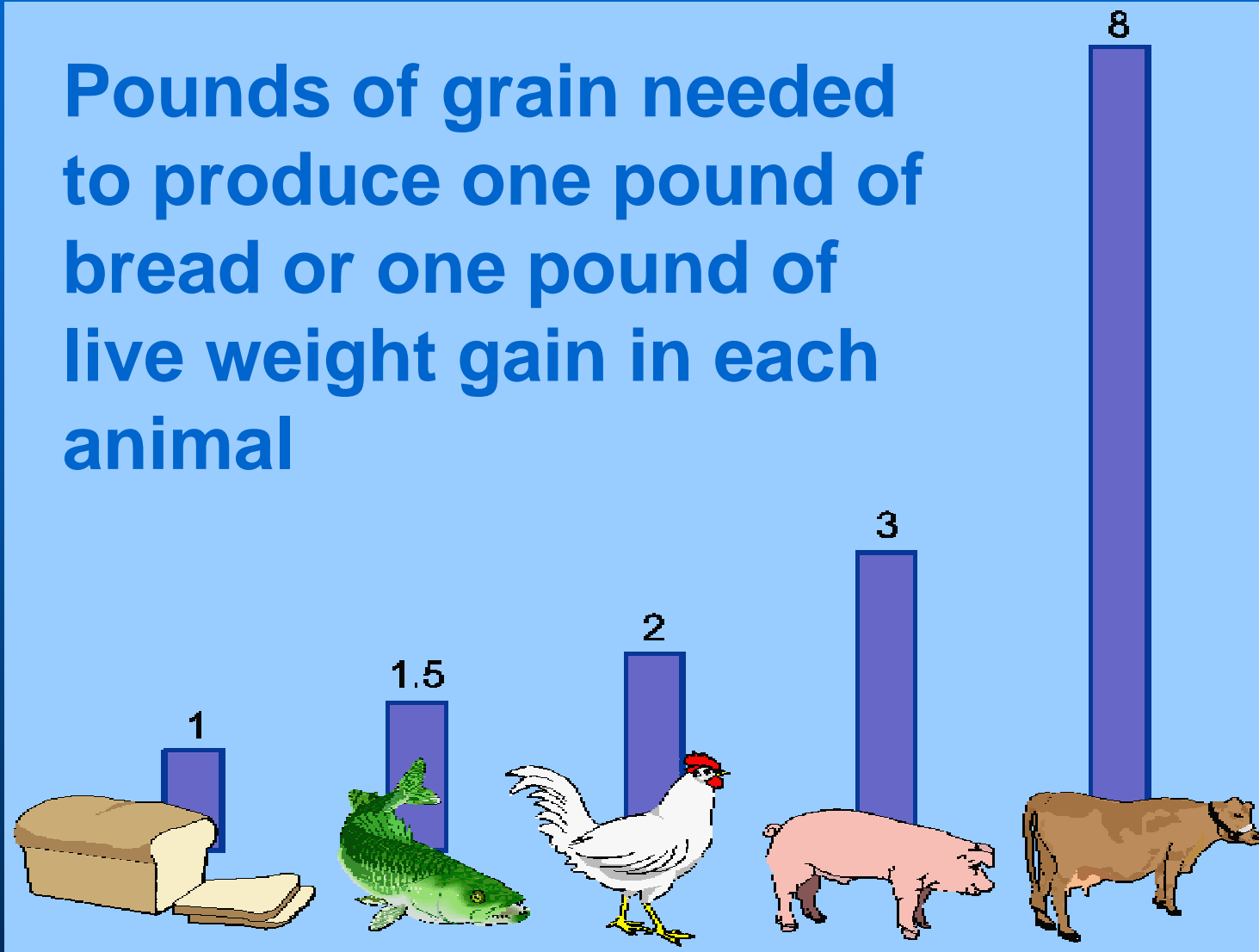
2000: 6 000 000 000

2050: >9 000 000 000



Increasing wealth → meat consumption increases

Pounds of grain needed to produce one pound of bread or one pound of live weight gain in each animal



# Agro Production Area

- 2 m<sup>2</sup> for 10 roses per week
- X 100 m<sup>2</sup> for a vegetarian diet
- X 1000 m<sup>2</sup> for a diet with meat



**One kg of beef requires 15  
times more water to  
produce than one kg of  
wheat**



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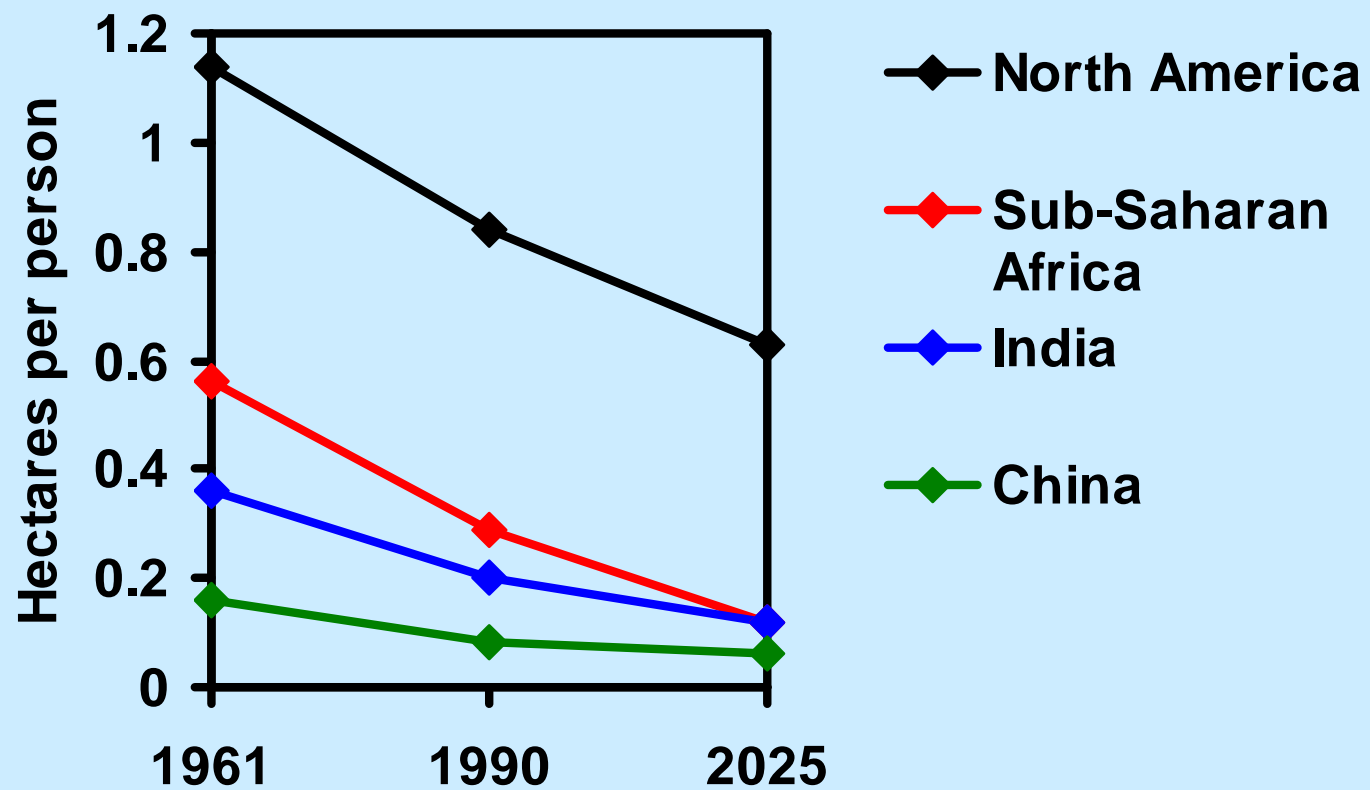
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# Resource Constraints

## ■ Land Constraint

- Arable land areas may increase in some countries but will decrease in most
- Gains will be offset by losses due to land degradation and urbanization

# Availability of Arable Land Per Person

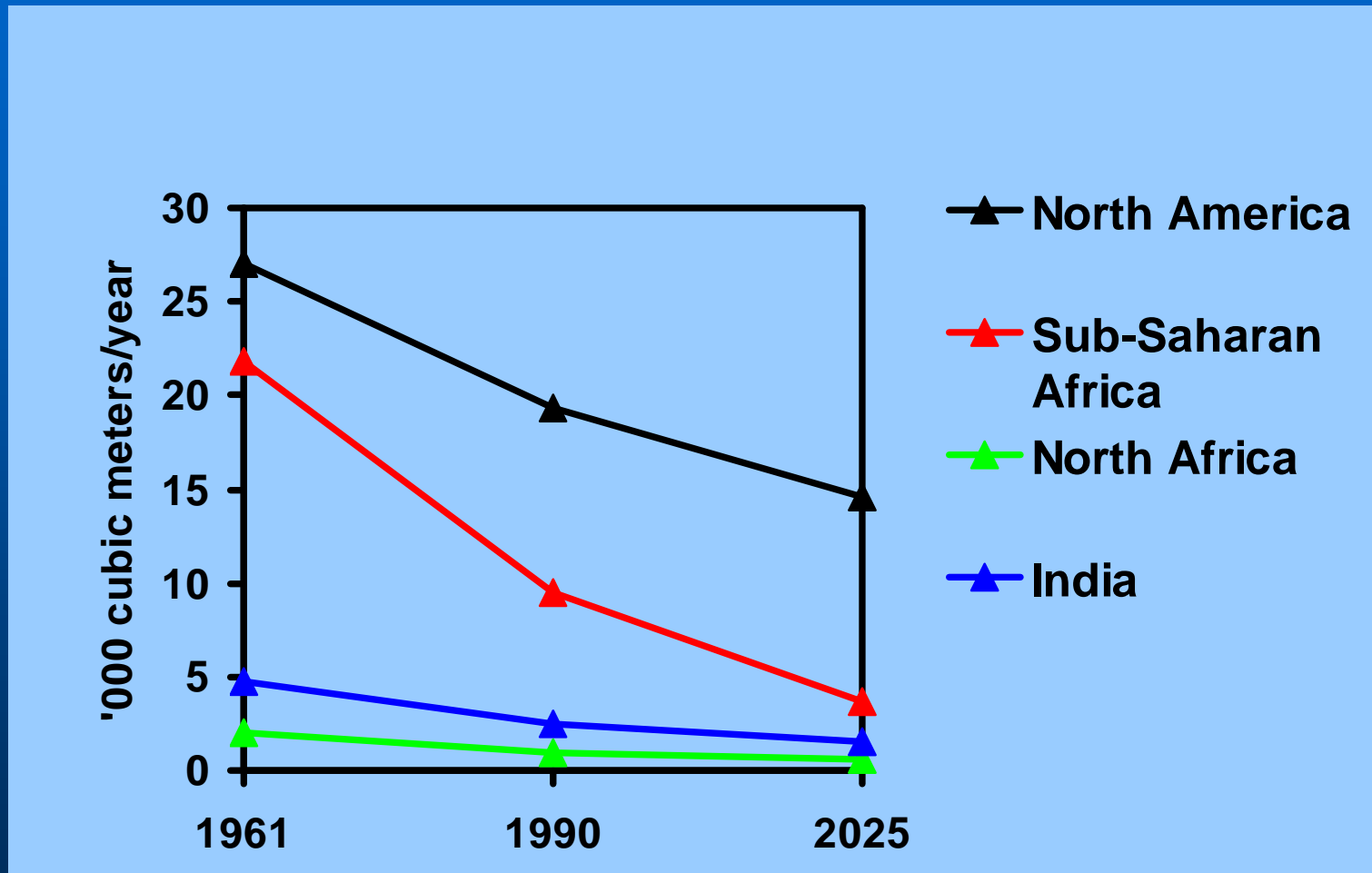


# Resource Constraints

## ■ Water Constraints

- Globally agriculture accounts for 70% of water used
- Considerable disparity in water availability among regions and sub regions
- People living in water-scarce countries will increase from 245 million (2000) to more than 850 million (2025)

# Availability of Fresh Water Per Person



# Any water?

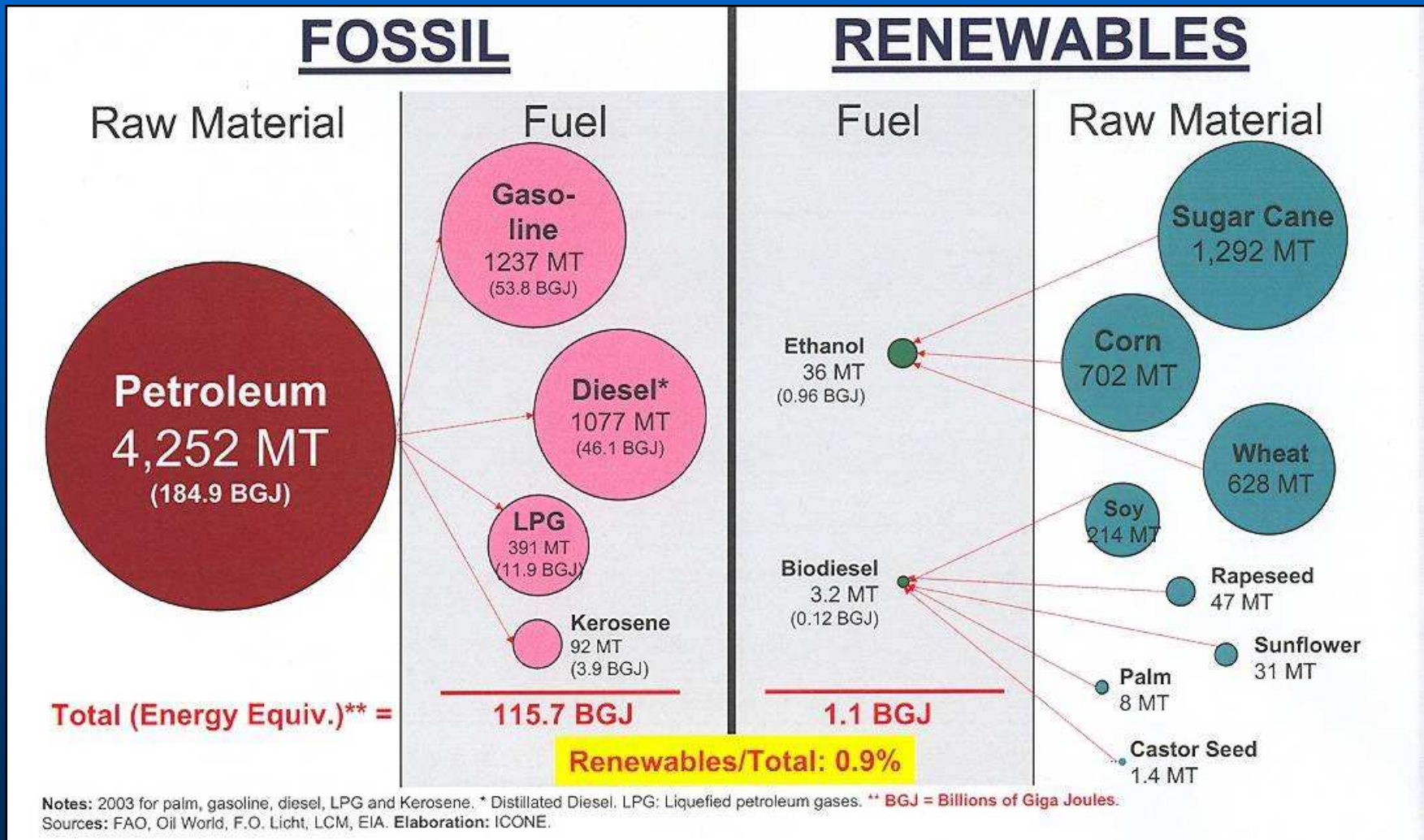


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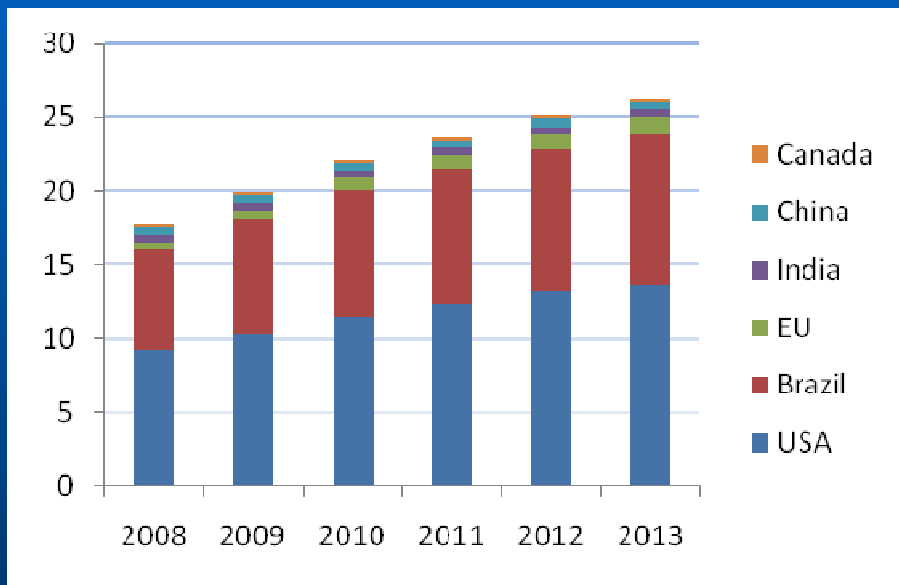
# World Production (million tons, 2005)



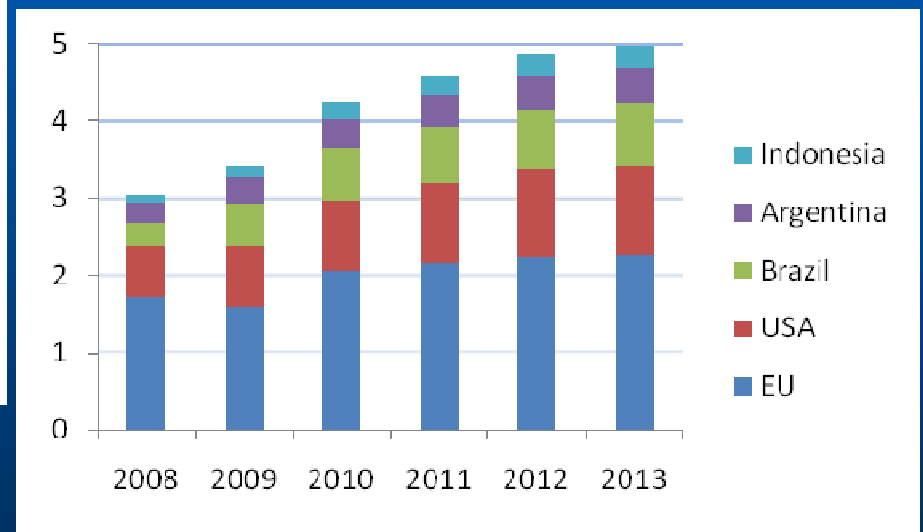


# Feeding the World while Producing Biofuels

Ethanol (Bgal)



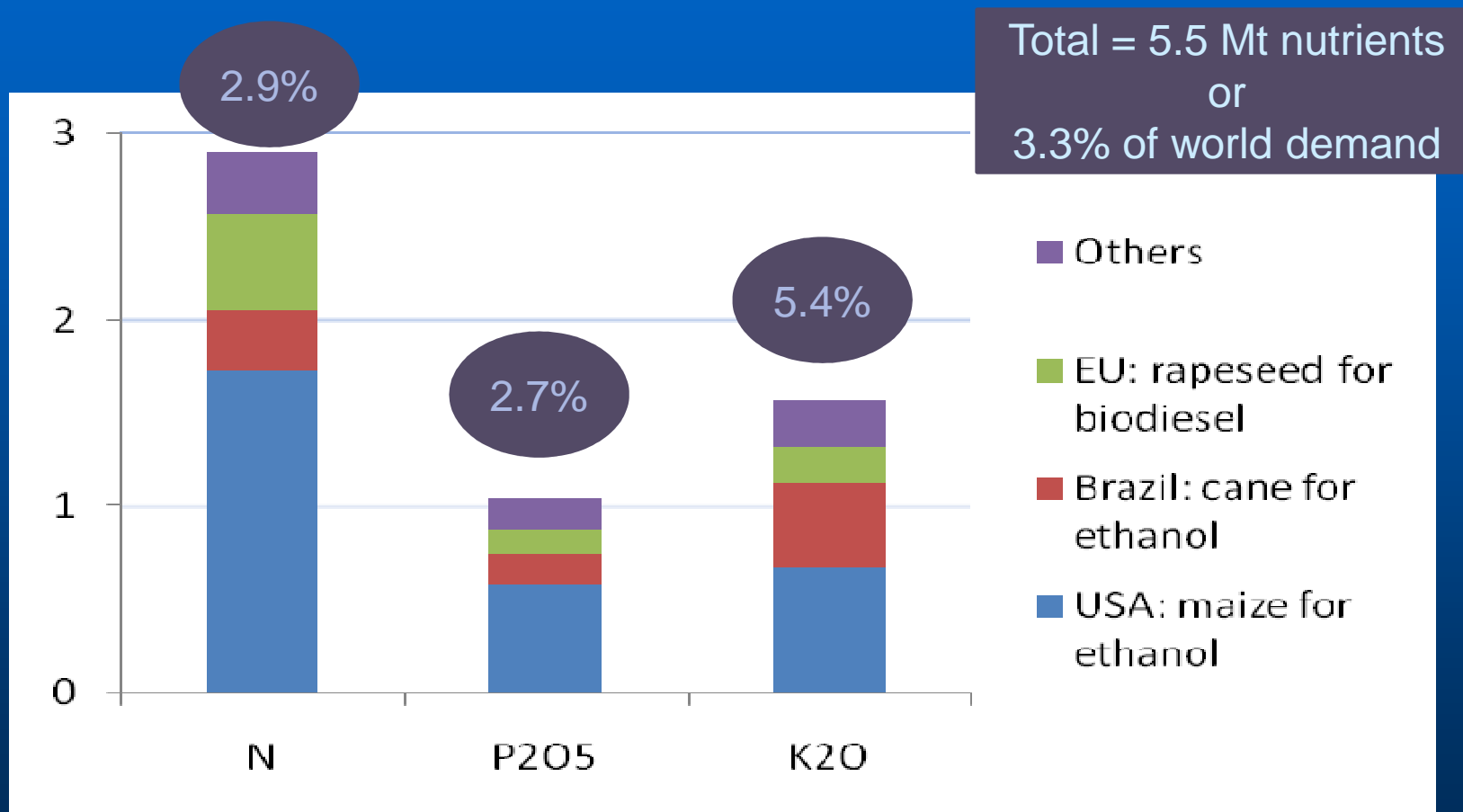
Biodiesel (Bgal)



Source: FAPRI

# Estimates of Global Fertilizer Use on Biofuel Crops: 2007/08 (Mt nutrients)

Source: IFA



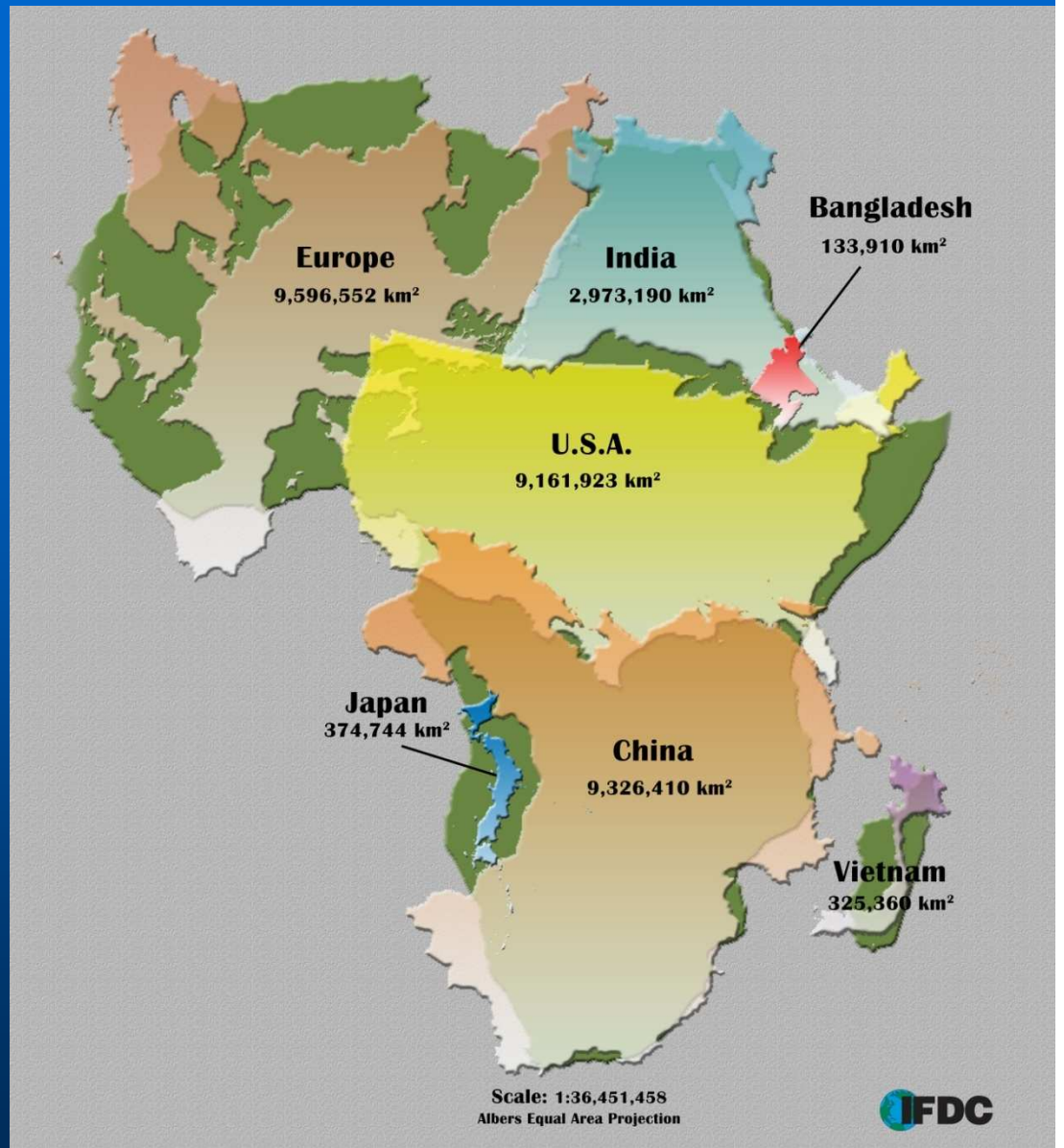
**Global climate change and  
declining soil fertility adds to the  
challenges to food production**

**Increasing Population, Changes in Diet,  
Biofuels production Land and Water  
Constraints Climate change and Soil  
Health will Require Agriculture to be  
more Adaptive Efficient and Productive**

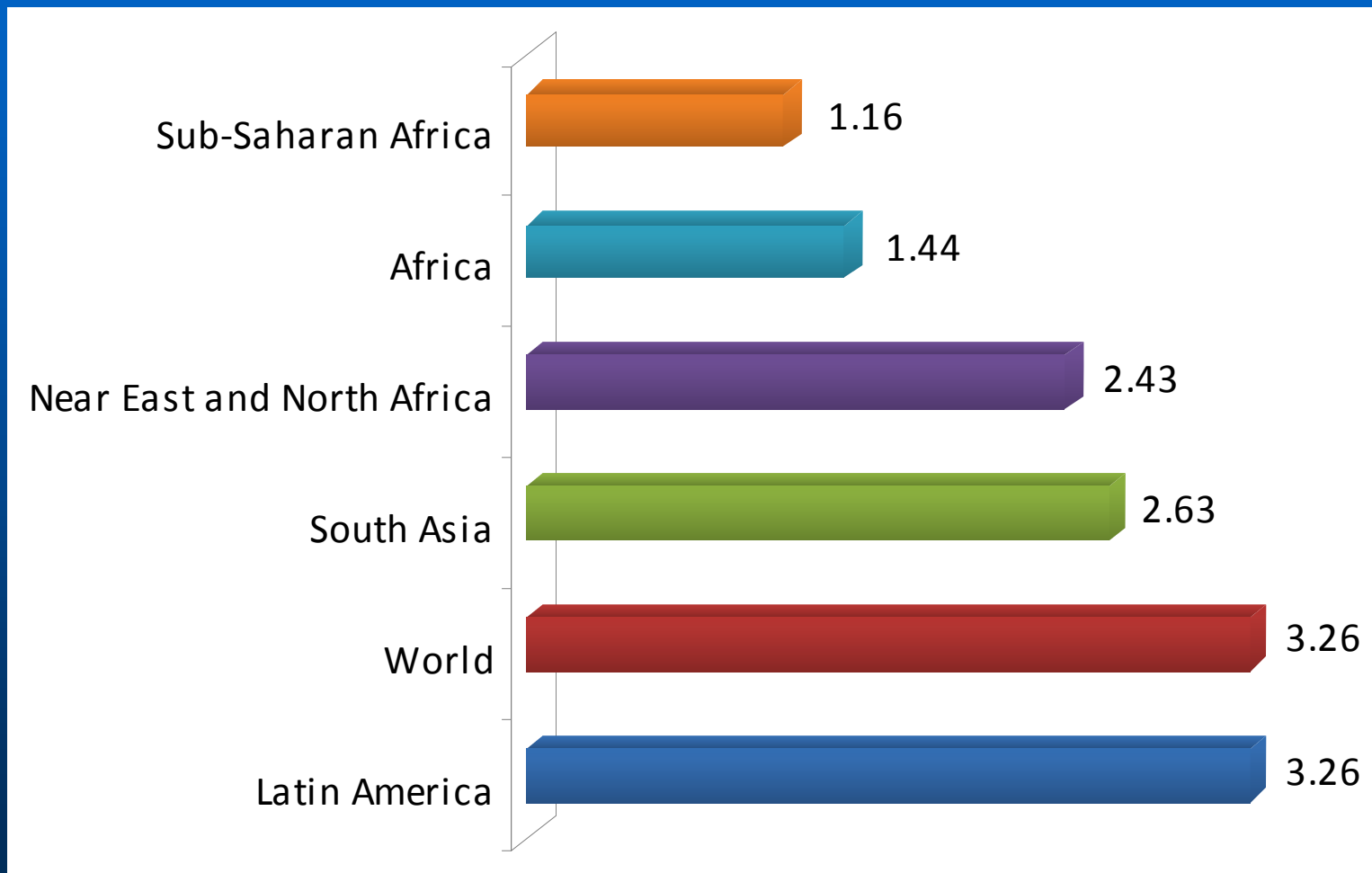
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# The Enormity of Africa

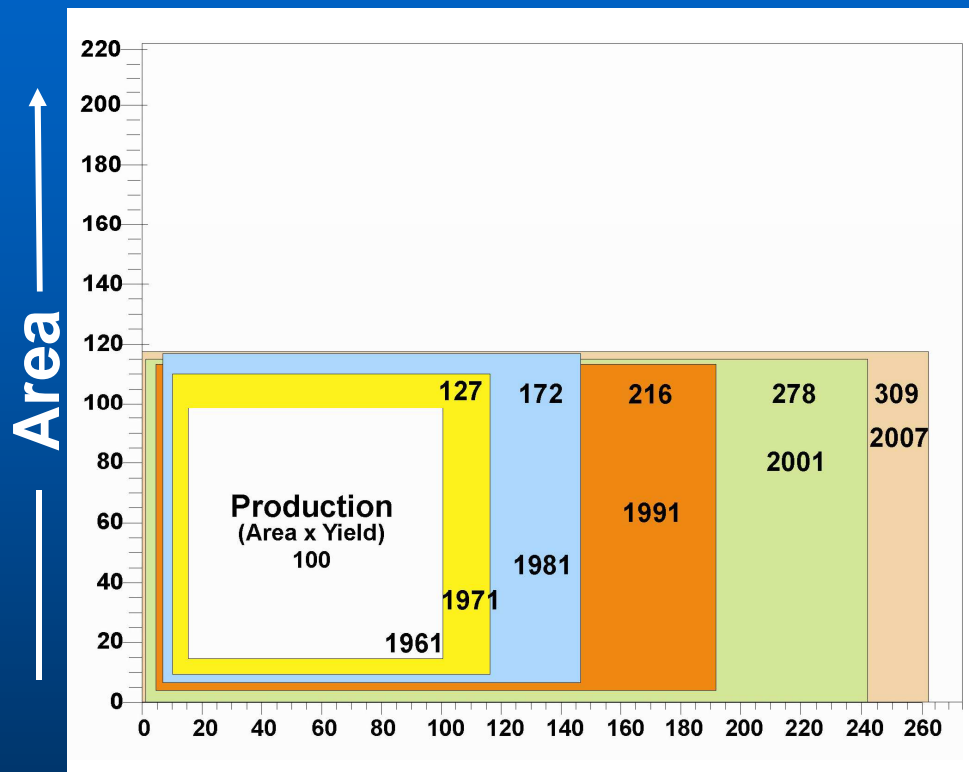


# Cereal Yields Per Hectare by Regions, 2006/07 (mt/ha)

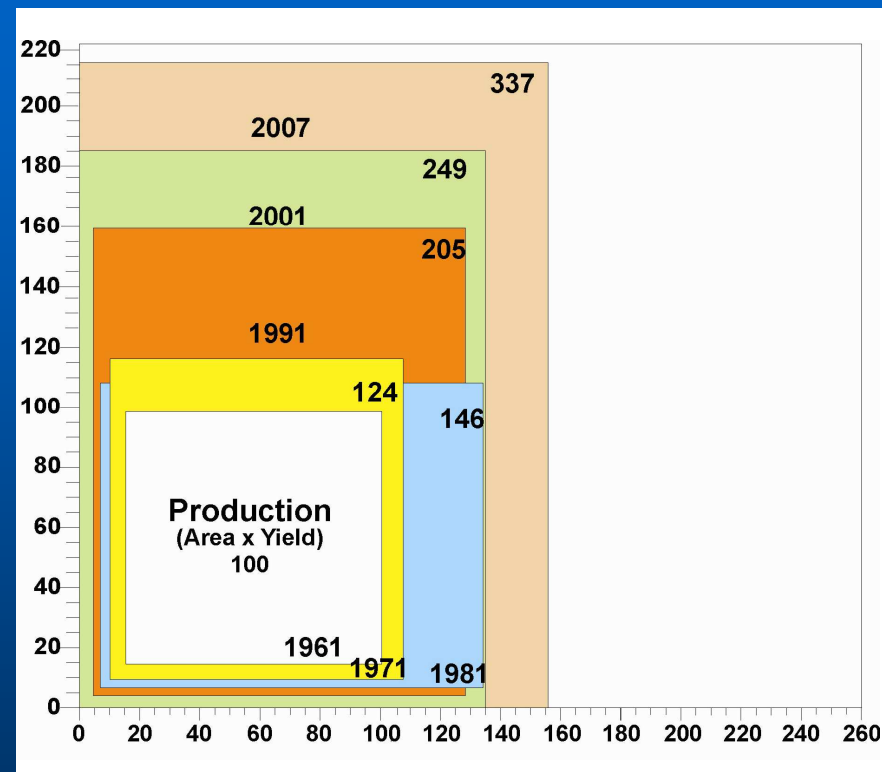


# Cereal Production, 1961–2007

(Index: 1961 = 100)



*South Asia*

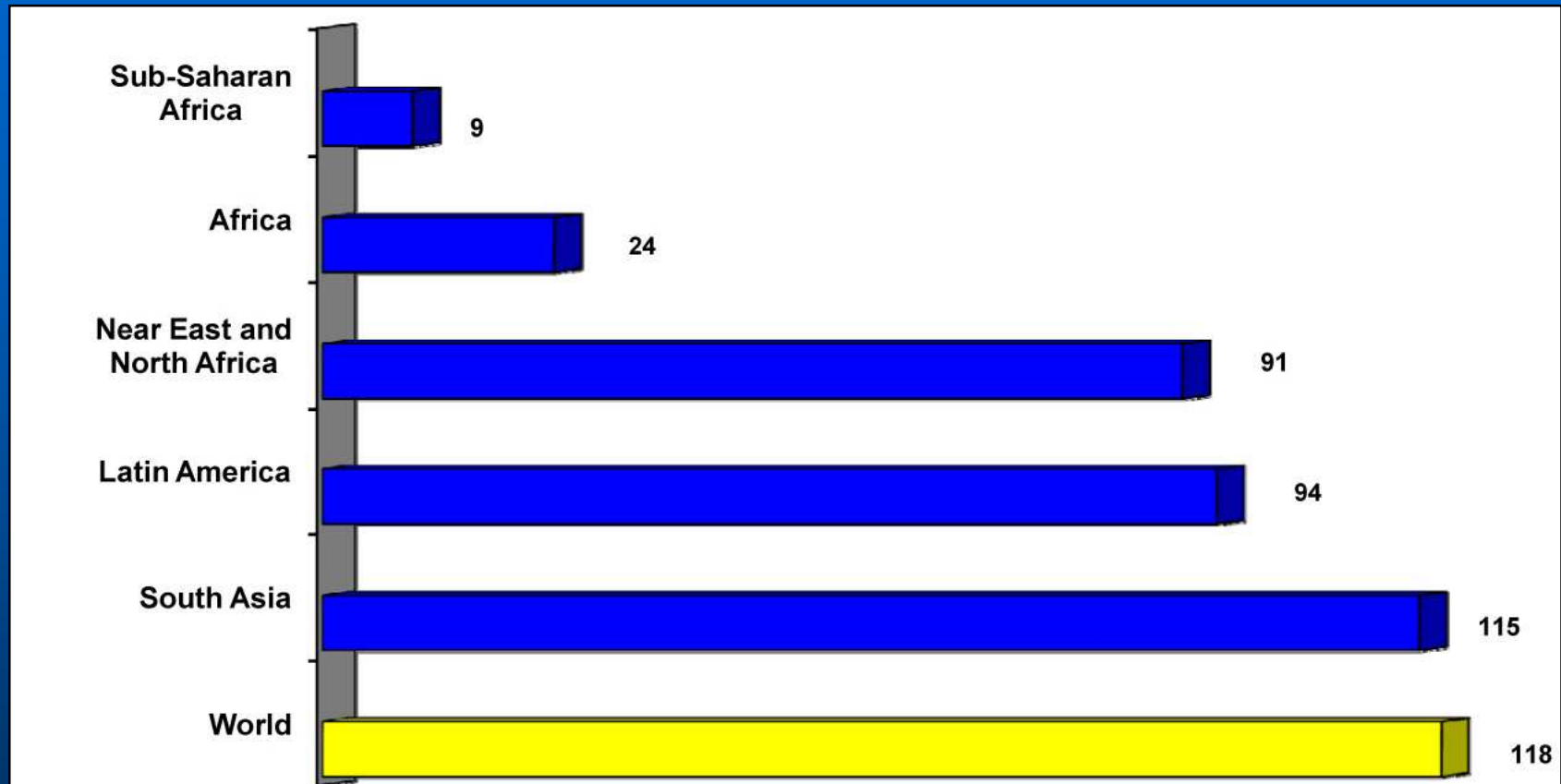


*Sub-Saharan Africa*

Derived from FAO data.



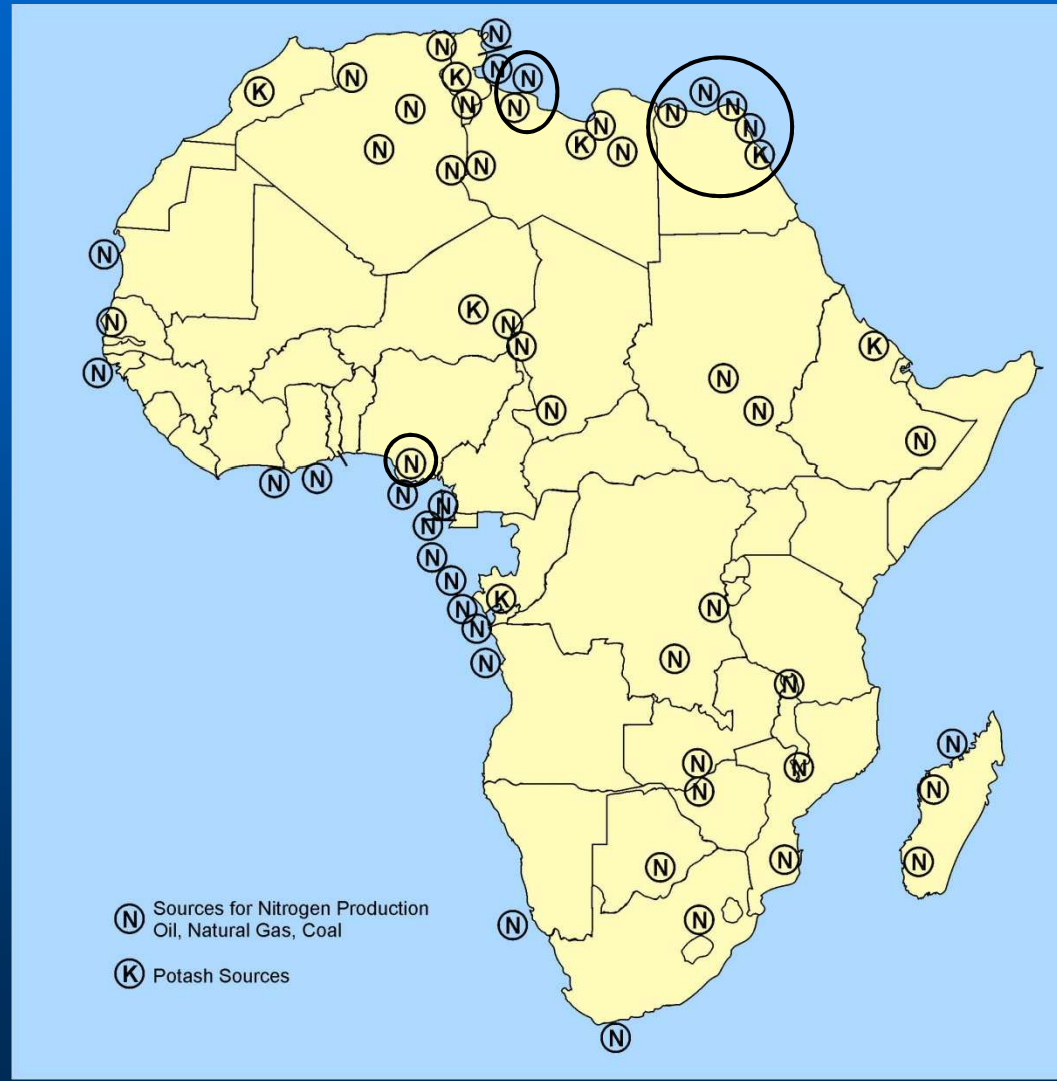
# Africa Has Lowest Per Hectare Use Fertilizers (kg/ha)



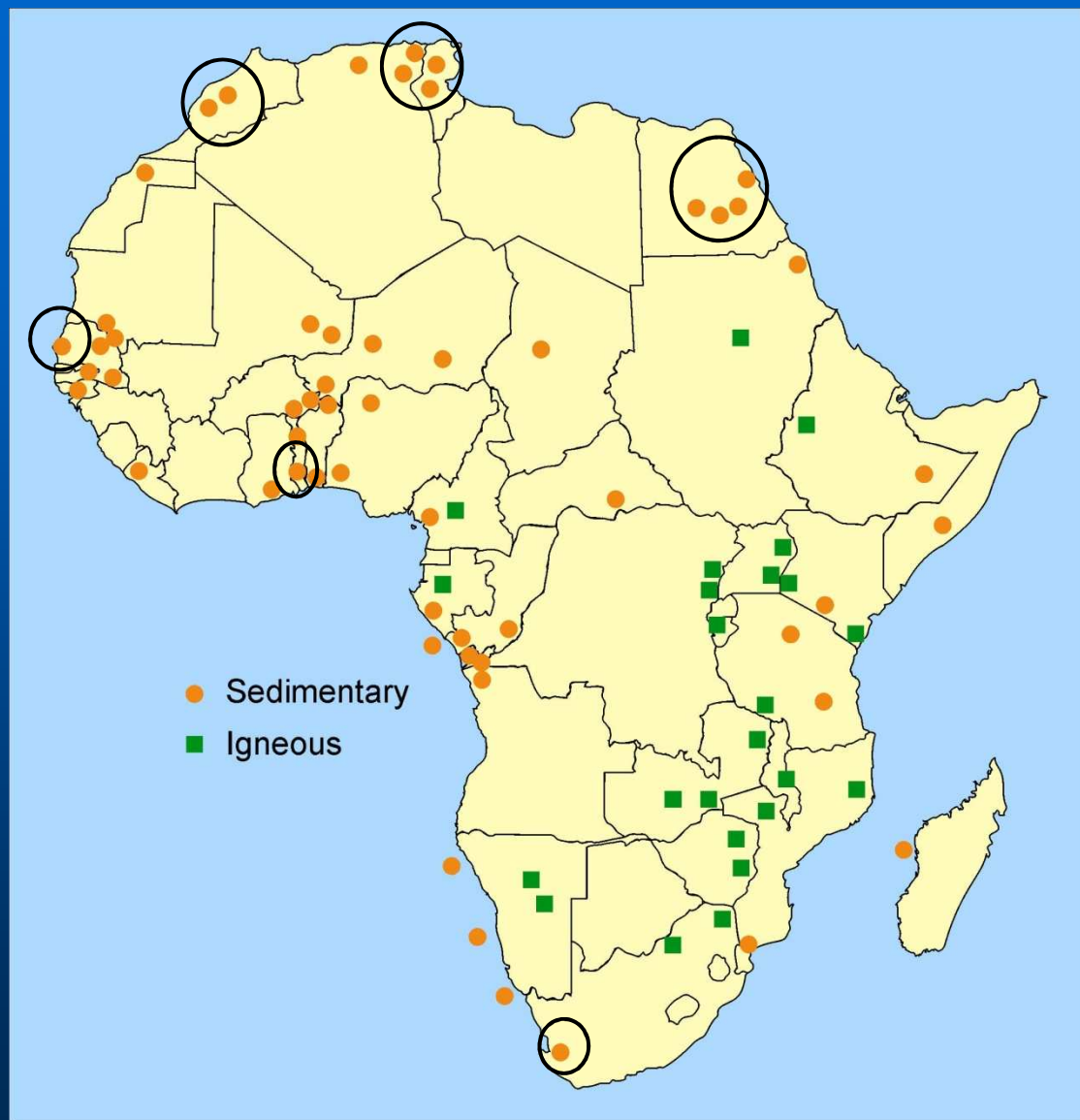
Source: Derived from FAO data.

**Continent in need of fertilizer is  
well endowed with fertilizer  
resources.**

# Significant Potential Nitrogen and Potash Resources of Africa

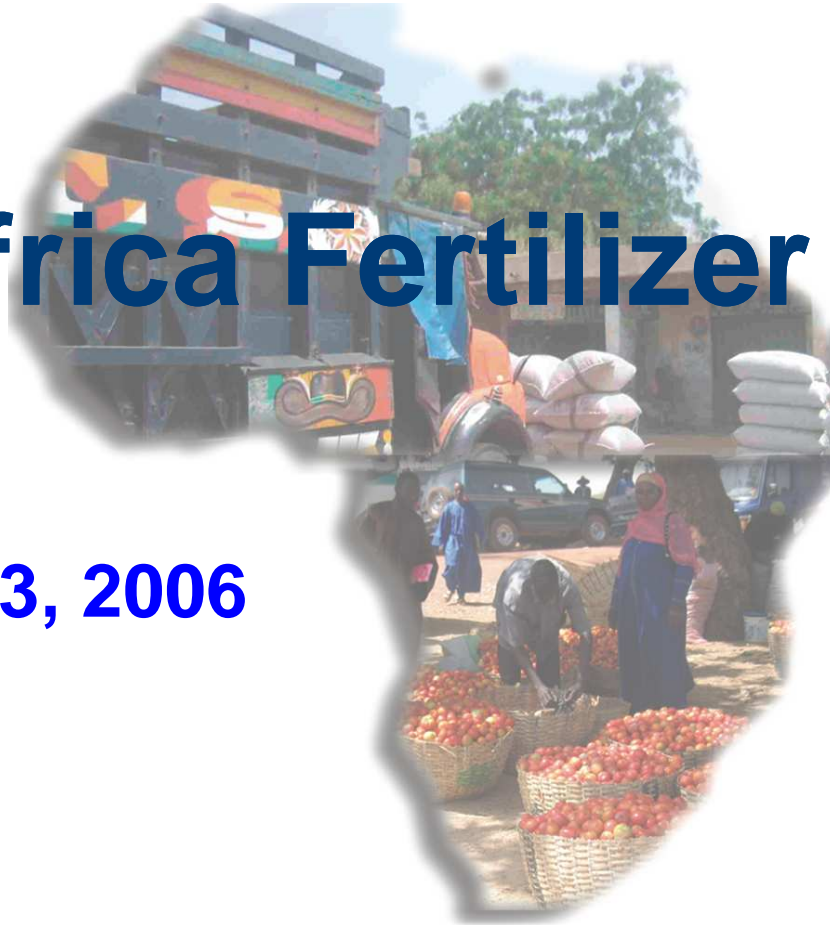


# Significant Phosphate Deposits of Africa



# The Africa Fertilizer Summit

June 9 – 13, 2006



# Abuja Declaration

**Fertilizer is Crucial for Achieving  
an African Green Revolution**

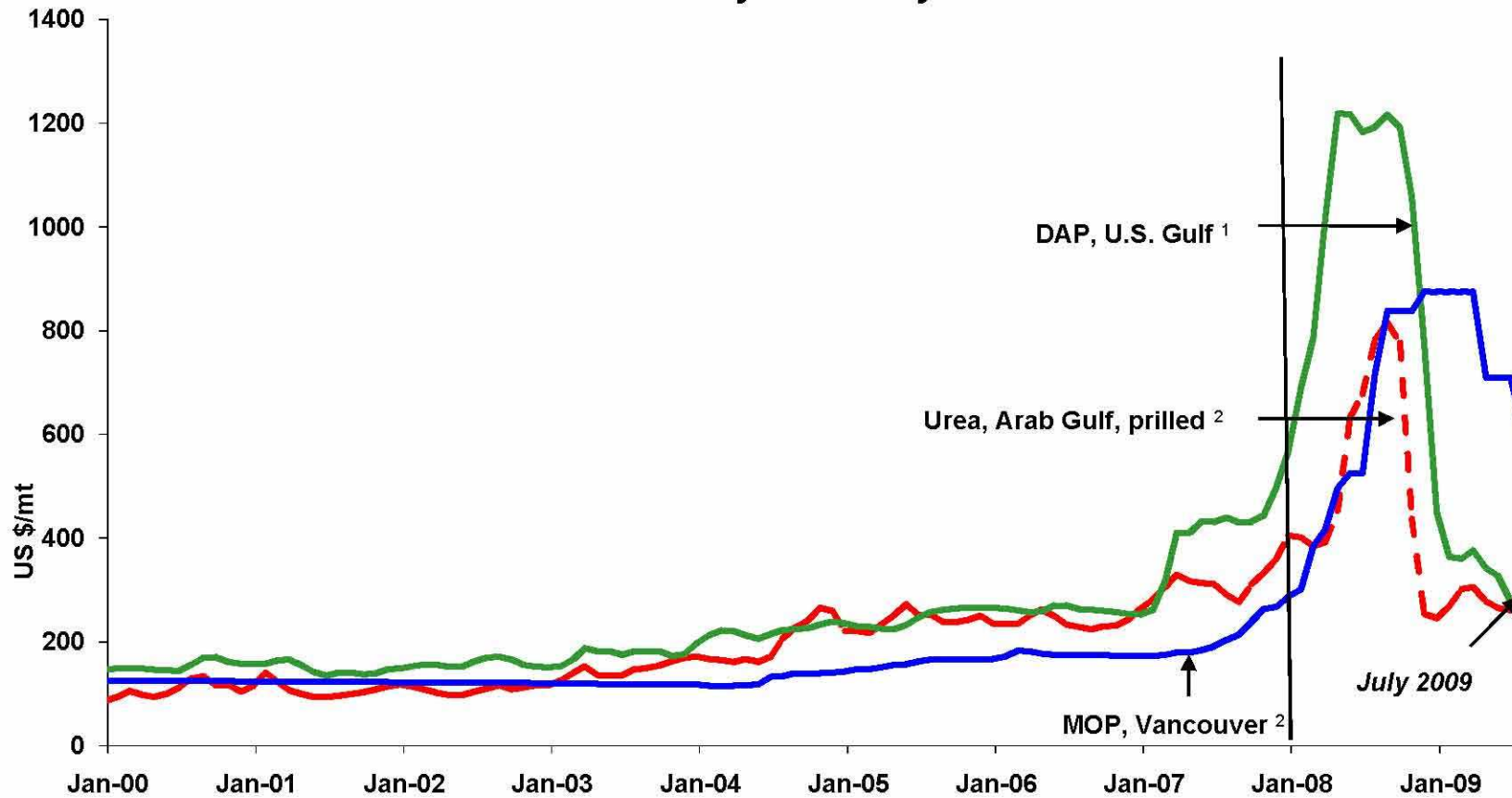
**Fertilizer is a Strategic Commodity  
Without Borders**

***Twelve Resolutions Adopted***

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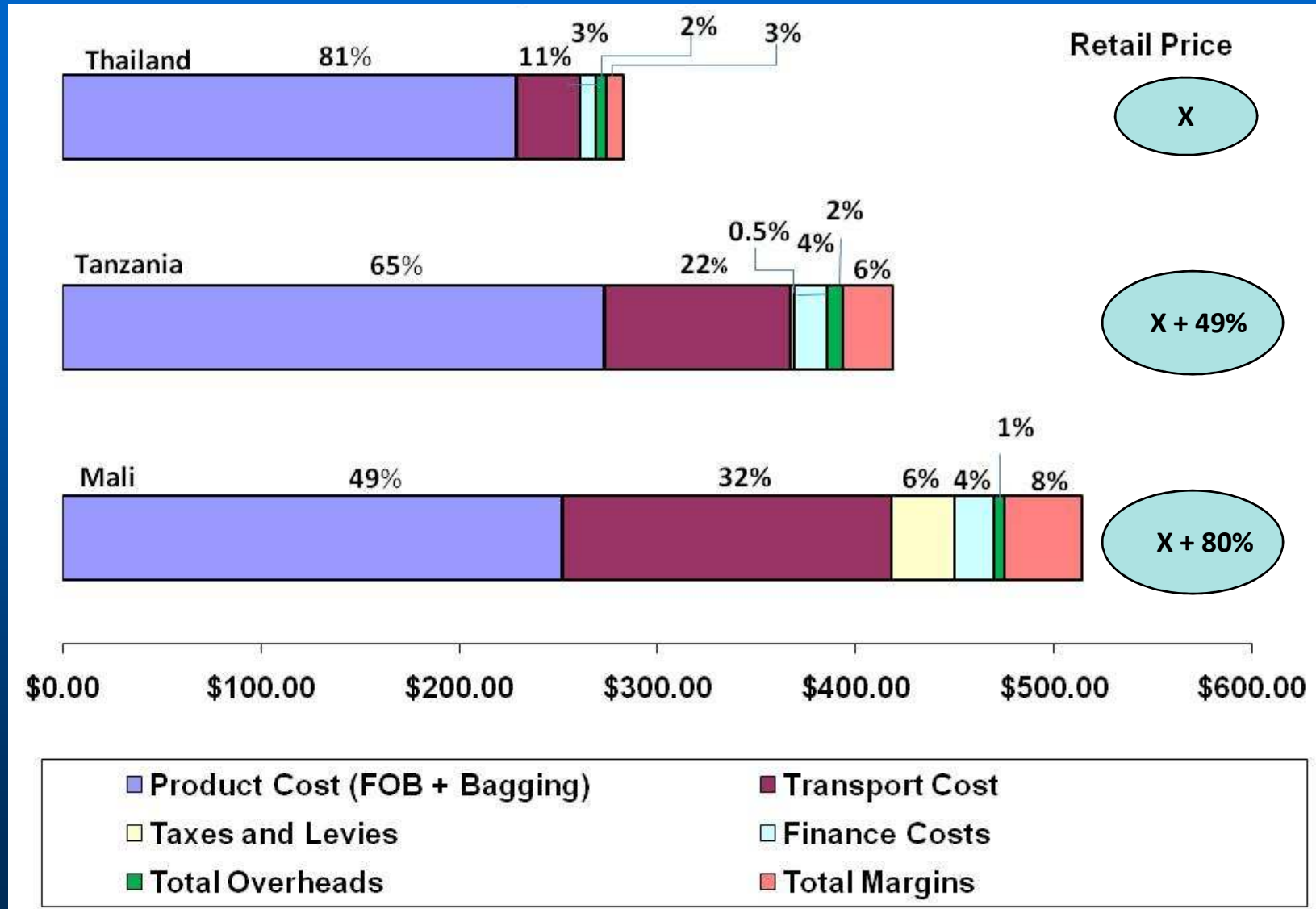
Fertilizer Prices  
(FOB, bulk)  
Monthly Averages  
January 2000 - July 2009



1. Derived from *Green Markets*. 2. Derived from *FMB Weekly*.



# Fertilizer Price Formation: Thailand vs. Sub-Saharan Africa

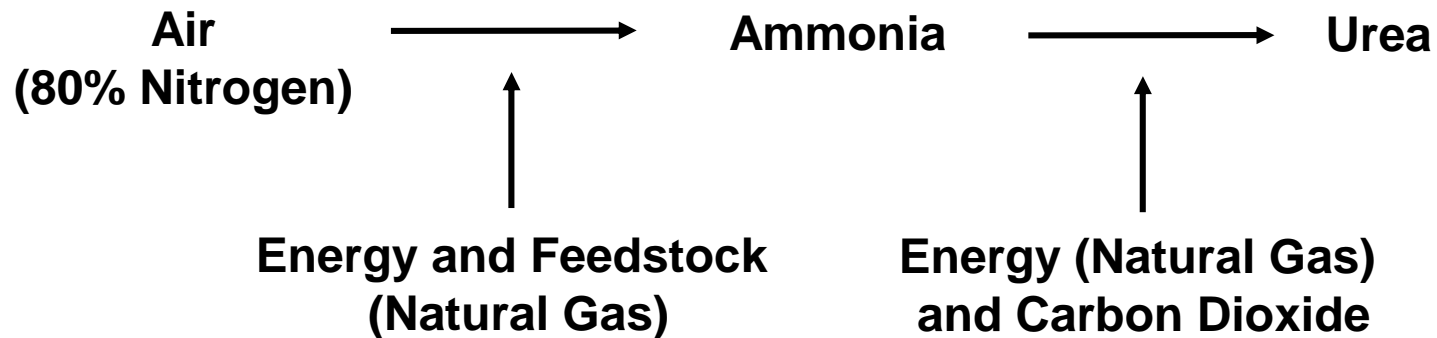


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# *Nitrogen Use Efficiency*

# Nitrogen



**One Ton Urea Requires Energy  
Contained in 4 Barrels of Oil**

2 out of 3 bags of Urea  
lost for split application  
in Wetland Rice



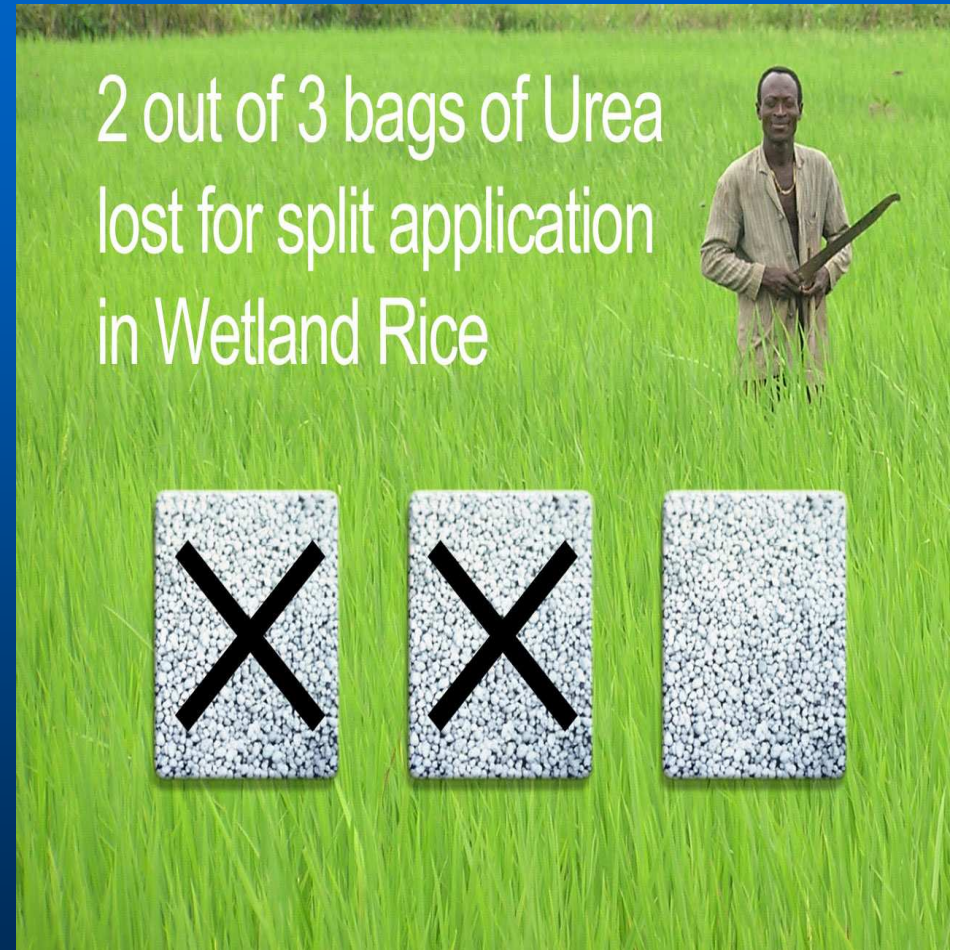
# A Simple Technology

## *Urea Deep Placement*



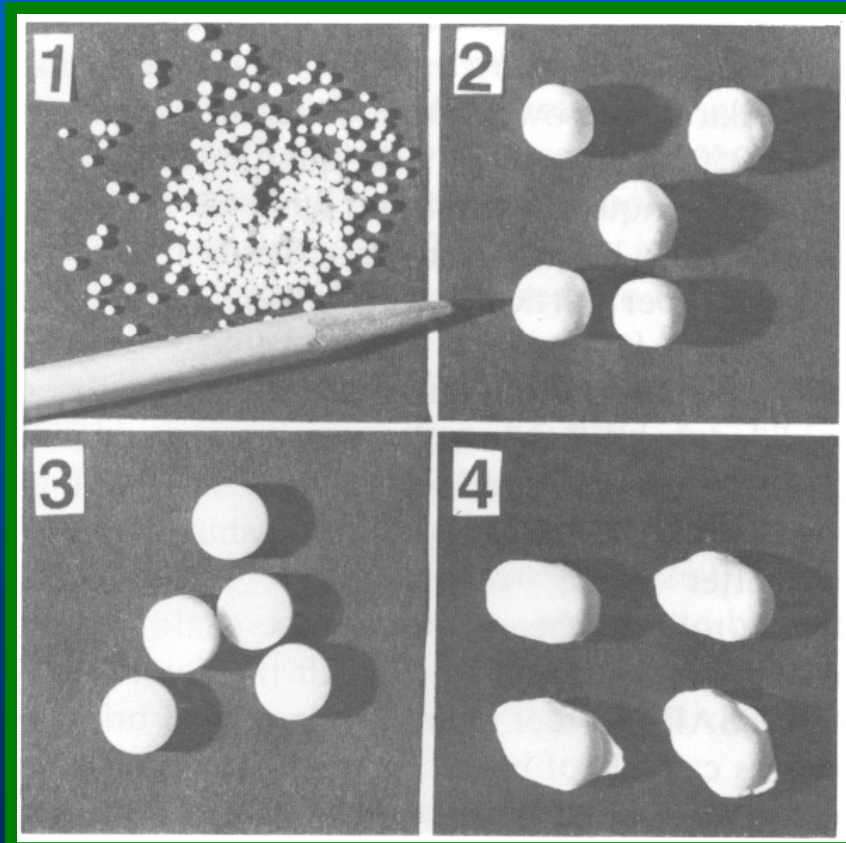
# UDP: Background and Benefits

- 1-3 g briquettes, in root zone at transplanting
- Slower release = nutrient use efficiency improves
- Expanded in Bangladesh, and Introduced in Central and West Africa



# Prilled Urea and USG

Prilled Urea



Spherical

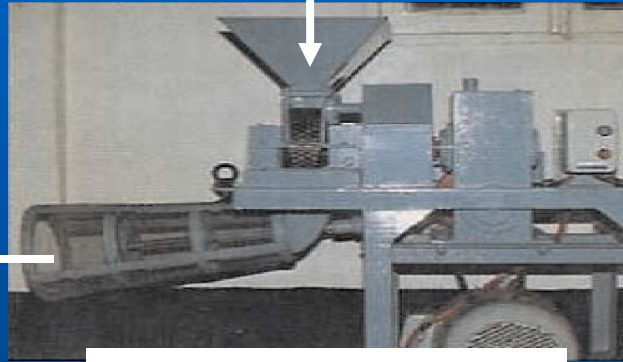
Tablet

Pillow  
(Briquettes)





**Prilled Urea**



**Briquette Machine  
for USG**



**USG**

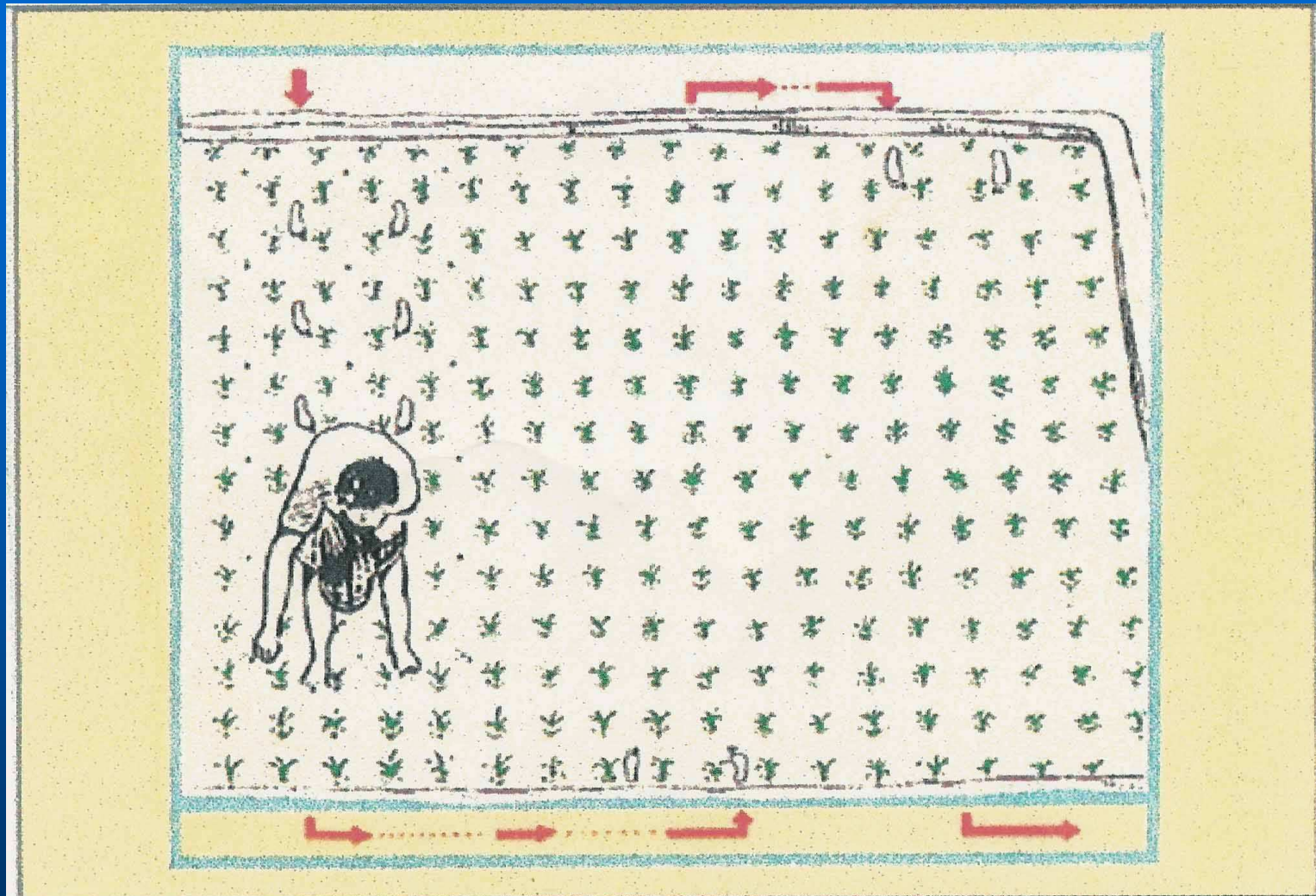
**Conversion  
of Prilled Urea to  
USG Using an  
IFDC-Designed  
Briquetter**





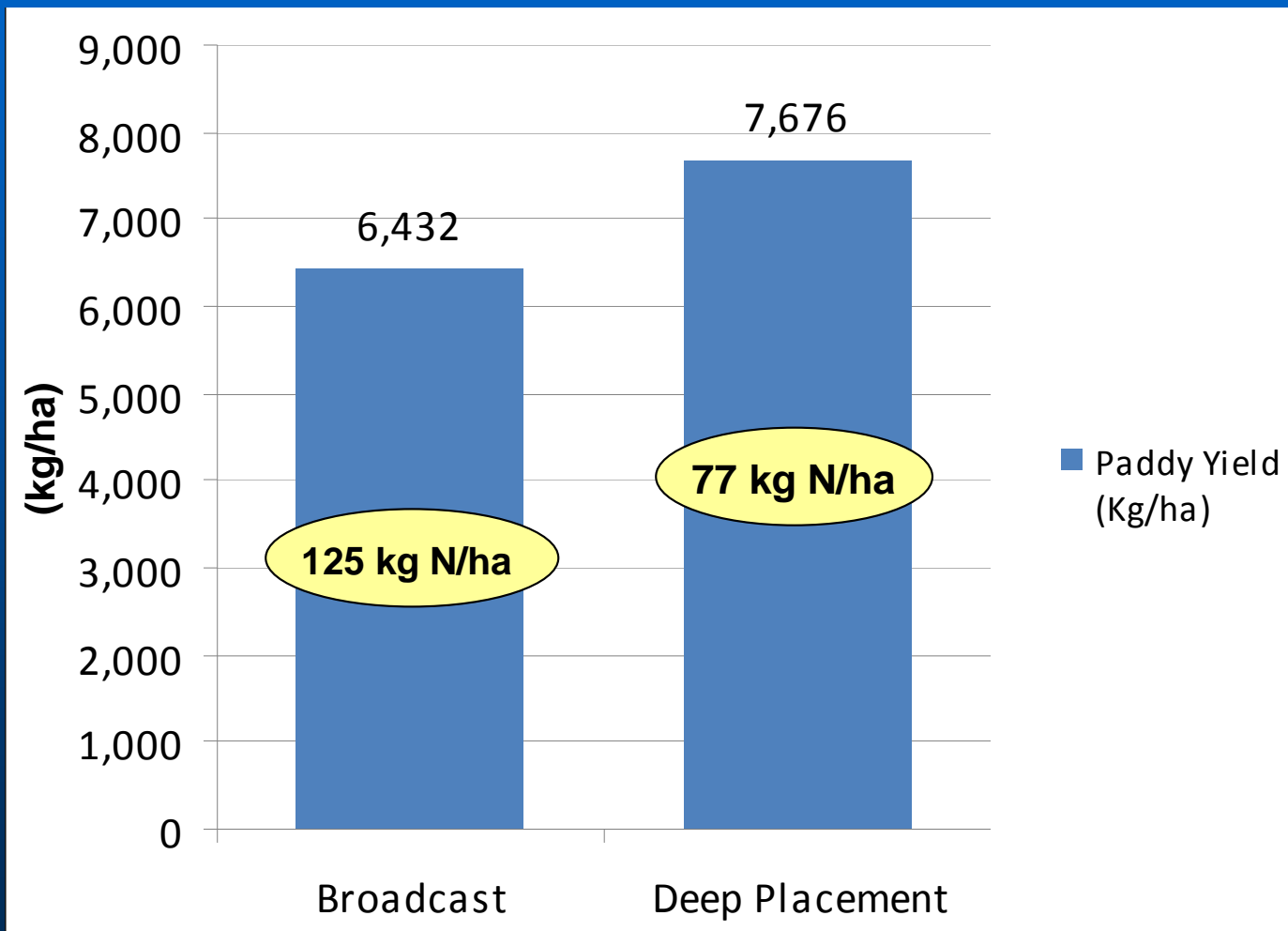






Deep placement of USG in paddy field

# Comparison Yields Between Broadcast and Urea Deep Placement Methods—Bangladesh



# *Crop Specific Nutrient management*



# Effect of Balanced Fertilization



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## Fertilizer Auction Objectives

- Transfer fertilizer retail business to the private sector to catalyze development of a competitive system
- Reduce impact of unprecedented high international market prices by providing 25% subsidy to all users

**Source: Dr. Agnes Kalibatta, Minister of Agriculture, Rwanda**

## Agricultural Intensification Program – 2008/09 Season

### Voucher Program Objectives

- Target resource limited maize and wheat farmers in the districts to provide Product Purchase Support (PPS)
- Wheat and maize chosen as fertilizer use is less known and less profitable Subsidy + Voucher urea 62% DAP 69%
- Introduce use of fertilizers and improved variety seed and other modern agricultural practices to these farmers thereby helping in increasing agricultural production to improve food security
- Encourage establishment of private sector distribution network to take on this function in the future

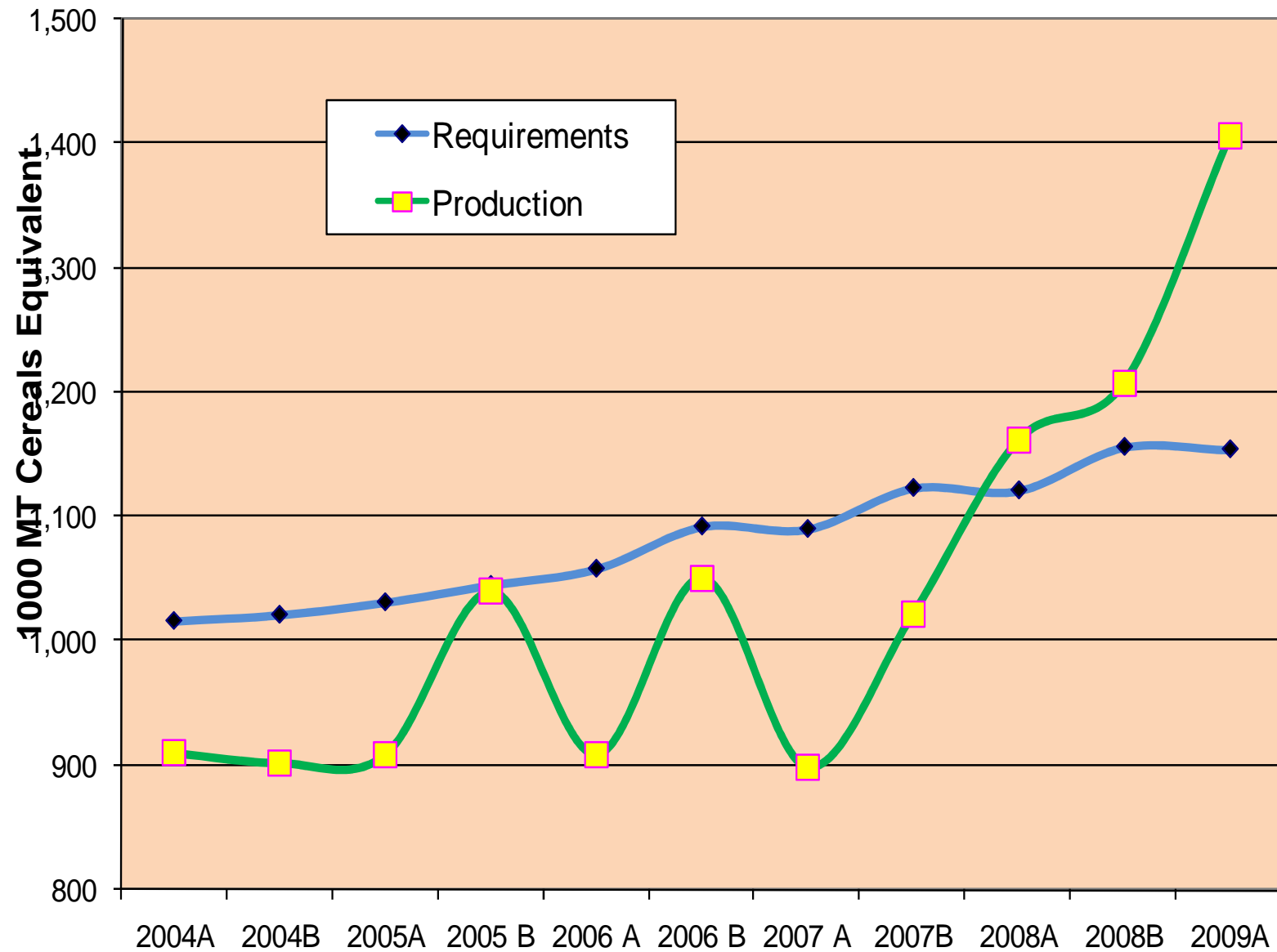
**Source: Dr. Agnes Kalibatta, Minister of Agriculture, Rwanda**

# Growth (2008)

Real growth	2008	2007	2002-2006 average
GDP	11.2%	7.9%	6.2%
Agriculture	<b>15.0%</b>	<b>0.7%</b>	<b>3.3%</b>
Industry	<b>10.7%</b>	<b>10.2%</b>	<b>7.9%</b>
Services	<b>7.9%</b>	<b>12.8%</b>	<b>8.2%</b>

Source: Dr. Agnes Kalibatta, Minister of Agriculture, Rwanda

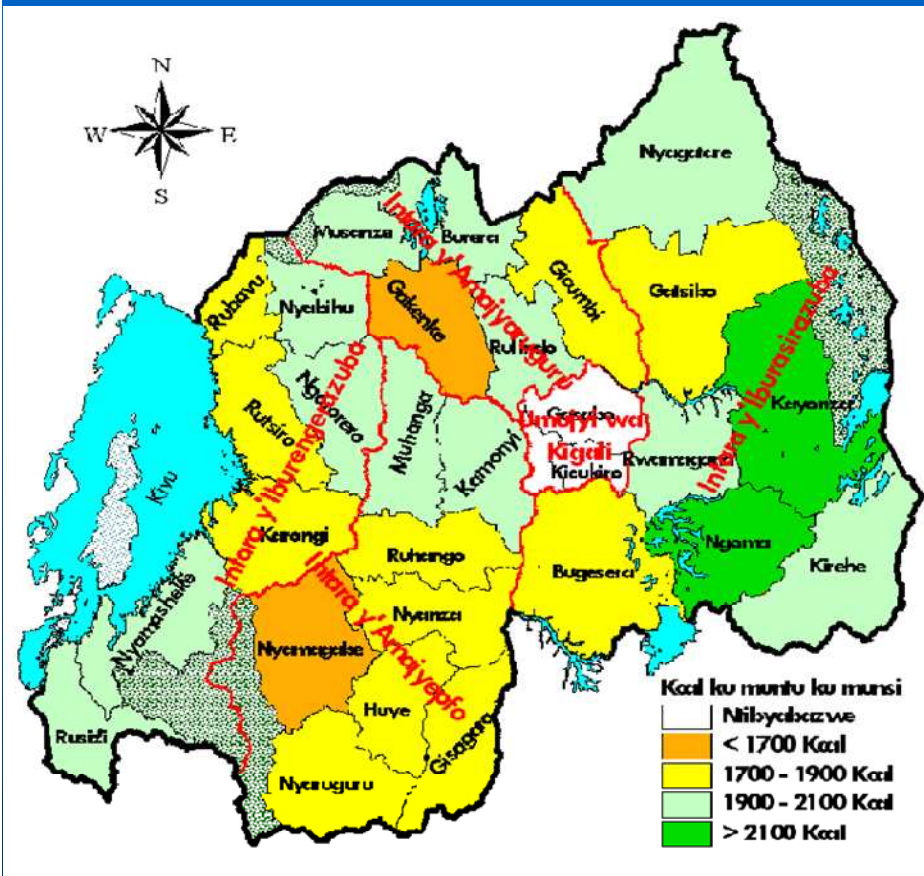
# Food consumption versus production



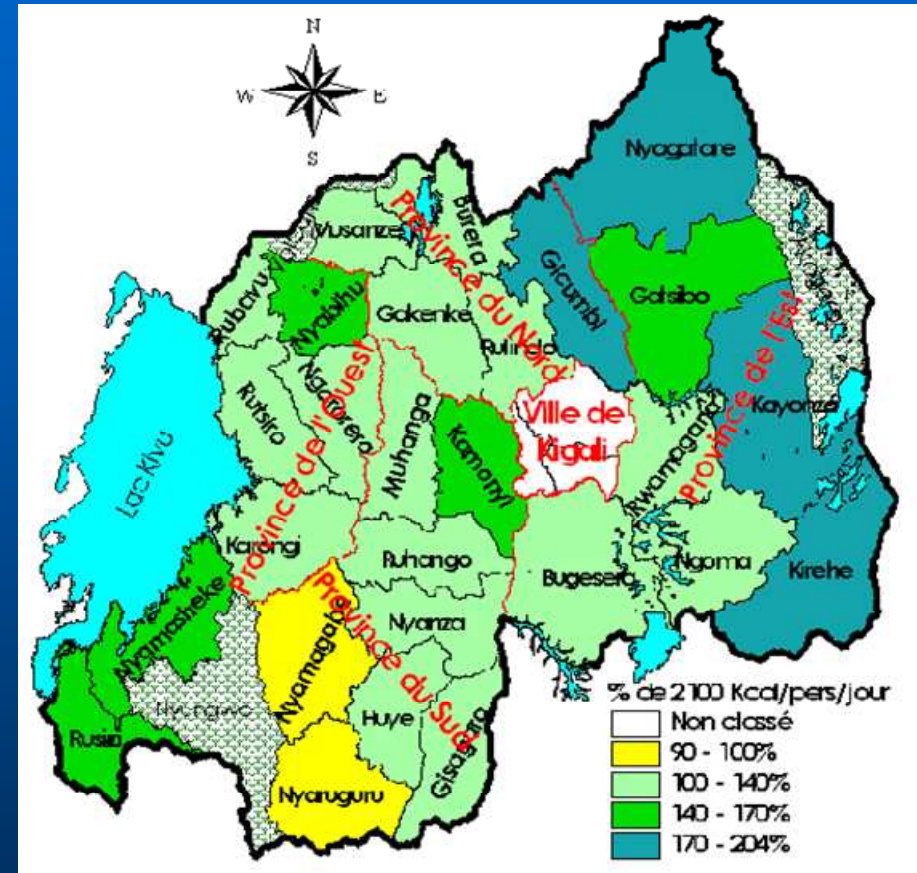
# Improved food security

2007A = 1,800 kcal/per/day

2009A = 2,500 kcal/per/day



- 13 districts below average



- 2 districts below avg. with 9 districts with excess

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# Conclusions

- **World food security can be attained**
- **High productive agriculture is needed, productivity increase per hectare indispensable**
- **Fuel from biomass may have detrimental side-effects**
- **Africa can achieve food security through focused interventions**
  - **Efficient fertilizer procurement and distribution**
  - **Site & crop specific nutrient management:**
  - **Targeted subsidies/purchasing power support to farmers**



# Thank You

