

Can We Balance Food and Energy Security?

Evert Byington

Is There a Problem? If There Is, Why?



- Prices as indicator of shortfalls in food
- Demand Factors
 - Population growth
 - Economic growth
 - Bioenergy
- Supply Factors
 - Land
 - Inputs
 - Support structure

Factors Associated with World Food Prices

- Global Food Prices highest since tracking started 20 years ago.
- Increased 2.2% in past month
- Shortage of production inputs
- 1 billion live on a dollar or less a day
- 40% of US corn crop going into EtOH
- Stock levels have run down creating price instability

U.S. Income for Food



- Average: 9.8%
(5.7% at home)
(4.1% away)

- Year Percent

– 1930 24%

– 1950 21%

– 1970 14%

– 1990 11%



U.S. Family Incomes

- Median Family Income: \$50,000
- Households between \$10k and \$15k spend 25% of income on food
- As high as 70% in poorest countries



What are the consequences of not solving food problems?

- Shortages
- Political unrest
- Simplistic solutions driven by emotions
- Problems remain
- Armed conflict
- Migration increases
- Conflict spreads



The Beginning: Food Riots in Tunisia

- **Egypt Is Coming Apart: Women's Protest Disrupted By Men, Army Forced To Break Up Fighting Christians And Muslims (3/8/11)**



Population Growth Food & Energy Demands



- Growth rate peaked in 1996
- Momentum will carry population to 8-9 billion by 2040
- 50% increase over today
- U.S. increase to 400 million by 2050

Growing Affluence

- Shift from grains, roots/tubers, low animal protein to varied grains, fruits & vegetables and high animal protein
- China: meat doubled since 1990s
- Japan: 3X meat per capita as China
- US: 75g/day/person of animal protein vs. Japan at 55g
- India adding 1-2 million tons of dairy/year

Global Land Use



- Asia has 8-9 times as many people per acre of cropland as North America
- Half of land area in agriculture
- 2/3 of ag. land is pasture & rangeland

Livestock Facts

- Land-based systems provide 89% of beef, 61% of pork, and 26% poultry
- Global meat (million tons): pork 72, beef 53, poultry 42

Global Cropland Resources

- 36% of potential cropland in production (3.8 billion acres)
- Most of undeveloped cropland is in developing countries
- Meet developing world needs by
 - Increased mgt intensity on 79% of cropland
 - Bring 570 million new acres into crop production

U.S. Croplands



- Federal 21%
- Cropland 20%
- Pasture 6%
- Rangeland 21%
- Forest 21%
- Developed 6%

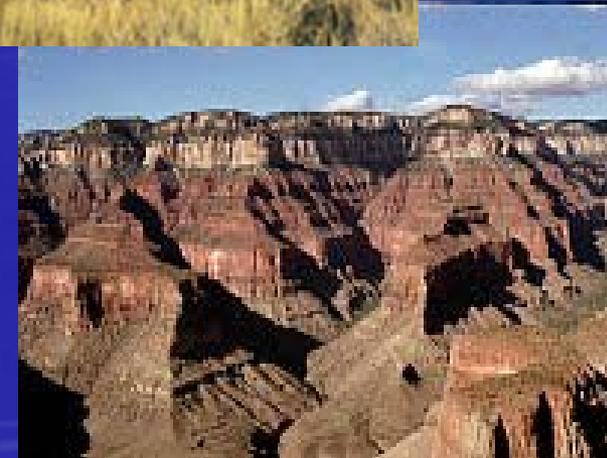
NRCS's 8 Soils Classifications

(See Handout)

Class I and II

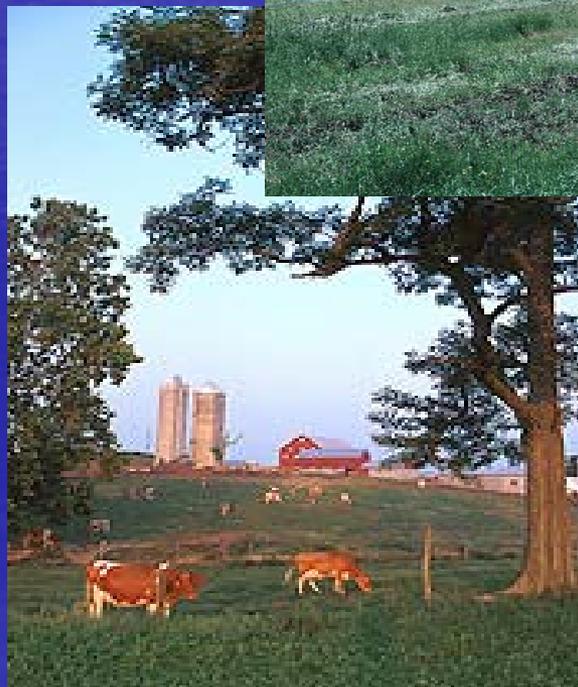
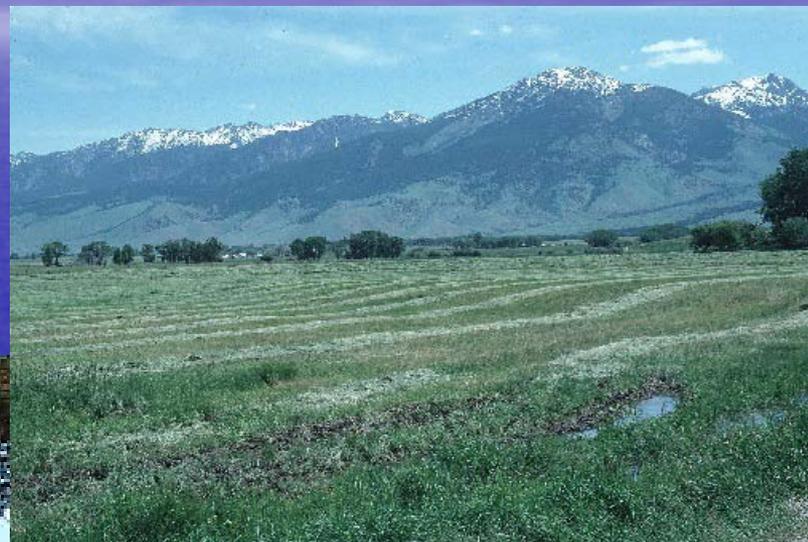


Class VII and VIII

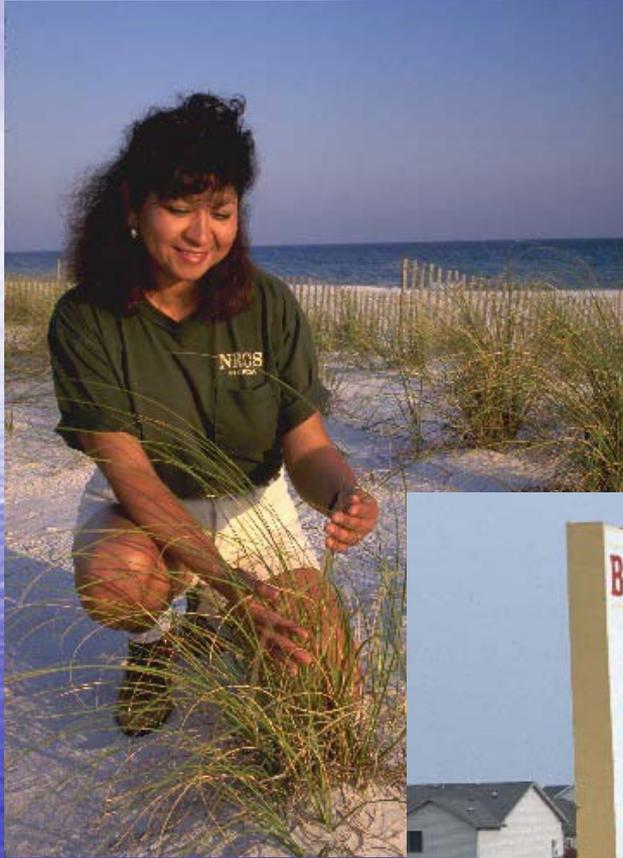


Soil Class IV Croplands

- Class IV is *marginal* cropland
- Hay is a crop
- Class IV is often pasture and woodlands



Distribution of Soil Classes





Use of U.S. Prime Farmland

- Cropland 64%
- Pasture 11%
- Rangeland 6%
- Forest 14%
- Other 5%

Global Potential for Increasing Yields

- Green Revolution 25-40 years ago
- Yields are stagnating:
 - Low cereal prices
 - Reduced inputs
 - Inadequate markets & infrastructure
 - Low investment in R&D
 - Human Capital
 - Environmental issues

Inputs



- Fertilizer (IPNI.net)
- Water
- Pest Management
- Energy
- Human Resources

Potash Facts

Price:

2006 \$190/ton

2008 \$570/ton

Major Suppliers:

Canada 33%

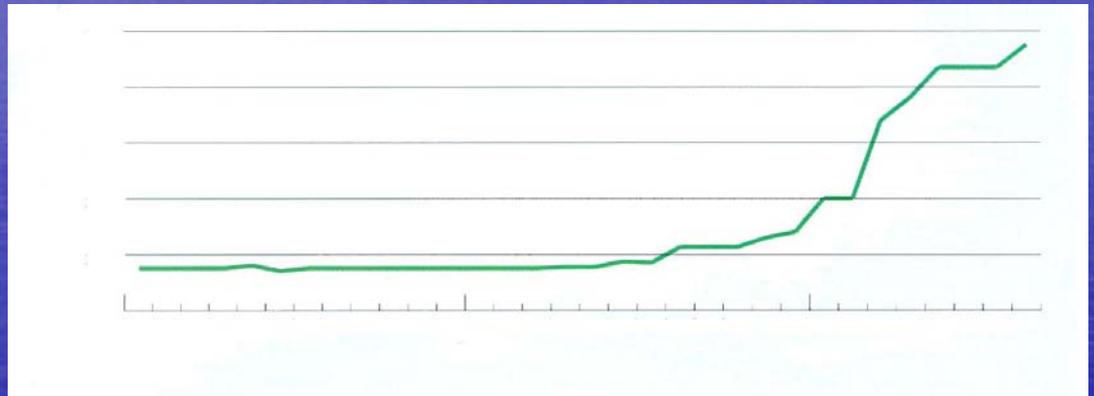
Russia 19%

Belarus 16%

Germany 11%

Demand:

2008 27MT K2O



Potash Resources

- Commercially Exploitable 8.3 BT
- Reserves 250 BT
- Quality
 - Canada 25-30%
3000->10,500 ft
 - Russia 15%



Issues: Limited Production Capacity & Higher Costs to Produce



- Estimated cost for a conventional mine ... \$2.8 billion, excluding external infrastructure
- No production for 5-7 years.

Other Fertilizers

Phosphorus

- Mining: 167M T/yr
- Reserves: 15B T
- Reserve Base: 47B T
- Environmental issues
- Largest Holdings:
Morocco
China
U.S.

Nitrogen

- 1,230 cubic meters of natural gas for a ton of ammonia N
- Most produced in developing world
- Environmental issues

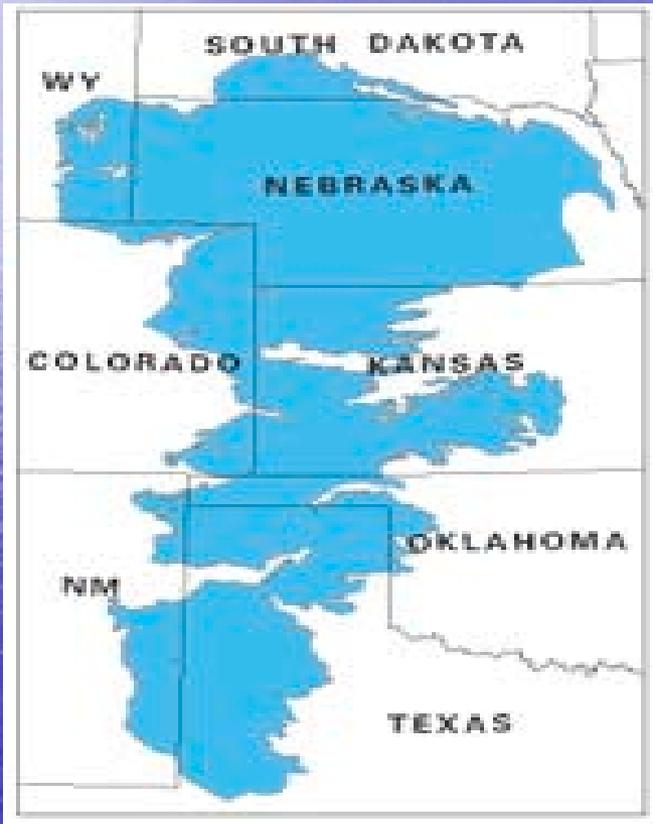
Greenhouse Gases

Environmental Concerns



- Carbon Dioxide Equiv.
 - Methane 21 X
 - Nitrous Oxide 310 X
 - SF6 23,900 X
- 28% CH₄ from human activities
- US cattle 5.5 t of CH₄ from 100 million head
- 1.3 billion worldwide (multiple use)
- Wildlife

Limitations on Irrigation to Stabilize Climatic Impacts



- Snow accumulation
- Spring snow melt
- Salinity
- Lack of storage
- Exhausting fossil water
- Environmental impacts
- Growing urban demand
- International Disputes

Food Security Biological Threats

- Animal Diseases
 - Foot-and-Mouth Disease, Avian Influenza, Rift Valley Fever, Monkeypox virus
- Plant Diseases
 - Wheat Rust
 - Citrus Greening



2001 Foot & Mouth Outbreak In Britain

- 10 million sheep and cattle killed
- Tourism adversely affected



- Losses estimated at \$16 billion



Food versus Fuel Issues



- Corn use?
- Marginal Lands
- Fertilizers & Pesticides
- Irrigation
- Handling & Transportation
- Invasive Weeds

Potential Impacts

- Up to 103 million ac of prime pasture, rangeland & woodlands could shift to grain production or biofeedstocks
- Some portion of 60 million ac of hayland could also be converted
- More pressure on remaining grazinglands
- Land more costly and more expensive production inputs required
- Result is higher prices for food & fuel

How Do We Meet Challenges?

- Systematic long-term planning and problem solving based on sound science to optimize the overall system
- Incrementalism: decisions on the margin based on a mix of politics, economics, and science—otherwise called the art of muddling through