

Environmental Trends in Agriculture

Federal Reserve Bank of Chicago
December 1, 2009

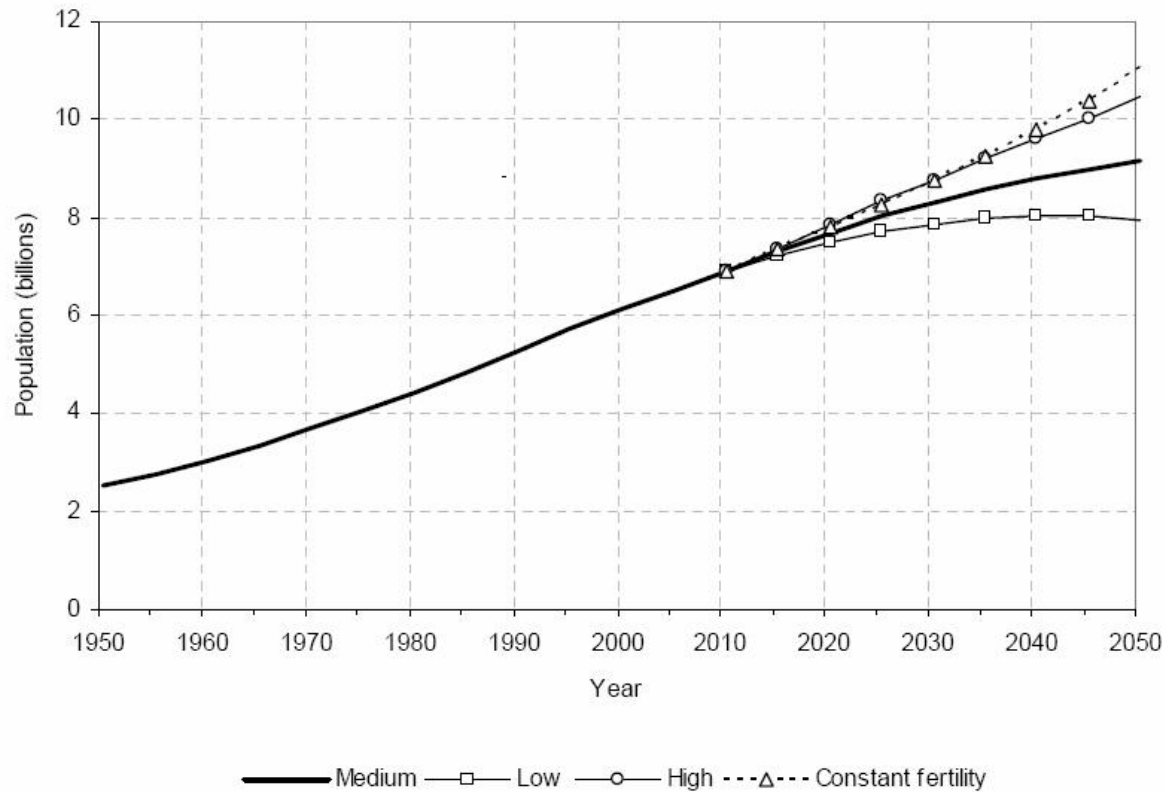




Drivers

Population

Figure 1. Population of the world, 1950-2050, according to different projections and variants



Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (2009). *World Population Prospects: The 2008 Revision*. New York: United Nations.

Population

○ States

Density

	Population	Houses
1. Illinois	223.4	87.9
2. Iowa	52.4	22.1
3. Indiana	169.5	70.6
4. Ohio	277.3	116.8

Population

The neighborhood is changing



The New Business Environment



Conservis

DRIVERS

5 BUSINESS REASONS TO MEASURE AND MANAGE CARBON

- Manage Business Risk
- Develop Sustainable Brand Identity
- Customer Demands
- Business Performance Specifications
- Current and Future Regulations

Making **GREEN** Work for Business™

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Regulations

- Clean Water Act

1. Gulf Hypoxia: Nitrates & phosphorous
2. Pesticide application
3. Waters of the U.S.



Regulations

- Clean Air Act
 1. Particulate Matter
 2. CO₂
 3. Greenhouse gases



Energy Independence

Total Imports of Petroleum (Top 15 Countries) (Thousand Barrels per Day)

Country	Aug-09	Jul-09	YTD 2009	Aug-08	YTD 2008
CANADA	2,524	2,639	2,459	2,247	2,473
MEXICO	1,159	1,316	1,265	1,401	1,318
VENEZUELA	1,070	959	1,138	1,305	1,207
NIGERIA	917	879	735	1,166	1,066
SAUDI ARABIA	766	1,153	1,053	1,573	1,556
ALGERIA	551	329	473	530	526
RUSSIA	512	637	621	490	491
IRAQ	500	365	461	663	675
ANGOLA	364	320	494	495	523
BRAZIL	275	392	350	208	245
COLOMBIA	269	305	284	257	210
UNITED KINGDOM	225	188	248	222	218
VIRGIN ISLANDS	223	273	291	298	326
NETHERLANDS	160	118	144	143	163
KUWAIT	148	261	182	203	208

Note: The data in the tables above exclude oil imports into the U.S. territories.

Energy Independence



Ethanol Plants

- ◉ Water efficiencies
- ◉ CHP
- ◉ Energy efficiencies



Energy Independence

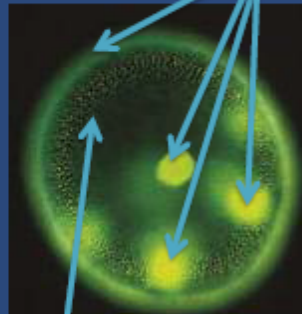


Energy Independence

- Algae
- 1. Exxon
- 2. Emissions

Biofuels from Algae

4-50%
Lipid biomass



50-90%
Other biomass

Rapid growth rate

Double 6-12 hours

High oil content

4-50% non-polar lipids

Biomass harvested

100%

Harvest interval

24/7, not seasonally

Energy Efficiency



Carbon Markets

- ◉ Illinois Conservation Climate Initiative

www.illinoisclimate.org

- ◉ AgraGate

www.agragate.com

- ◉ National Farmers Union

www.carboncredit.ndfu.org

Illinois Conservation Climate Initiative

Carbon Aggregation

- Started in 2005 with a \$20,000 grant from the Illinois EPA.
- Created the Illinois Conservation and Climate Initiative and formed an innovative partnership with the State of Illinois, state agencies, SWCDs, and a wide-ranging advisory committee.
- Has expanded into Michigan with a similar program, and into 14 other states.
- Have returned over \$2 million in revenue to enrollees.
- Developed new CCX protocol for Sustainably Managed Forests , as well as new applications of Energy Efficiency and Ozone-Depleting Substance Destruction Protocol.



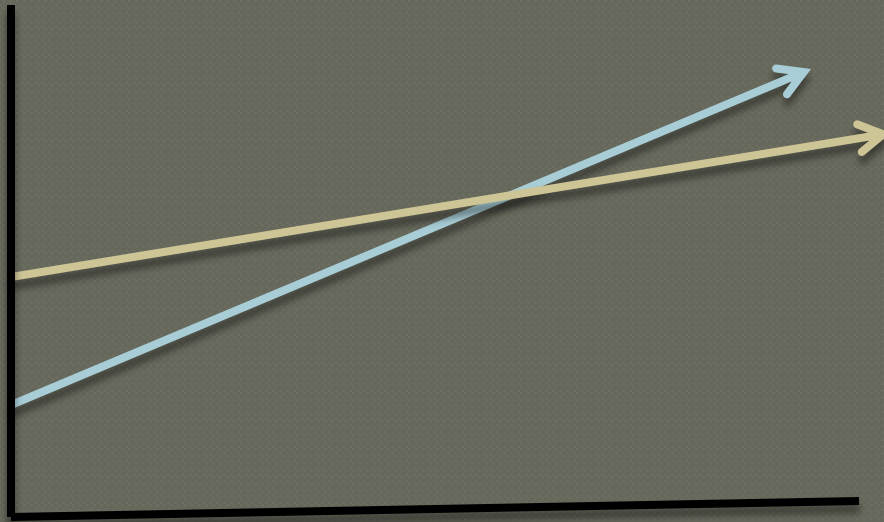
Market Based Conservation

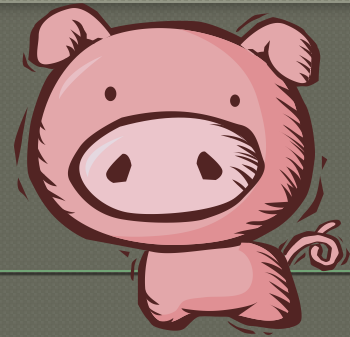
Stacking environmental attributes

- Carbon
- Nutrient
- Ecological

Carbon Price & Technology Adoption

○ Timeline





Livestock

◉ Lookout cow



Methane



Slurry Store



Injection



Crops

- ⦿ Expanding pesticide technology: half life
- ⦿ Plant genetics: resistances
- ⦿ Agronomics: roots
- ⦿ Precision nutrient technologies:
anhydrous ammonia
- ⦿ Drainage best management practices:
bio-chambers

Machinery

- Auto steer: no overlap
- Engine technology: cleaner engines
- Mulch tillage: keeping soil in place



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