

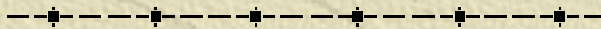


# Future Energy Demand and Potential Impacts on Agriculture

**Strategic Planning Directorate  
Manitoba Agriculture, Food, and Rural  
Initiatives**

**AIC – Innovation for Growth, Winnipeg,  
MB**

**November 5-8, 2006**





# **Presentation Outline**

- **History and Theory**
- **Future Projections**
- **Agriculture Consumption**
- **An Alternate Future – Possible Solutions**



## **George Washington Carver (1864-1943)**

**“ I believe the Great Creator has put ores and oil on this earth to give us a breathing spell..... As we exhaust them we must be prepared to fall back on our farms, which are the Creator’s true storehouse and can never be exhausted.**

**For we can learn to synthesize materials for every human need from the things that we grow”**



## History and Theory

Total world energy sources – 37% is oil

- 96% of transportation - oil based

✦ Only two oil “creation periods”

- ◆ 90/145 million years ago

- ◆ Great Barrier Reef similarity

Only few isolated locations, of which 62% is located in the Persian Gulf accounting for only .2% of the Earth’s surface.

# Major Saudi Aramco oil fields



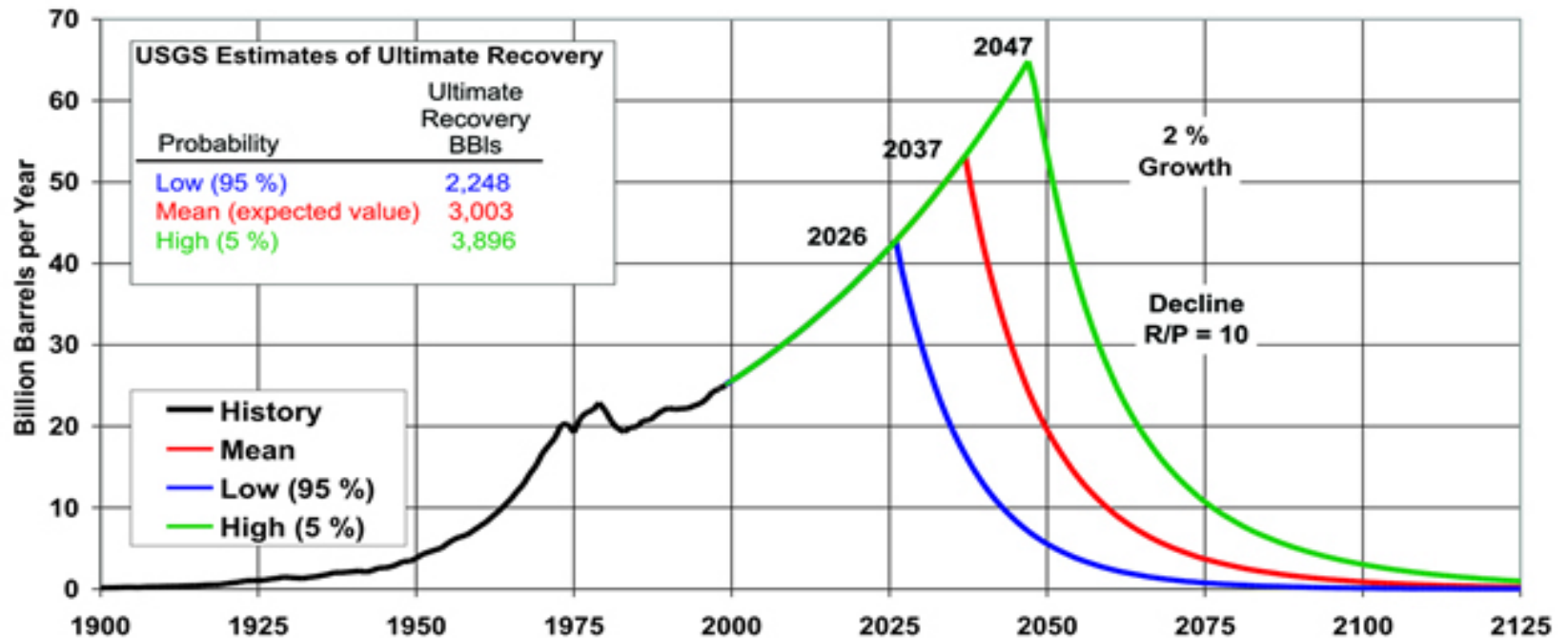
Ghawar

## Background

- ✦ Estimated we have now extracted about half the oil (easy) that will ever be recovered.
- ✦ Only 5% of claimed reserves have been audited by independent agencies.
- ✦ Global demand increasing 2% per annum
- ✦ Oil - \$2.75(1950); \$10.11(1973); \$35.97(1990); \$11.28(1998); \$37.05(2004); \$56.50(2005); High - \$78

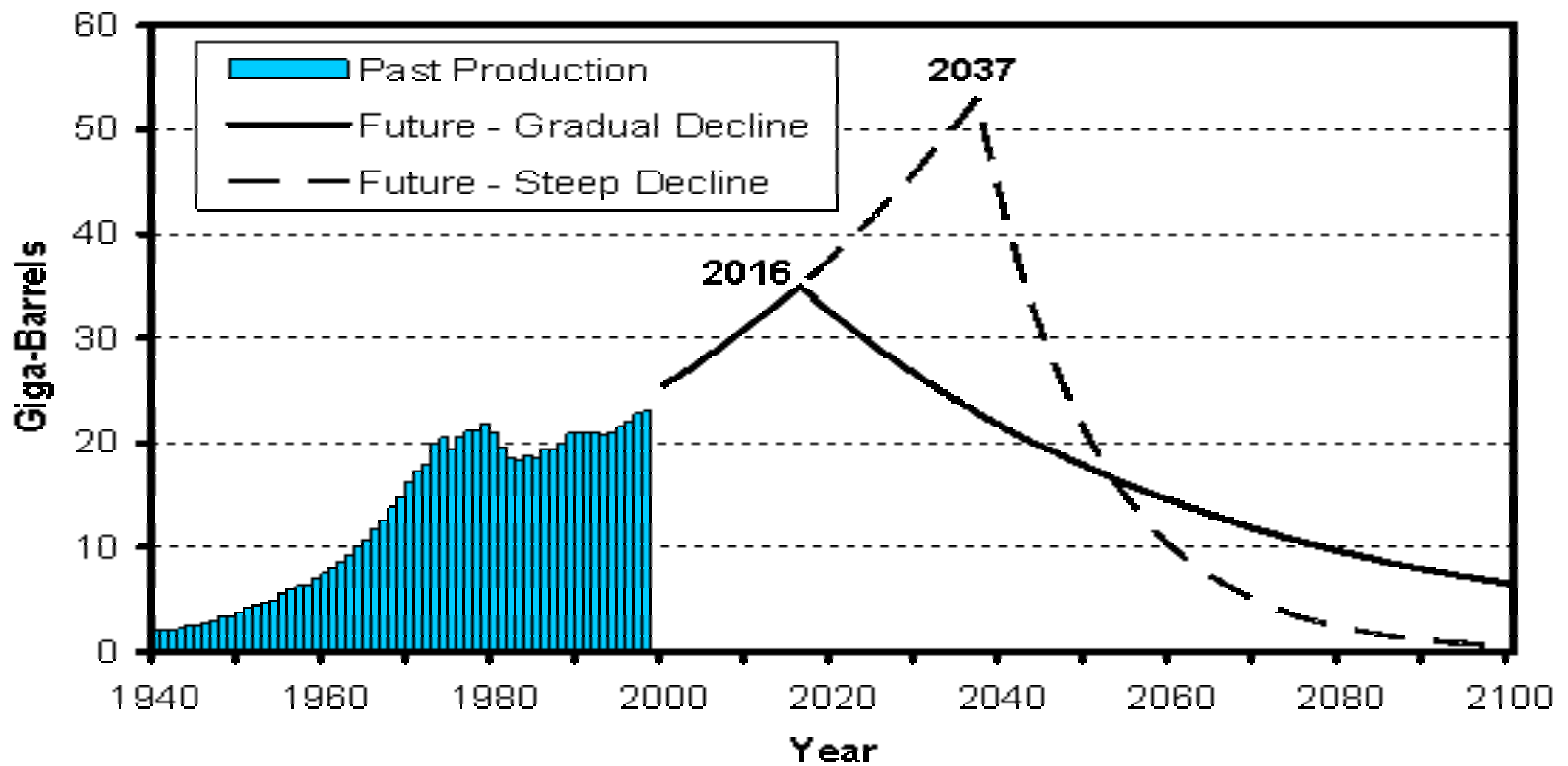
# Energy Information Administration (EIA) Forecast

Figure 2. Annual Production Scenarios with 2 Percent Growth Rates and Different Resource Levels (Decline R/P=10)

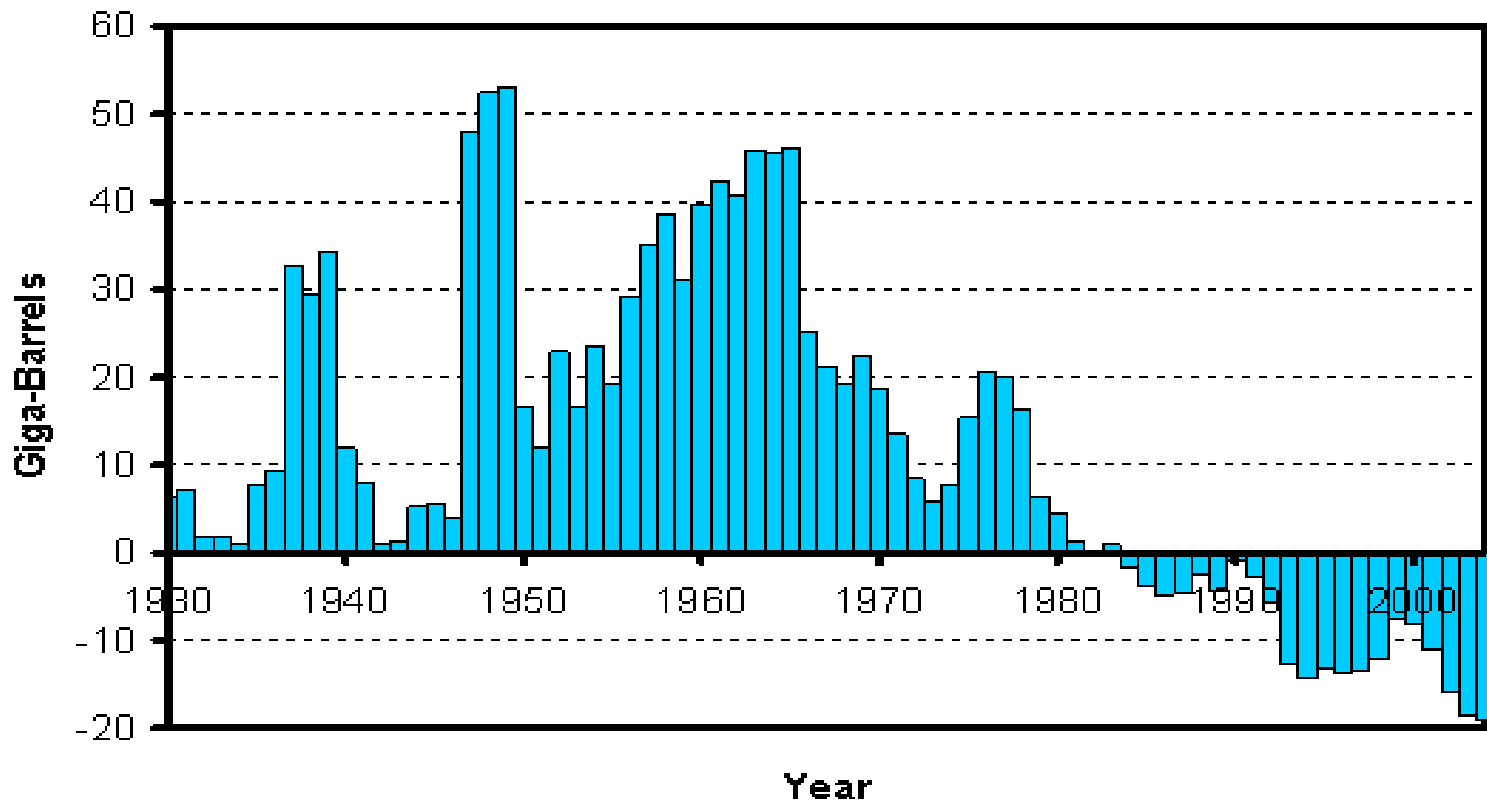


Source: Energy Information Administration  
Note: U.S. volumes were added to the USGS foreign volumes to obtain world totals.

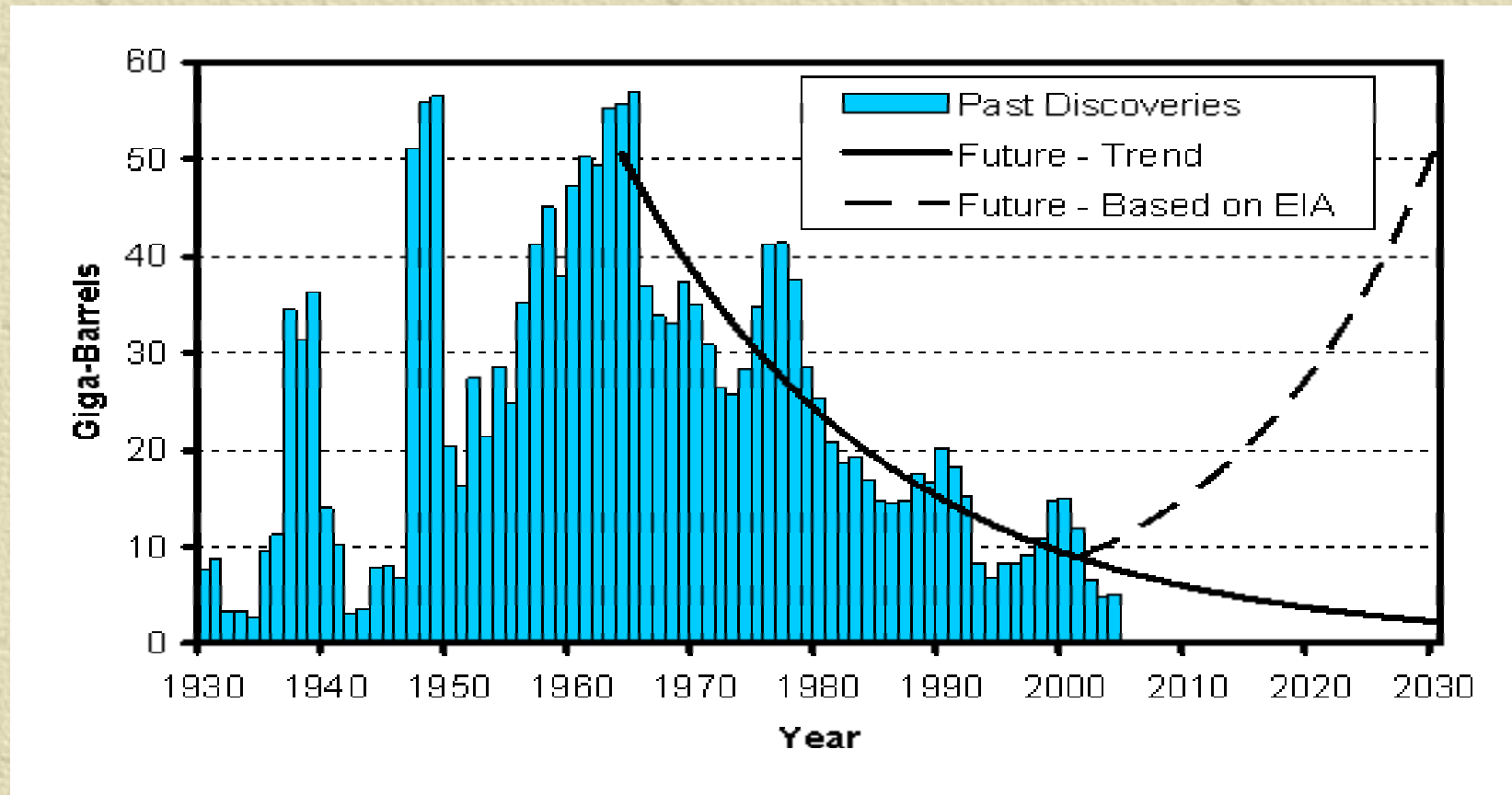
# Energy Information Administration vs. U.S. Department of Energy



# Oil Discovery Minus Consumption



# Past Discoveries and Future Projections



# Energy Return on Energy Input (EROEI)

- ✦ Hydro – 45:1
- ✦ Sweet crude – 30 - 100:1 (Past)
- ✦ Wind – 4 -10:1
- ✦ Solar – 5:1
- ✦ Bio-Mass – 4.17:1 (Ethanol from Cellulose)
- ✦ Bio-Diesel – 3.2:1
- ✦ Tar Sands – 1:5:1
- ✦ Ethanol from Grain – 1:5:1(.95:1 less DDG)
- ✦ Diesel - .843:1
- ✦ Gasoline - .805:1
- ✦ Hydrogen - .5:1

# Agriculture - Energy Consumption

- ✦ **To produce 1 calorie of food using fossil fuel dependent industrial agriculture takes 15 calories of energy input**
- ✦ **To produce 1 calorie of food organically uses 5 calories of energy input**
- ✦ **A gardener with a hoe uses 1 calorie of energy to produce 20 calories of food**

# Agriculture Background

- ✦ Nitrogen fertilizer production leaving North America (Simplot example)
- ✦ Natural Gas 92% of cost
- ✦ Crops Cost of Production – Energy inputs account for 50-60%.
- ✦ Weak commodity prices plus high fertilizer cost = Lower fertilizer demand

# Alternate Future - Agriculture Solutions

- ✦ **Minimum tillage production systems**
- ✦ **Fertilizer placement (banding) / increased soil testing**
- ✦ **Bioenergy**
- ✦ **On farm energy use**
- ✦ **Use of legumes – crop rotation**
- ✦ **Manure use / transportation**
- ✦ **Matching Local production to Local consumption**
- ✦ **Renewed focus on a Biological Cropping System approach vs current practices**

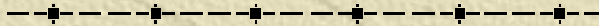
## Perennial Wheat Test Plot, Salina, KS, 2006



# Agriculture –The Future

“On a global scale, the farmer who is “carbon frugal” is due for big rewards.”

- Craig Sams



# Discussion

- ✦ Current Government Position vs Preparedness?
- ✦ Review of Goals and Objectives?
- ✦ Policy and Programming?
- ✦ Partners – Internal/External?