Some Domestic Environmental Effects of U.S. Agricultural Adjustments under Liberalized Trade

Joseph Cooper, Robert Johansson, and Mark Peters
Economic Research Service
U.S. Department of Agriculture

USDA

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Introduction

- The WTO negotiation process commits member countries to the long run goal of liberalizing agricultural trade.

- Barriers to agricultural trade to be eliminated include tariffs, domestic production subsides, and export subsidies.

- Agricultural trade liberalization is a beneficial goal in its own right.

- But it is also likely to affect the environment in a variety of ways, some good and some bad.

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Introduction - Continued

- Analysis of the impacts of trade liberalization on:
  - nitrogen loss to water
  - phosphorus loss to water
  - pesticide loss to water
  - sheet, rill, and wind related soil erosion
  - manure nutrient production
- Indicators defined at national and regional levels of aggregation

Introduction - Continued

☞ **Trade Scenario:** the elimination of all agricultural policy distortions by all WTO member countries

Eliminates all **amber box** and **blue box** forms of support, including:

- tariffs
- fixed payments linked to output
- direct & whole-farm payments based on area or that otherwise affect crop mix

Outline of the Methodology

Agricultural Trade Liberalization

⇓

Change in world prices

Changes in production practices, input use and outputs

⇓

Changes in physical measures of environmental impacts

⇓

Changes in economic measures of environmental impacts

Empirical Approach

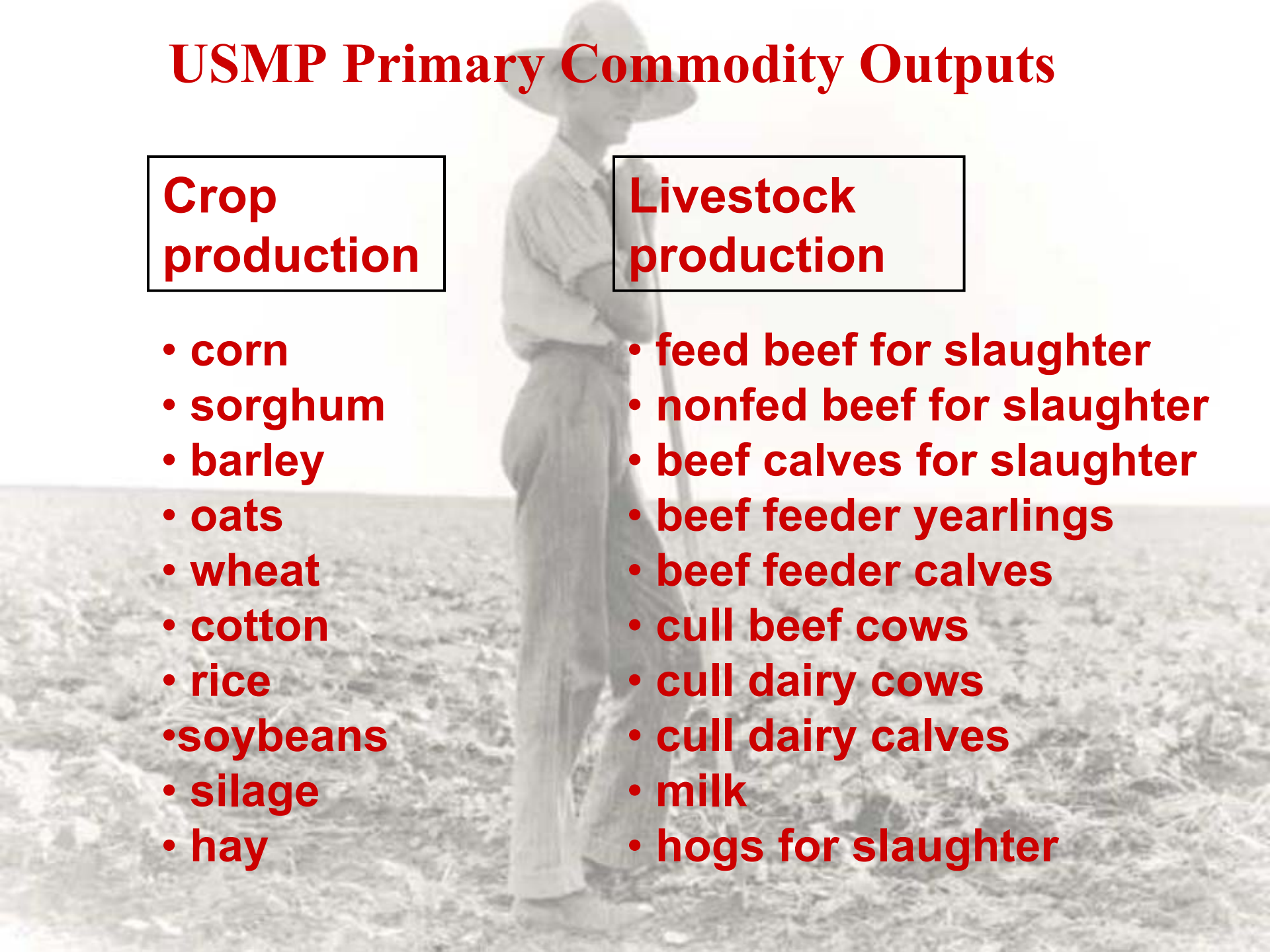
- A partial equilibrium model estimates the **price** and **production impacts** of the elimination of all agricultural policy distortions by WTO member countries.
  - 4 countries/regions: US, EU, Japan, rest of the world
  - 21 agricultural commodities
  - exports and imports of each traded commodity in every region

Empirical Approach - continued

- Estimated U.S. production changes are imposed in a model of the U.S. agricultural sector (USMP).

- USMP is a multi-region partial equilibrium model with:
  - 5500+ cropping systems:
    - 10 major crops
    - tillage, rotations, fertilizer and pesticide regimes
  - 13 livestock systems
  - markets for 44 commodities
  - production and environmental indicators linkages.

USMP Primary Commodity Outputs



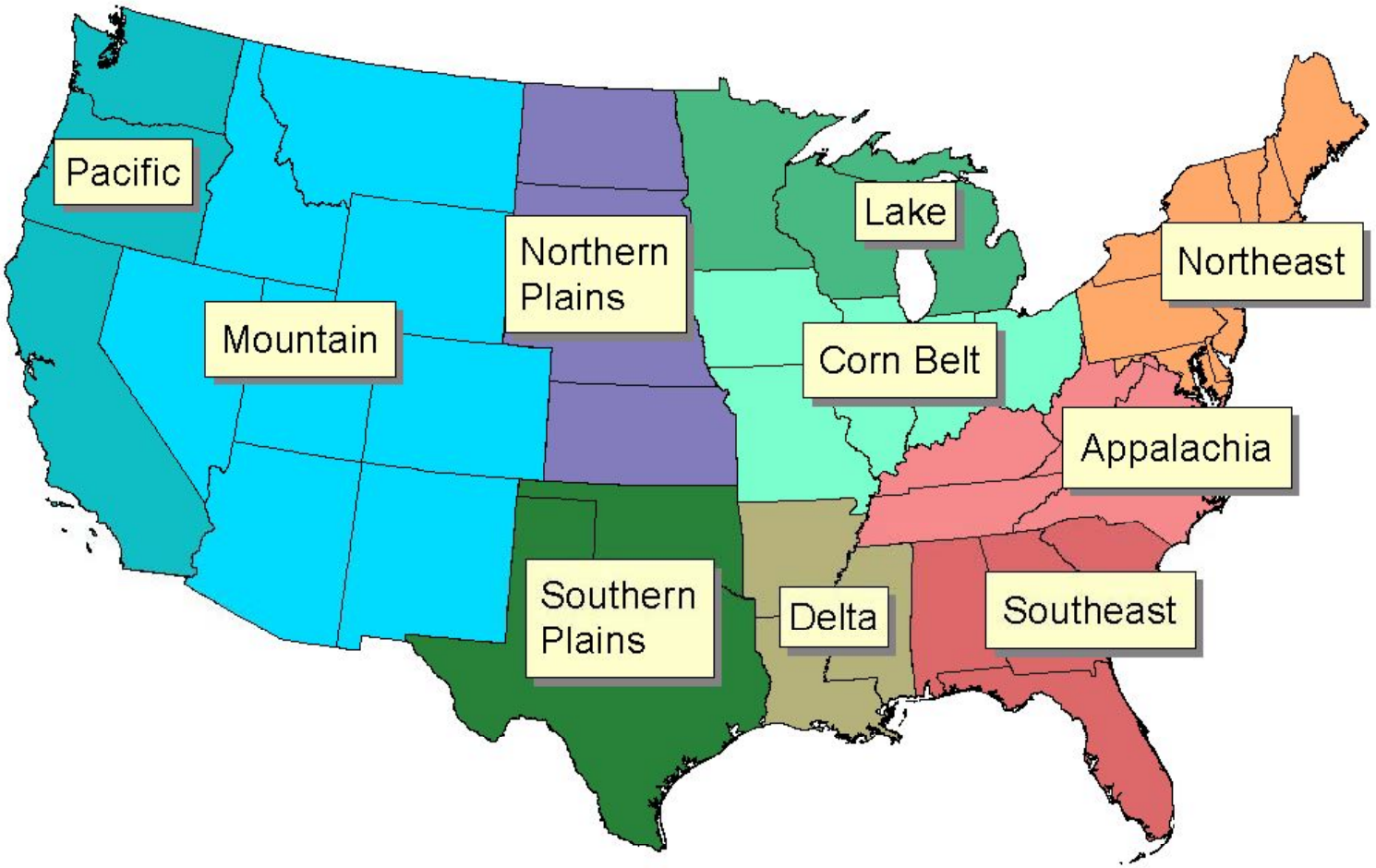
Crop production

- corn
- sorghum
- barley
- oats
- wheat
- cotton
- rice
- soybeans
- silage
- hay

Livestock production

- feed beef for slaughter
- nonfed beef for slaughter
- beef calves for slaughter
- beef feeder yearlings
- beef feeder calves
- cull beef cows
- cull dairy cows
- cull dairy calves
- milk
- hogs for slaughter

U.S. Regional Aggregations for the Empirical Analysis



Simulated Changes Resulting from the Elimination of all Agricultural Trade Distortions (Percent Change)

Commodity	Production	Consumer Price	Gross Returns
Rice	-1.2	13.2	-0.8
Wheat	-0.1	4.8	2.5
Corn	2.4	16.5	13.9
Other coarse grains	1.7	13.5	10.9
Soybeans	-0.7	7.5	3.9
Cotton	0	4.5	2.1

Source: ERS/PSU World Trade Model

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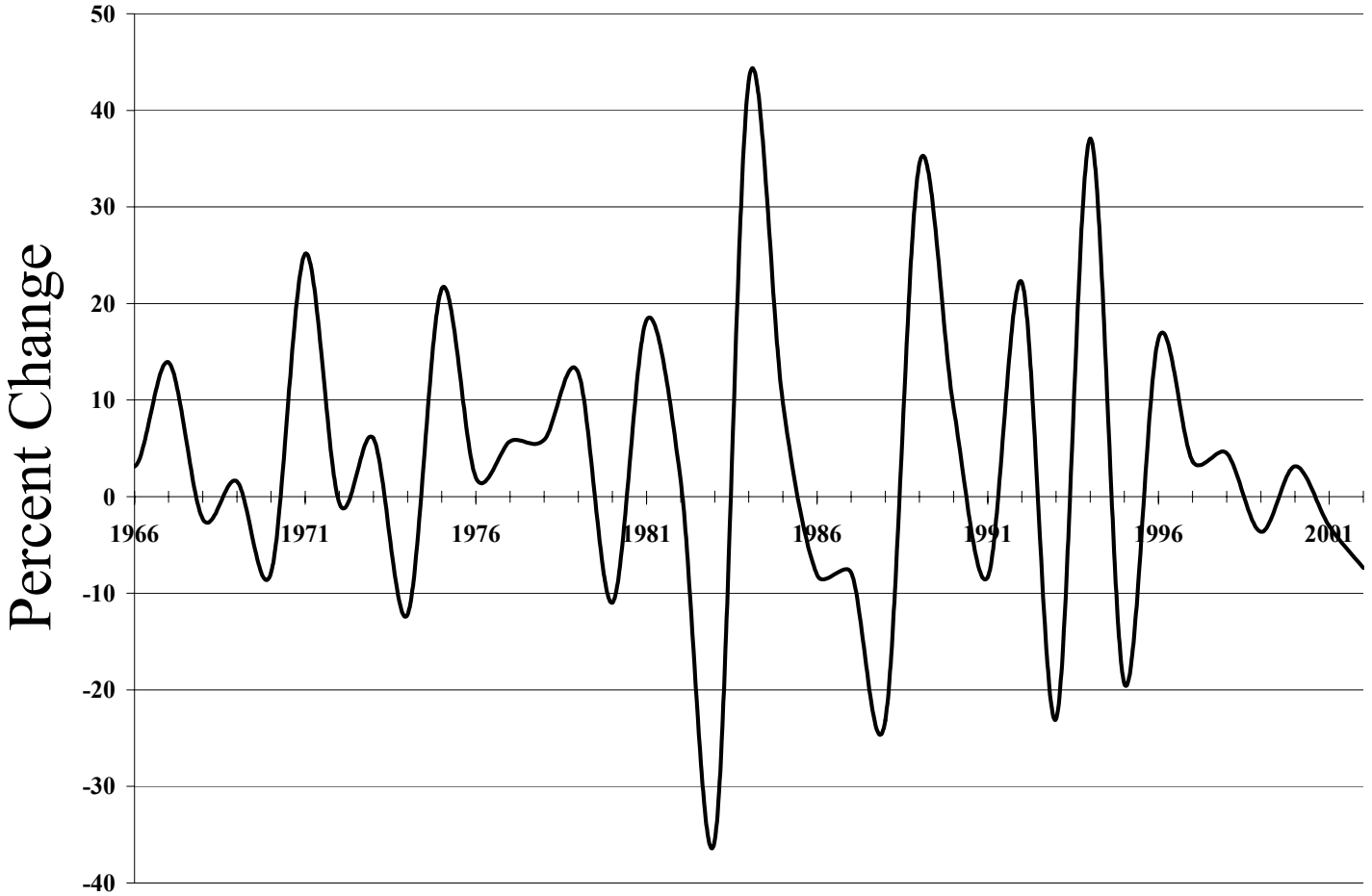
Simulated Changes Resulting from the Elimination of all Agricultural Trade Distortions (Percent Change) -- Continued --

Commodity	Production	Consumer Price	Gross Returns
Beef & veal	-0.1	10.6	8.1
Pork	0	7.5	5
Poultry meat	1.6	13	10.5
Butter	-15	-12	-12
Cheese	-0.6	-1.9	-1.9
Non-fat dry milk	-15	-1.6	-1.6
Fluid milka	1.7	-1.2	-1.2
Whole dry milk	-31.6	-13.4	-13.4
Other dairy	1.9	-1.1	-1.1
Total	0.27	9.19	4.23

Annual Aggregated Percentage Changes in Production from Previous Year: Corn, Soybeans, Rice, Wheat, Poultry, Pork (1966 – 2002)



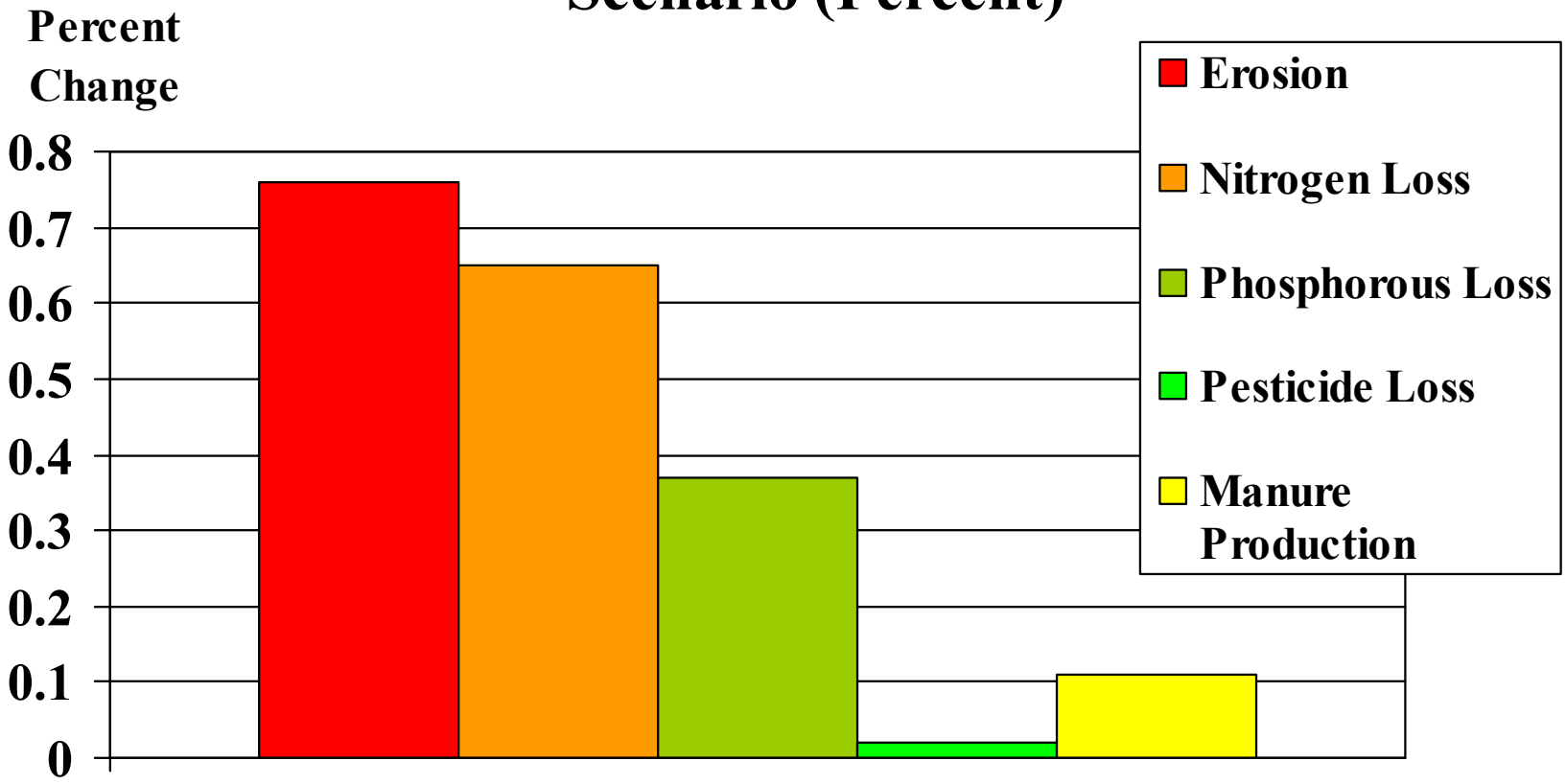
Environmental Components of USMP

- Focus is on indicators with closest links to potential environmental consequences

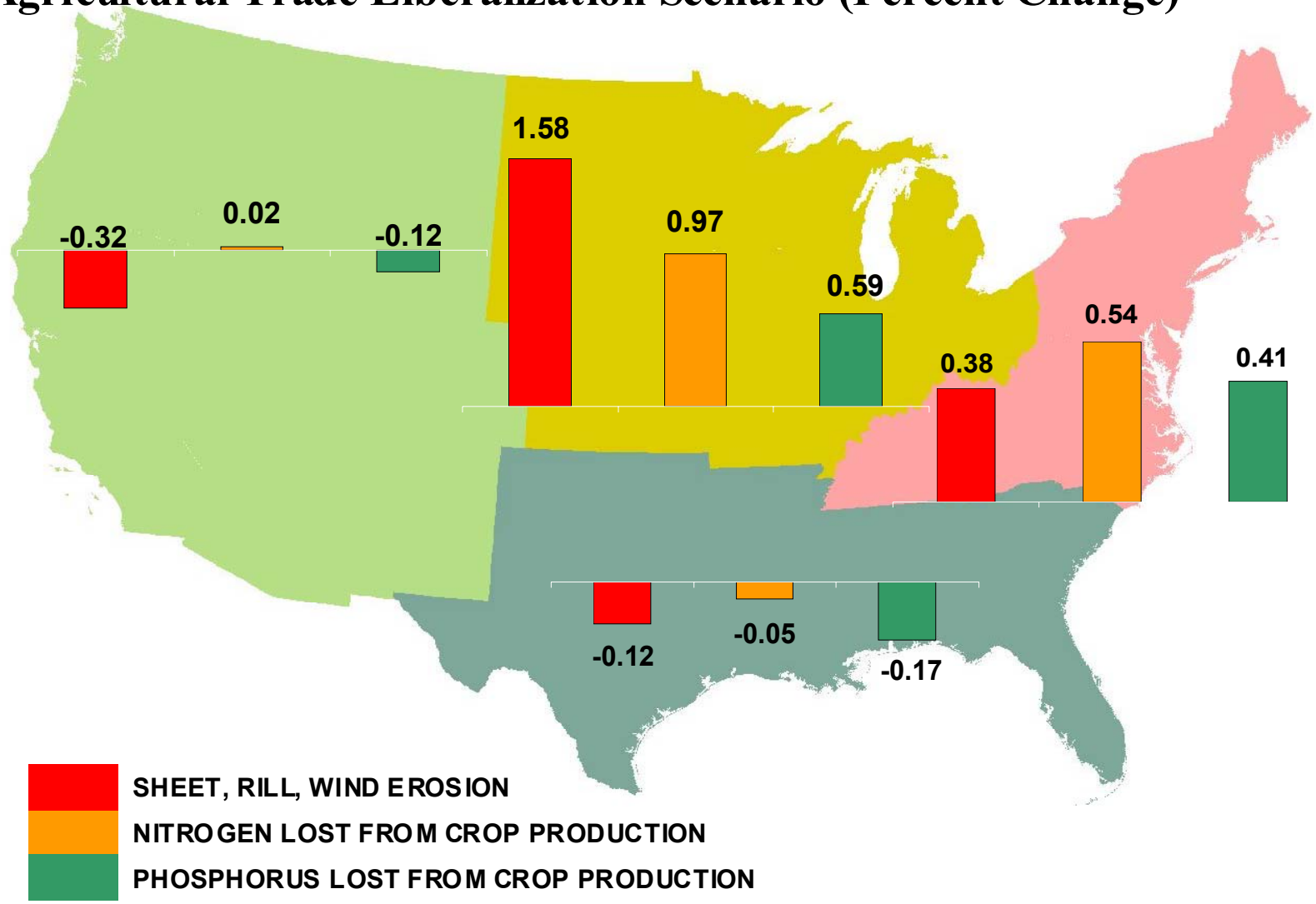
- Emissions for each crop production activity were estimated with the Erosion Productivity Impact Calculator (EPIC)

- EPIC uses information on soils weather and management practices to estimate:
  - crop yields
  - erosion
  - chemical losses to the environment

Some Estimated Environmental Impacts Under the Agricultural Trade Liberalization Scenario (Percent)



Some Estimated Regional Environmental Impacts Under the Agricultural Trade Liberalization Scenario (Percent Change)



Monetary Valuation of Environmental Impacts

- **Placing monetary values on environmental impacts is useful for assessing the costs and benefits of agri-environmental policies. Few attempts have been made to value these impacts.**

Both on-site and off-site damages are estimated here:

- **<u>On-site damage:</u> Soil depreciation = the discounted value of long term yield changes due to erosion, based on current output prices.**

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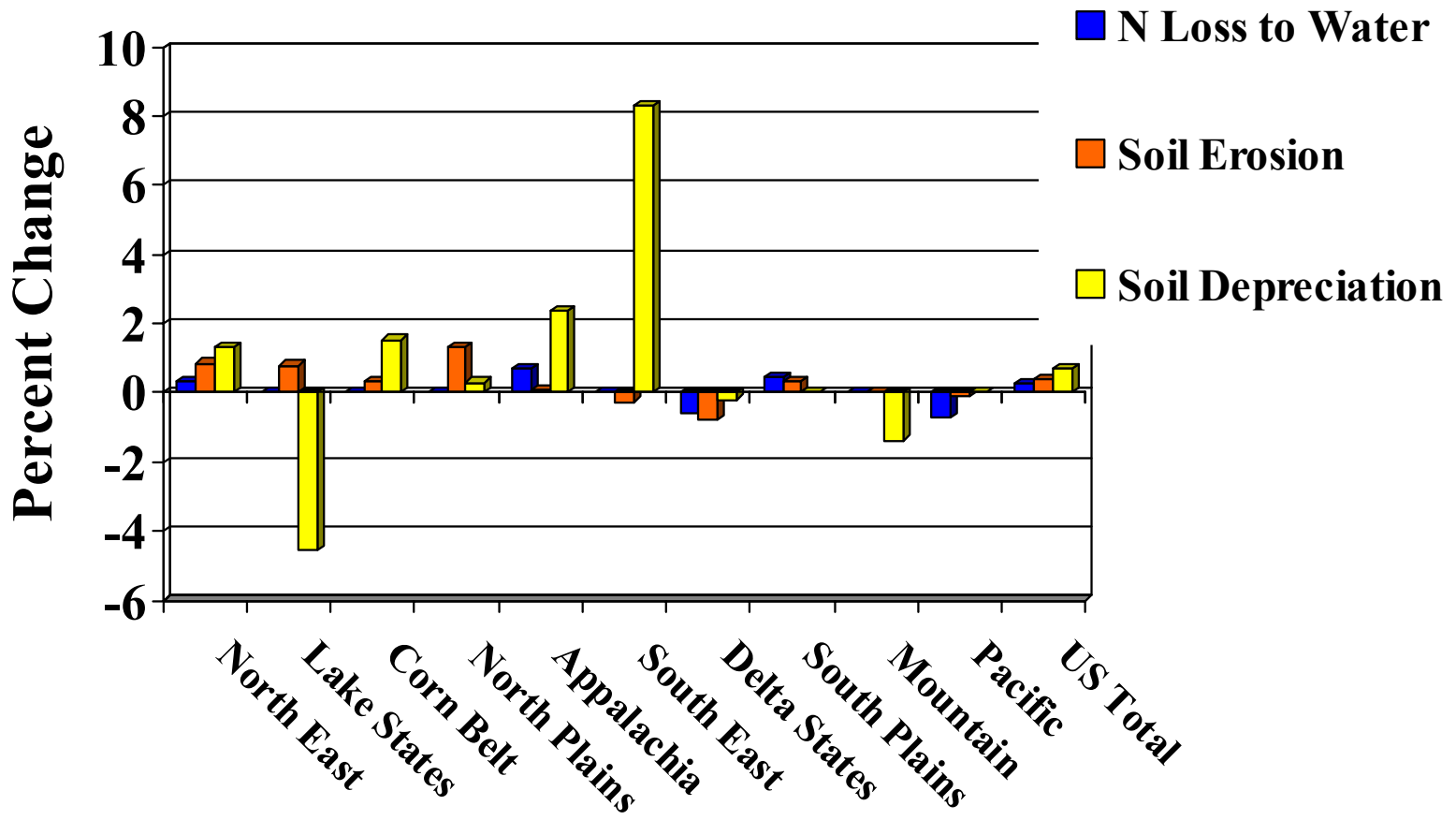
Monetary Valuation - Cont.

• **<u>Off-site damage:</u> sediment and nitrogen damage indices developed by the USDA**

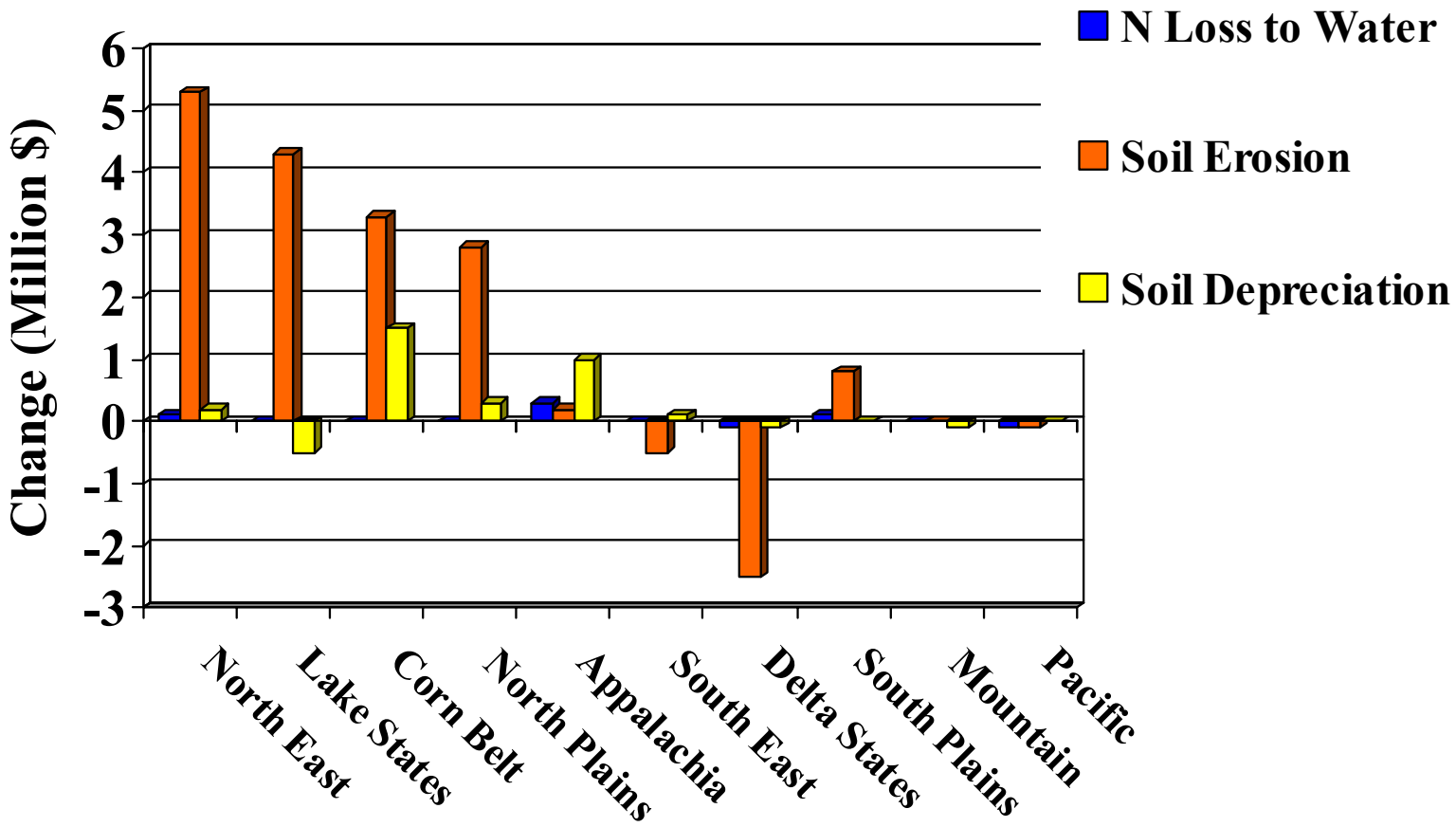
Activities valued in the indices include:

- municipal and industrial water use
- irrigation ditch and road ditch maintenance,
- fresh water-based recreation, navigation, and
- estuary-based boating, swimming, and recreation.

Increase in Monetary Value of Environmental Damages (Percent)



Increase in Monetary Value of Environmental Damages (Million U.S. Dollars)



Discussion and Conclusions

Trade and production changes of the WTO Scenario are small, so the environmental effects of the trade pact are also small:

- **Agricultural commodity production is predicted to increase less than 1%**

- **Estimated changes in U.S. agricultural production are smaller than average seasonal variation in commodity production over the last 35 years**

Discussion and Conclusions

- **Predicted environmental impacts are less than 1% for the U.S. as a whole**

- **While the environment impacts are small, they are not uniform across the U.S. ….**
  ...Country averages can mask important regional changes
  - **Some regions will have *increases* in agricultural production and potential environmental impacts,**
  - **While others will see *decreased* production and reductions in environmental impacts**

Discussion and Conclusions

- In the U.S., environmental reviews of new trade agreements are required under U.S. Executive Order 13142 and the U.S. Trade Act of 2002.

- Our methodology can serve as background information for potential future quantitative analysis that informs the official environmental review process.

- Other applications include measuring the environmental impacts of the FTAA and other trade agreements.

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NEXT TIME TRY THE TRAIN
RELAX
Southern Pacific

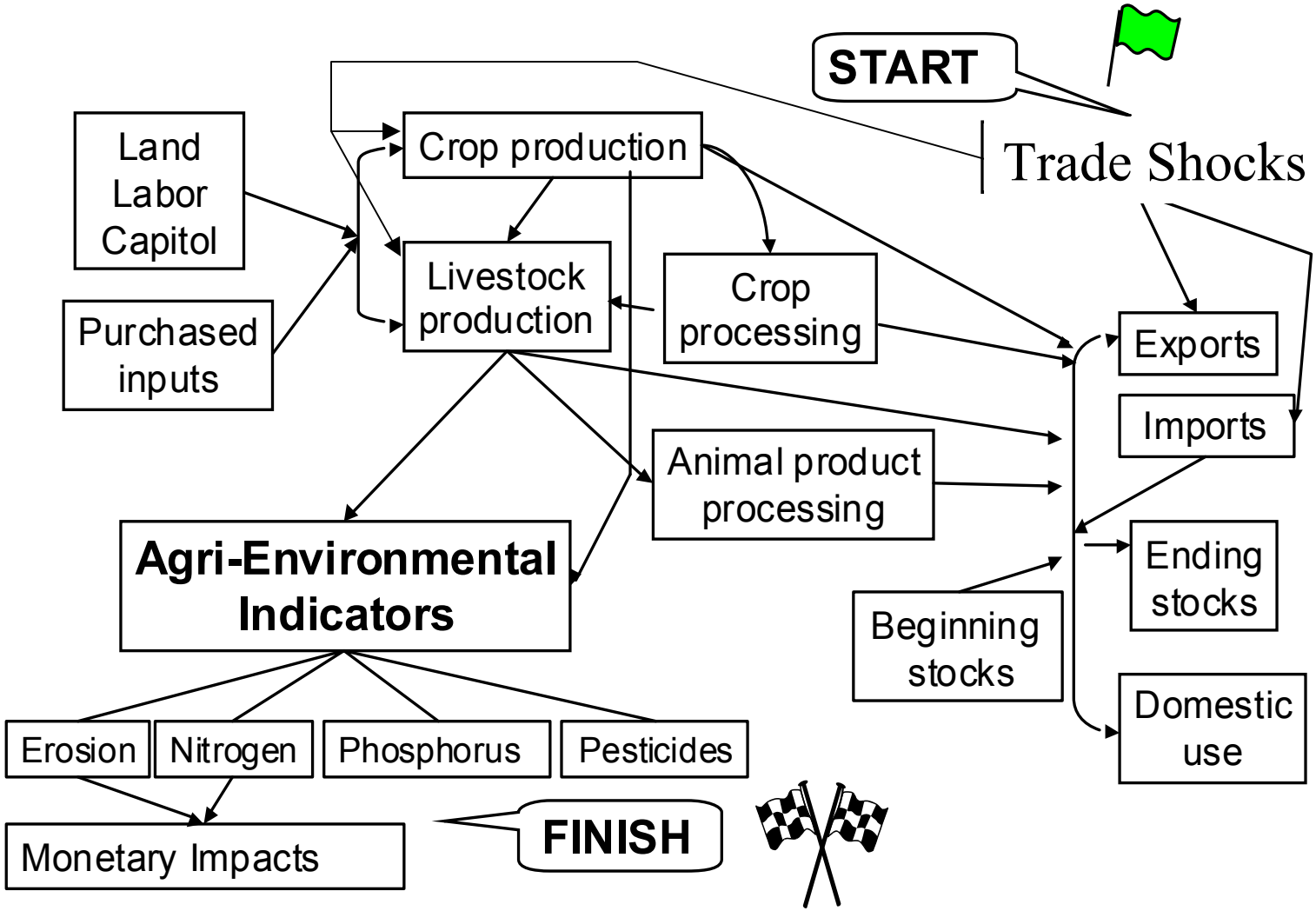
Extra Slides follow:

Crop and Animal Product Processing

soybean meal
soybean oil
ethanol
livestock feed mixes
cattle feed supplements
dairy feed supplements
swine feed supplements
fed beef
nonfed beef
veal
pork
butter

American cheese
other cheese
ice cream
nonfat dry milk
manufacturing milk

Fig. 1. USMP Trade and Env. Schematic



Treatment of domestic agricultural support in the Uruguay Round Agreement on Agriculture (URAA)

Category	General criteria	Examples of policies
Exempt support (green box)	Measures must be financed by the government rather than consumers and must not provide price support to producers Specific criteria are defined for general government services, public stockholding, domestic food aid, direct payments, payments under agri-environmental programs, and other programs	Green box programs include direct payments to farmers that do not depend on current production decisions or prices, disaster assistance, and government programs on research, extension, pest and disease control, and agri-environmental subsidy programs such as the Conservation Reserve Program and the Environmental Quality Incentives Program
Exempt direct payments (blue box)	Direct payments under production-limiting programs must be based on fixed area or yields, and cover 85 percent or less of the base level of production or head of livestock	Blue box policies are direct payments to producers, linked to production of specific crops, but which impose offsetting limits on output
Nonexempt support (amber box)	Market price support, nonexempt direct payments and any other subsidies not specifically exempted are subject to reduction commitments	Amber box policies include market price supports, and output and input subsidies

Source: Uruguay Round Agreement on Agriculture, WTO (with modifications by the authors).

- The U.S. is currently negotiating the Free Trade Area of the Americas (FTAA).

- The FTAA will eliminate barriers to trade and investment among 34 countries of the Western Hemisphere.

- Negotiations are to conclude in 2005.

- Barriers to agricultural trade to be eliminated include tariffs, domestic production subsides, and export subsidies.

HOW TRADE SHOCKS ARE INCORPORATED IN USMP

- USMP's import and export functions cannot account for world reactions to policy as it is a US-only model

- We imposed U.S. market changes due to world trade shocks into USMP in two different ways:

    1) impose US quantity changes (used in paper);
    The ERS/PSU supplied quantity changes reflect the new world market equilibrium.

    2) or impose changes in U.S. imports and exports.
    Production results were in the same ballpark as above.

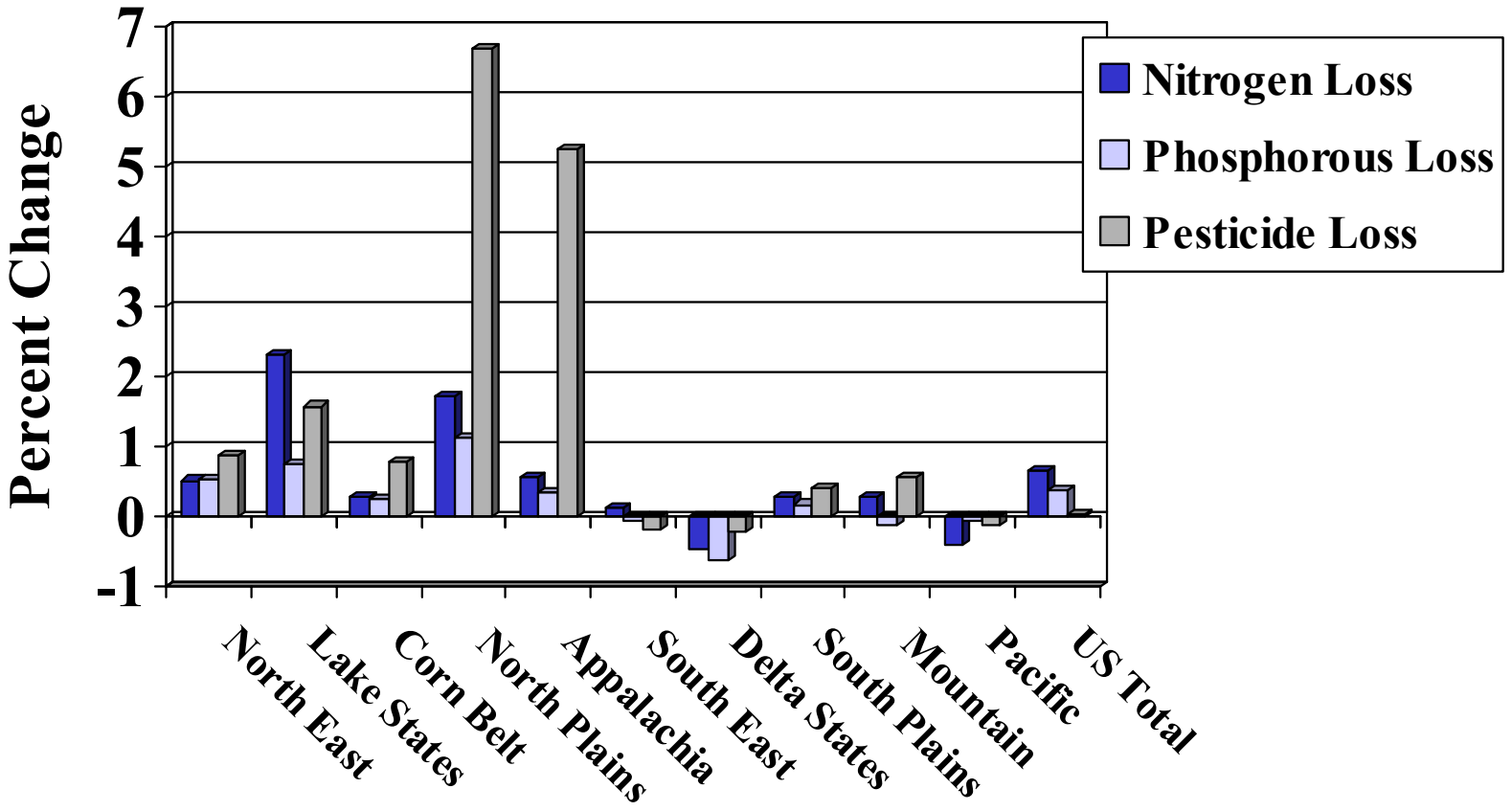
HOW TRADE SHOCKS ARE INCORPORATED IN USMP

- As the production changes are relatively small, we choose option (1) as it is these production changes that determine the environmental impacts

- A third alternative, imposing the US price changes from the ERS/PSU model on USMP is the most problematical in practice
  – Price and quantity changes are inversely related in USMP.
  – However, U.S. price and quantity impacts of world trade shocks may not be inversely related.

- The ideal solution to this issue would to be upgrade the U.S. module of the ERS/PSU model to include regional disaggregations and environmental impacts.
  –This upgrade currently infeasible due to manpower limitations

Change in Physical Environmental Indicators Resulting from Agricultural Trade Liberalization



Change in Physical Environmental Indicators Resulting from Agricultural Trade Liberalization (continued)