

# ***Bioenergy***

## ***Have We Lost Sight of the Forest for the Trees?***

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# ***The World's Challenges***

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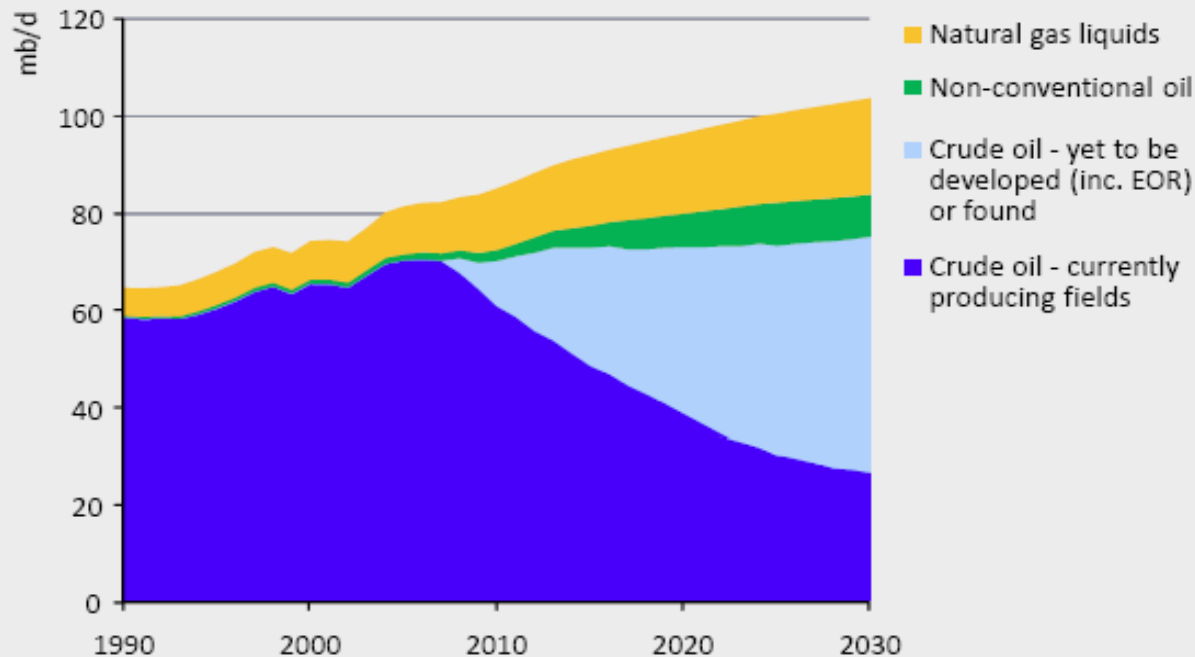
- Energy
- Climate Change
- Economic Development
  - Food Security
  - Land Use

# Energy

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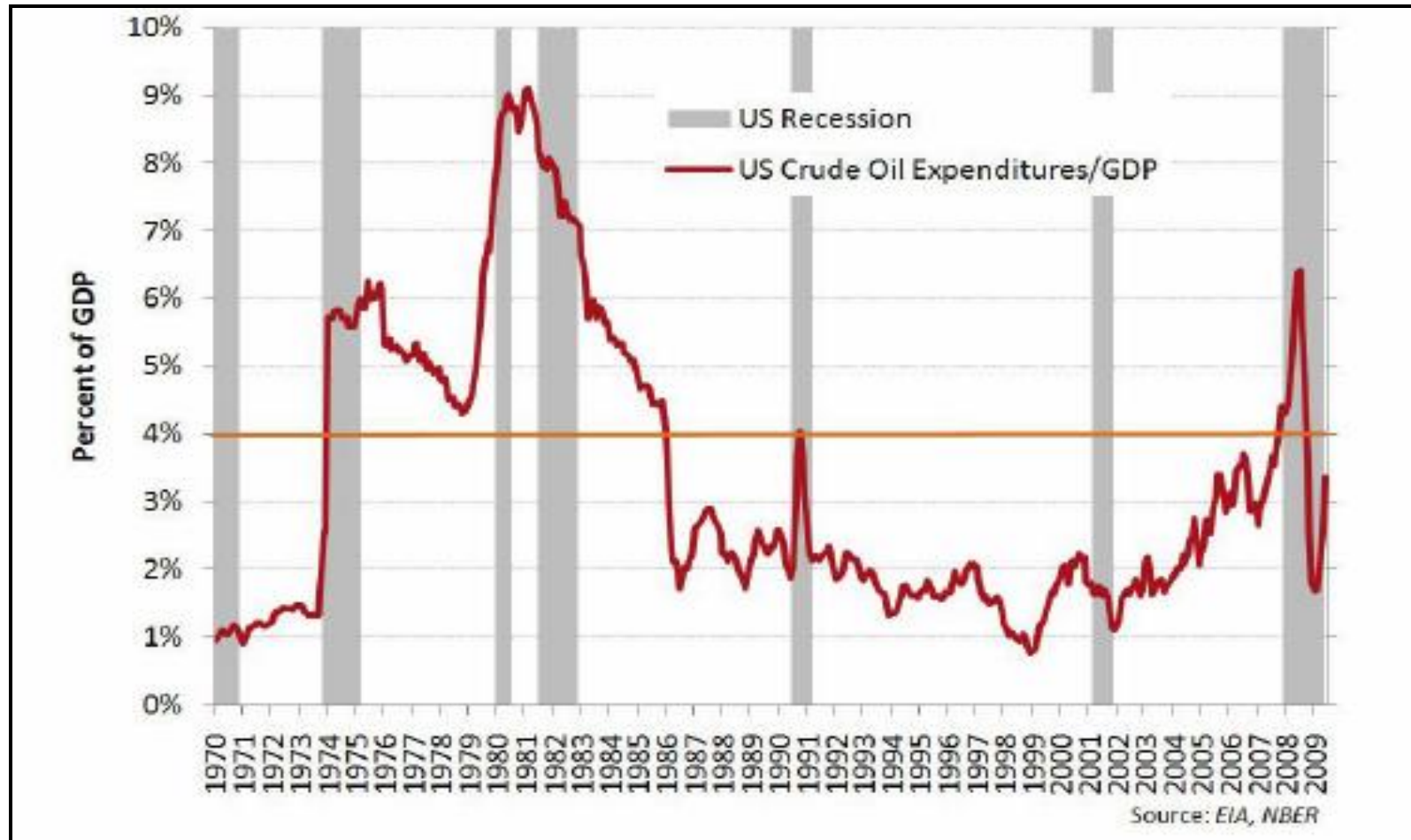
- Despite record high oil prices in 2008, the world's traditional oil reserves dropped by 3%, the first decline in a decade.
- There are multinational oil companies who think that we are close to maximum production capacity of conventional oil.
- Oil price spikes of 50% in one year and US oil costs/GDP of 4% will usually lead to a recession.

# IEA Liquids Forecast



*64 mb/d of gross capacity needs to be installed between 2007 & 2030 – six times the current capacity of Saudi Arabia – to meet demand growth & offset decline*

# US Energy Expenditures



# ***Energy Summary***

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- An increasing supply and demand gap suggests higher prices.
- But higher real prices will cripple the economy.
- Solutions:
  - Either a massive improvement in energy efficiency to allow for higher prices without destroying the economy, or
  - Alternative supplies that are cost competitive, or
  - Some combination of the two.

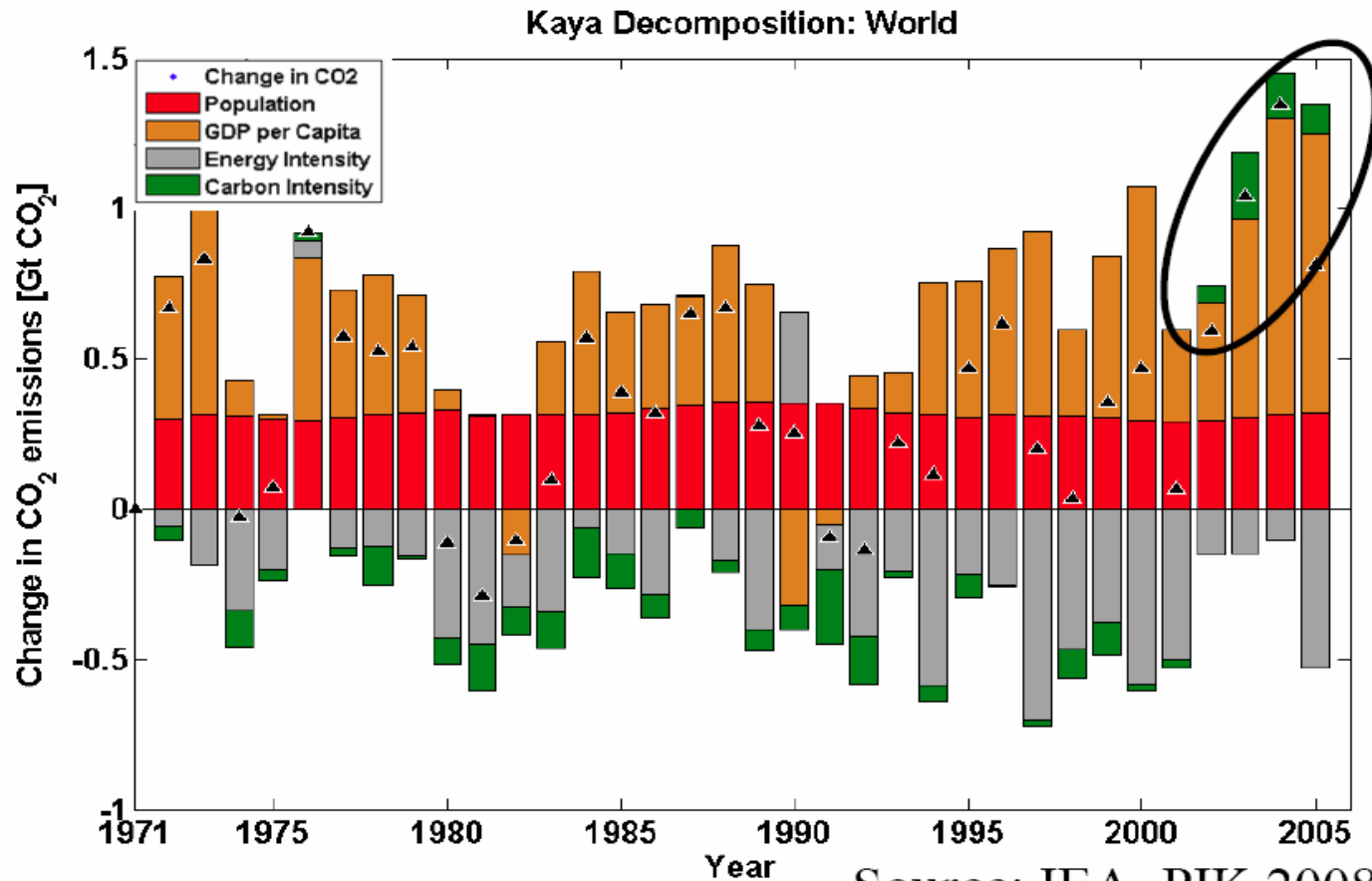
# Climate Change

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- Oil is losing market share to coal.
- In the past decade the rate of increase in the demand for coal has been four times the rate of increase in oil production.
- Unconventional (high GHG) oil is expected to contribute a larger share of oil supply and conventional oil is getting more difficult to produce.
  - Between 2001 and 2007 the energy cost of producing crude oil increased by 50%.

# New Emissions Trend?

## Drivers of CO<sub>2</sub> Emissions



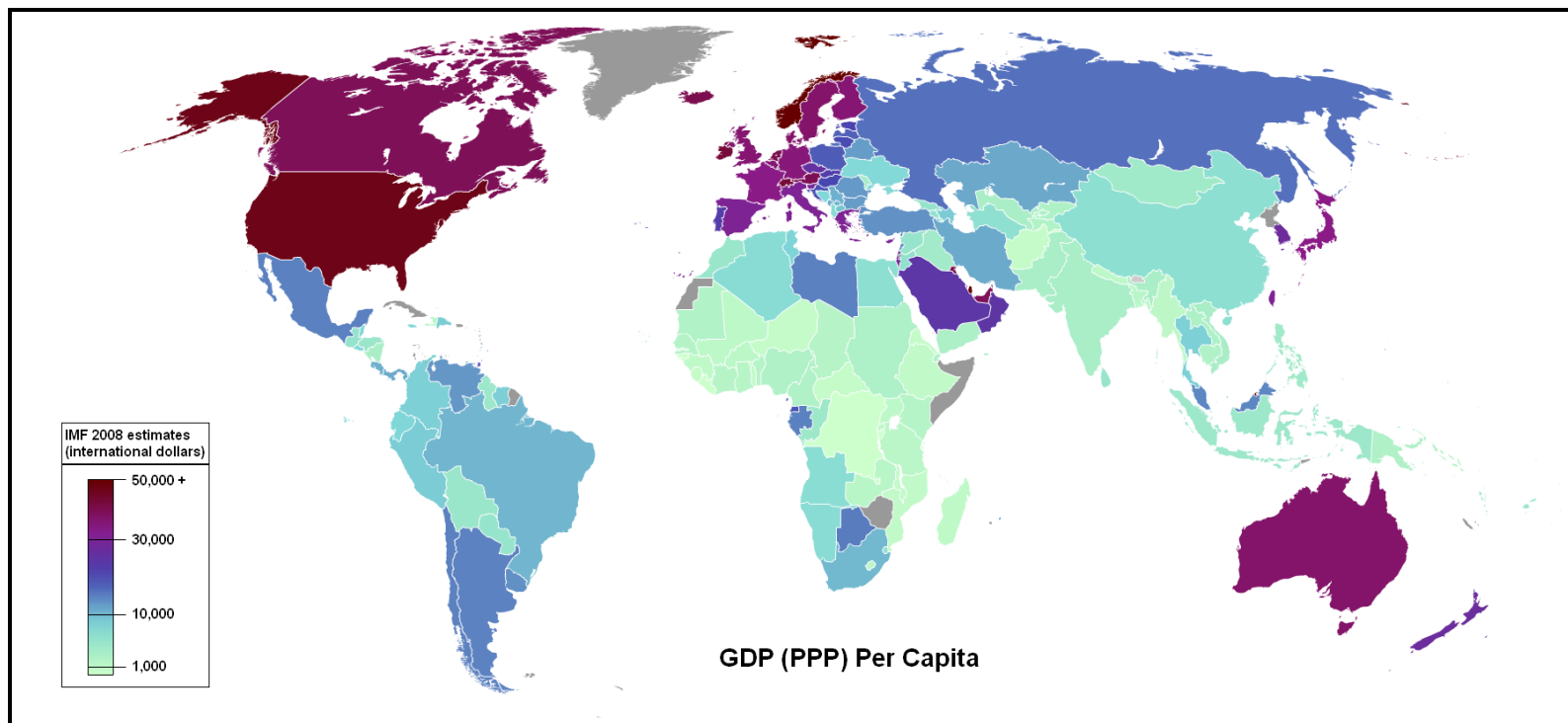


# *Climate Change Summary*

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- Two of the four drivers are probably not controllable, population and per capita GDP.
- We need massive improvements in energy intensity.
- But we also need to reverse the recent trend towards increasing carbon intensity and renewables are one of the few options that can make large differences.

# Great Economic Disparity

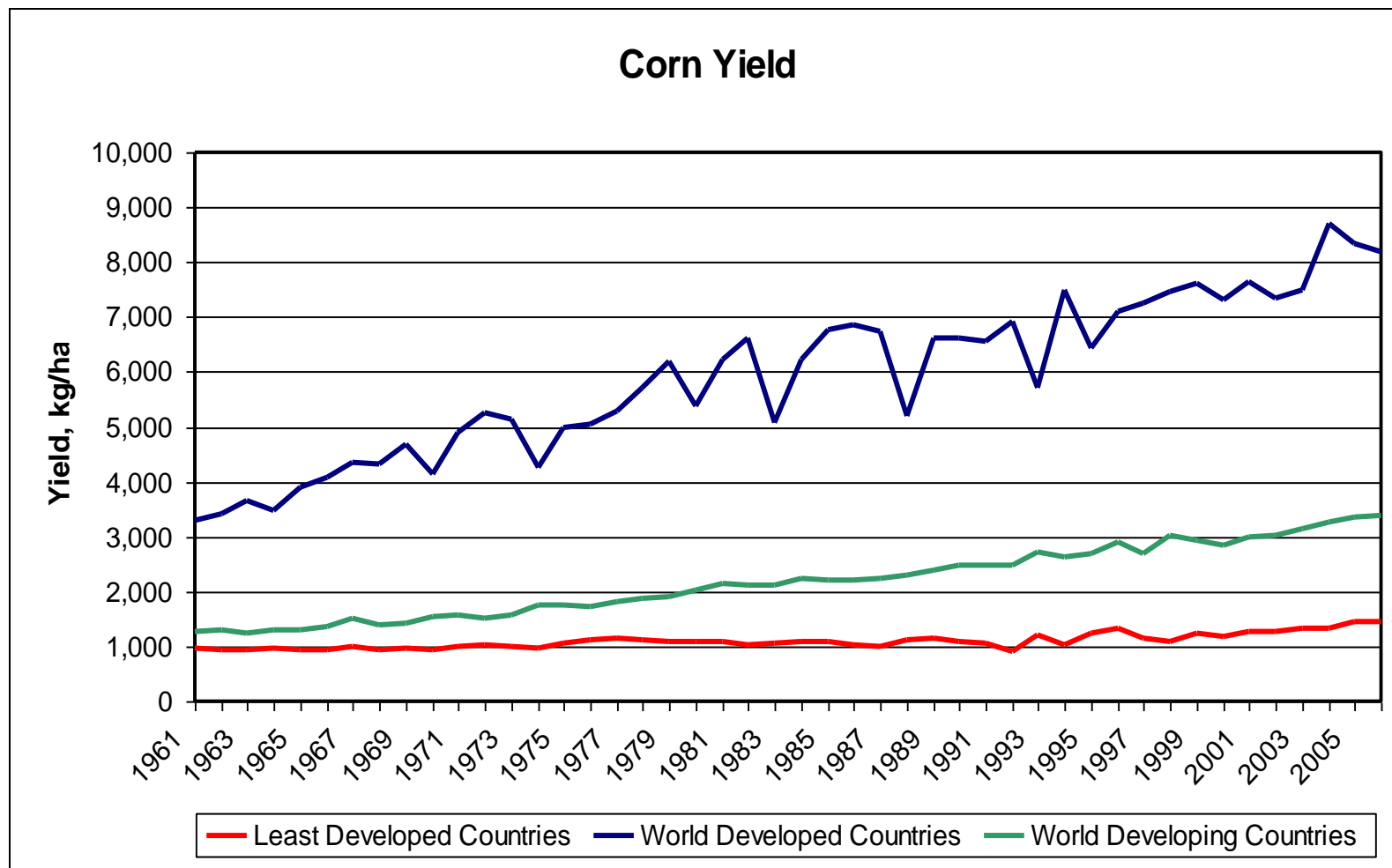


# ***Food Security***

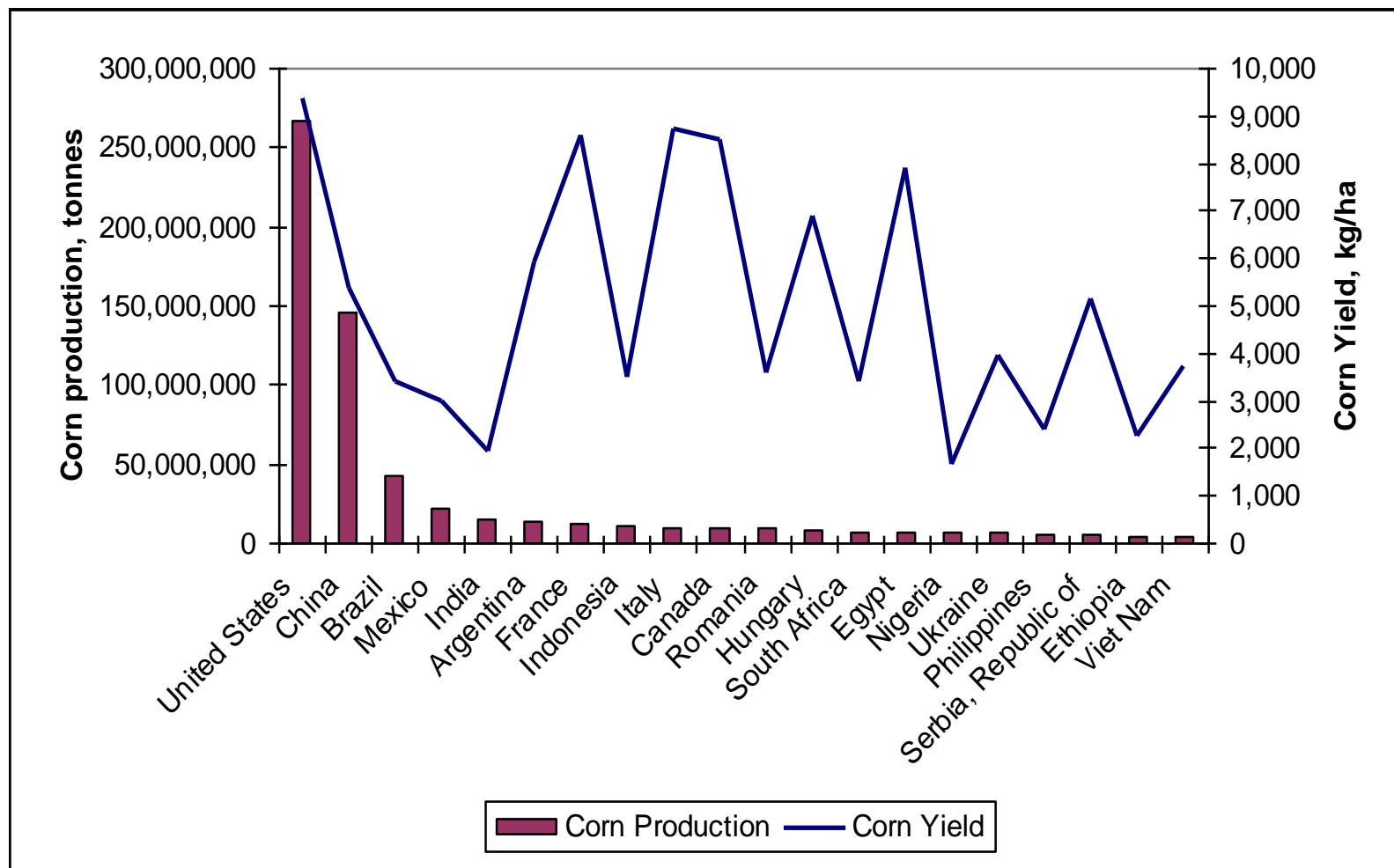
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- Poverty is inversely correlated to GDP and in rural economies GDP means agricultural productivity.
- The agricultural productivity gap between the developed and developing world is very large and troublesome.
- The last G8 meeting finally focussed on increasing ag productivity to alleviate hunger.

# Agricultural Productivity



# Agricultural Productivity

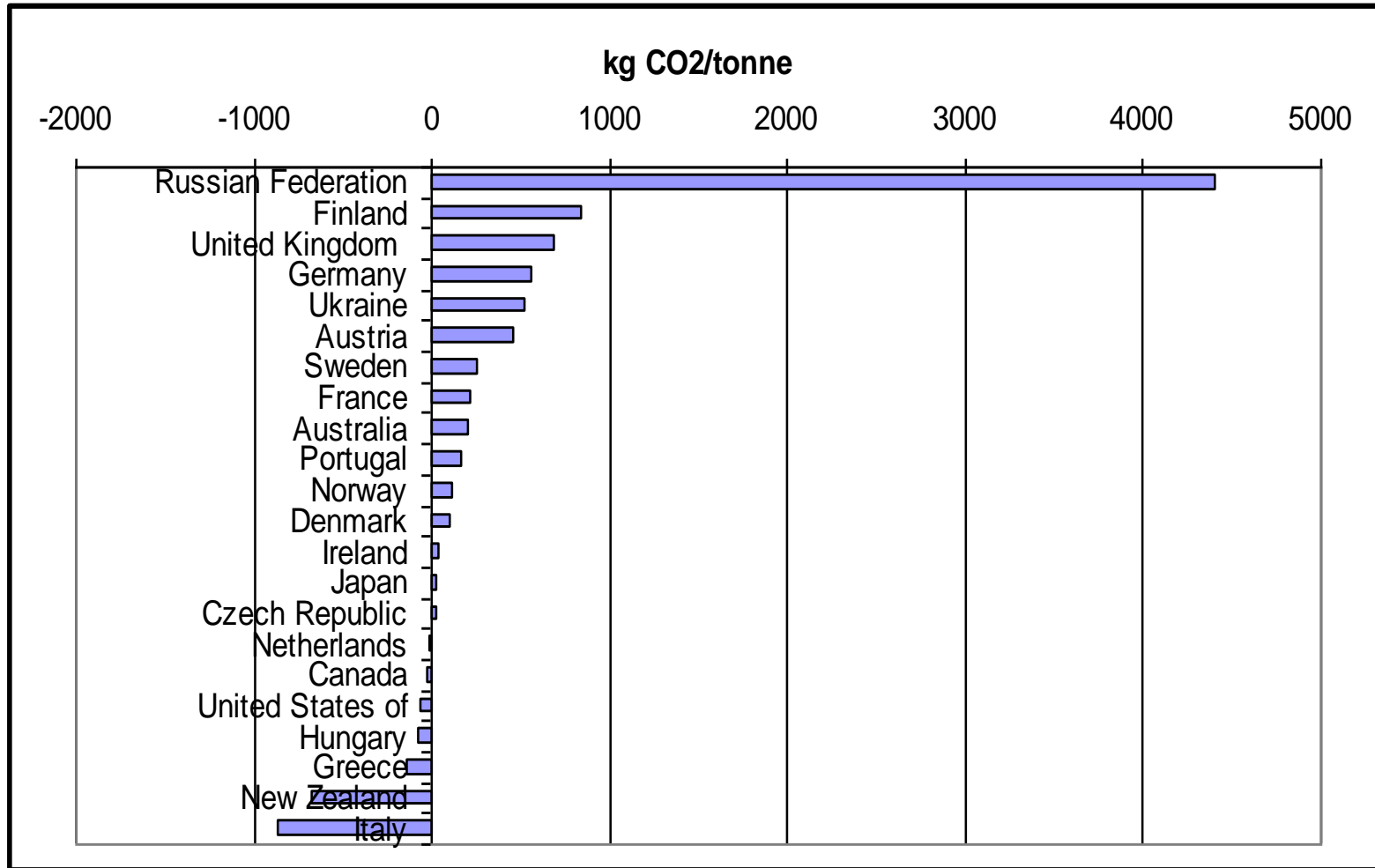


# ***Land Use***

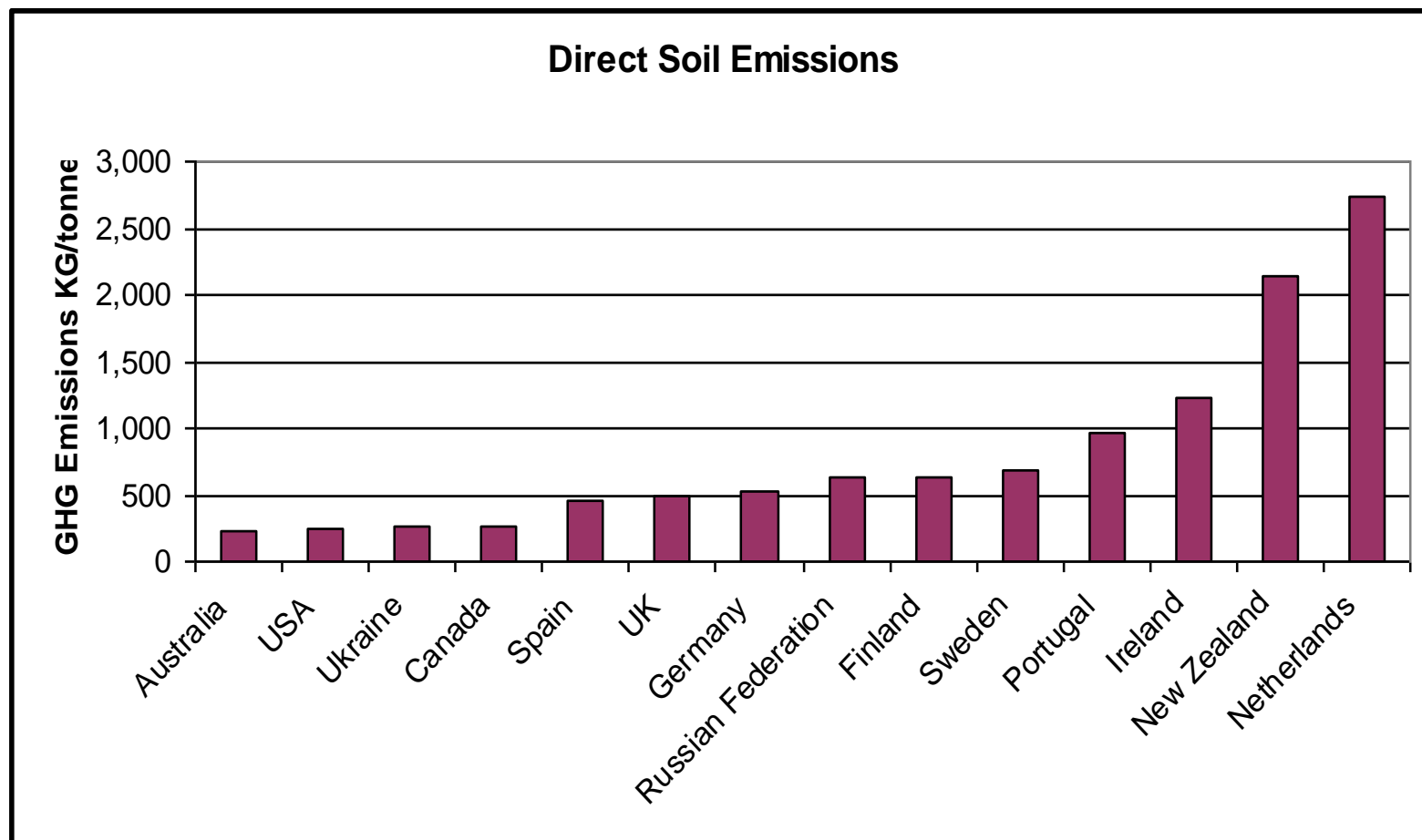
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- There are huge differences in land use around the world and therefore opportunities to increase agricultural productivity, increase per capita GDP, reduce poverty and hunger.
- And yet the foundation of all of the discussion on indirect land use changes is based on the assumption that the “system” is operating at capacity. This Malthusian concept is terribly misguided.

# International Land Use Emissions



# Direct Soil Emissions





# ***US EPA ILUC Estimates***

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- The change in world crop area for the corn ethanol scenario is 0.26% in the year 2022. For biodiesel it is 0.05%.
- The range in corn yield between the highest and lowest is 85% of the highest yield. For soybeans it is 60% of the highest yield.
- About half of the calculated emissions are from countries for which there is zero land use data.
- For countries for which there is land use data, it is assumed that land use was caused by increased ag demand only. About half of the emissions are from land use change where crop land is not involved.

# Summary

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- The world is facing a number of interrelated problems with respect to energy supply, climate, change, and economic development.
- Unfortunately there is no silver bullet for all these problems.
- The solutions will be multidimensional and it is unlikely that each individual component of the overall solution will be without it's own challenge.
- Bioenergy is not perfect and the growth rate of biofuels a few years ago did tax some parts of the system.

# Summary

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- But in the past several years the biofuels industry have allowed the critics to very narrowly define the issues.
  - Food vs. fuel instead of the agricultural productivity gap and the economic instability of agriculture throughout the developed and developing world.
  - Indirect Land Use Change by assuming increased demand must mean more land instead of an opportunity to address the productivity gap.

# Summary

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- We need to refocus on the bigger issues and the role that bioenergy and biofuels can play in addressing those issues.
- We need to have honest debates about the real issues and not allow the critics to twist and distort the “facts”.
- We have an opportunity to make a difference, it would be a shame to lose that because we can't see the forest for the trees.