



Fertilizer Industry Roundtable

14 November, 2011



The Promise of Abundant, Sustainable Agriculture



JOHN DEERE



TECHNOLOGY EVOLVES



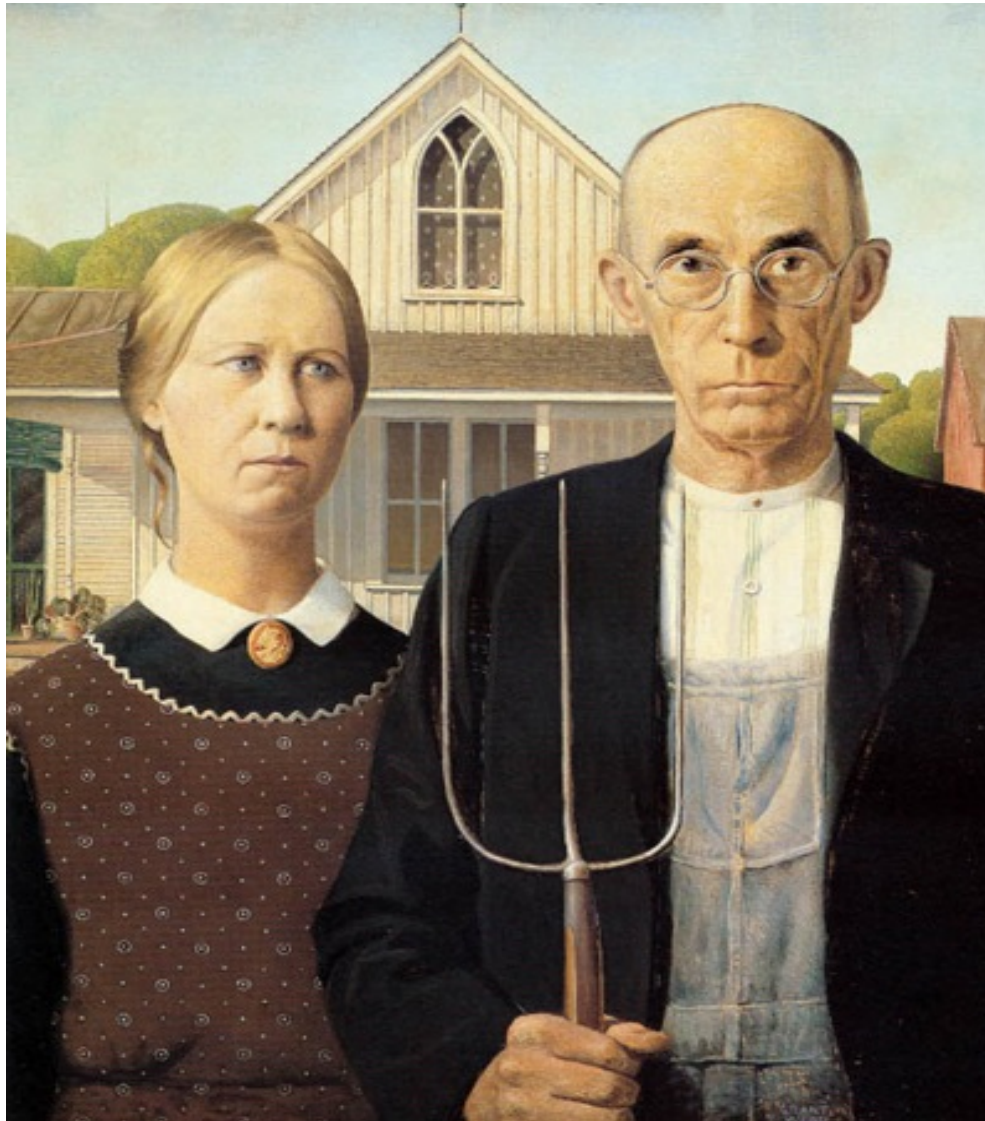
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**1956 IBM HARD DRIVE
5MB OF STORAGE**



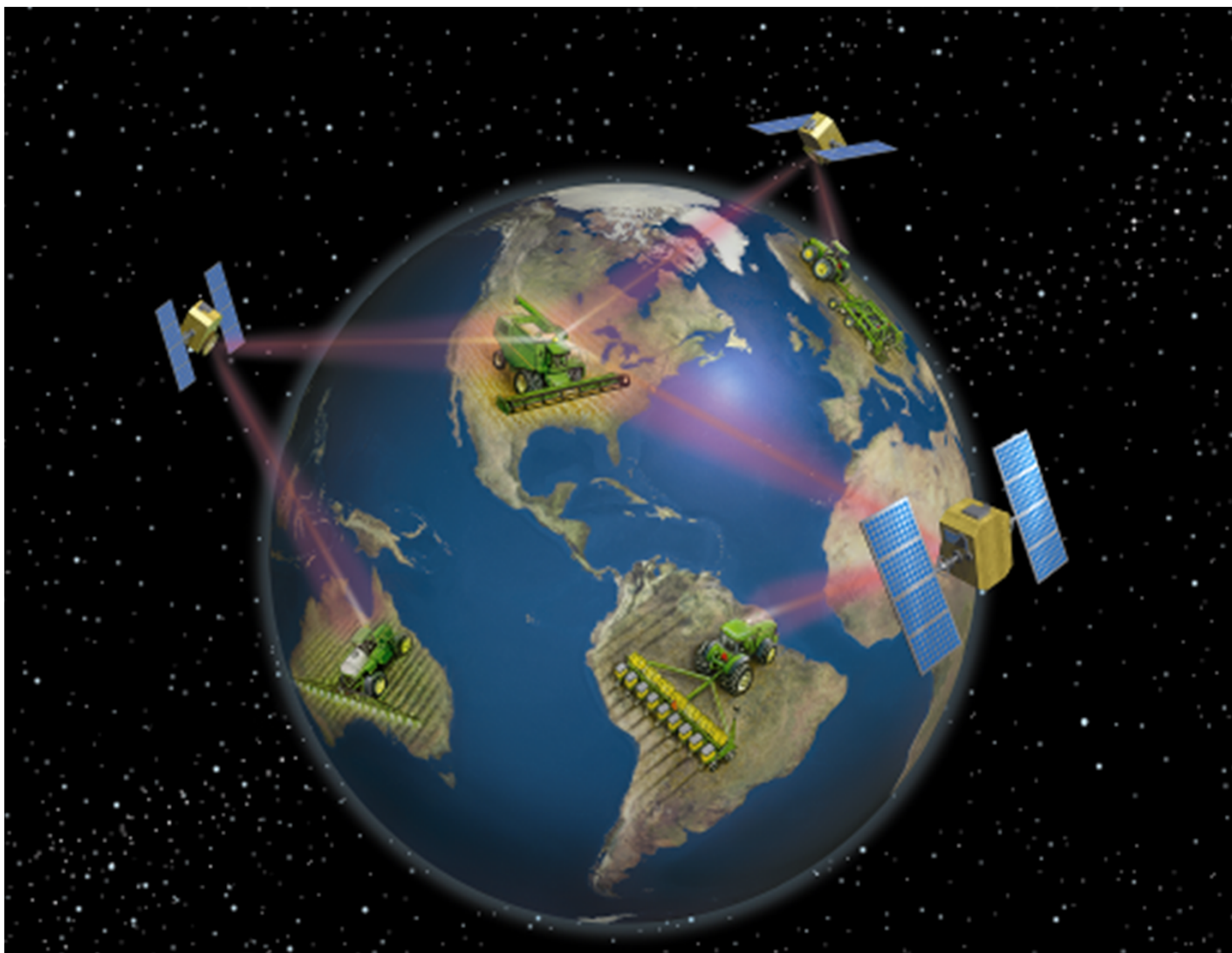
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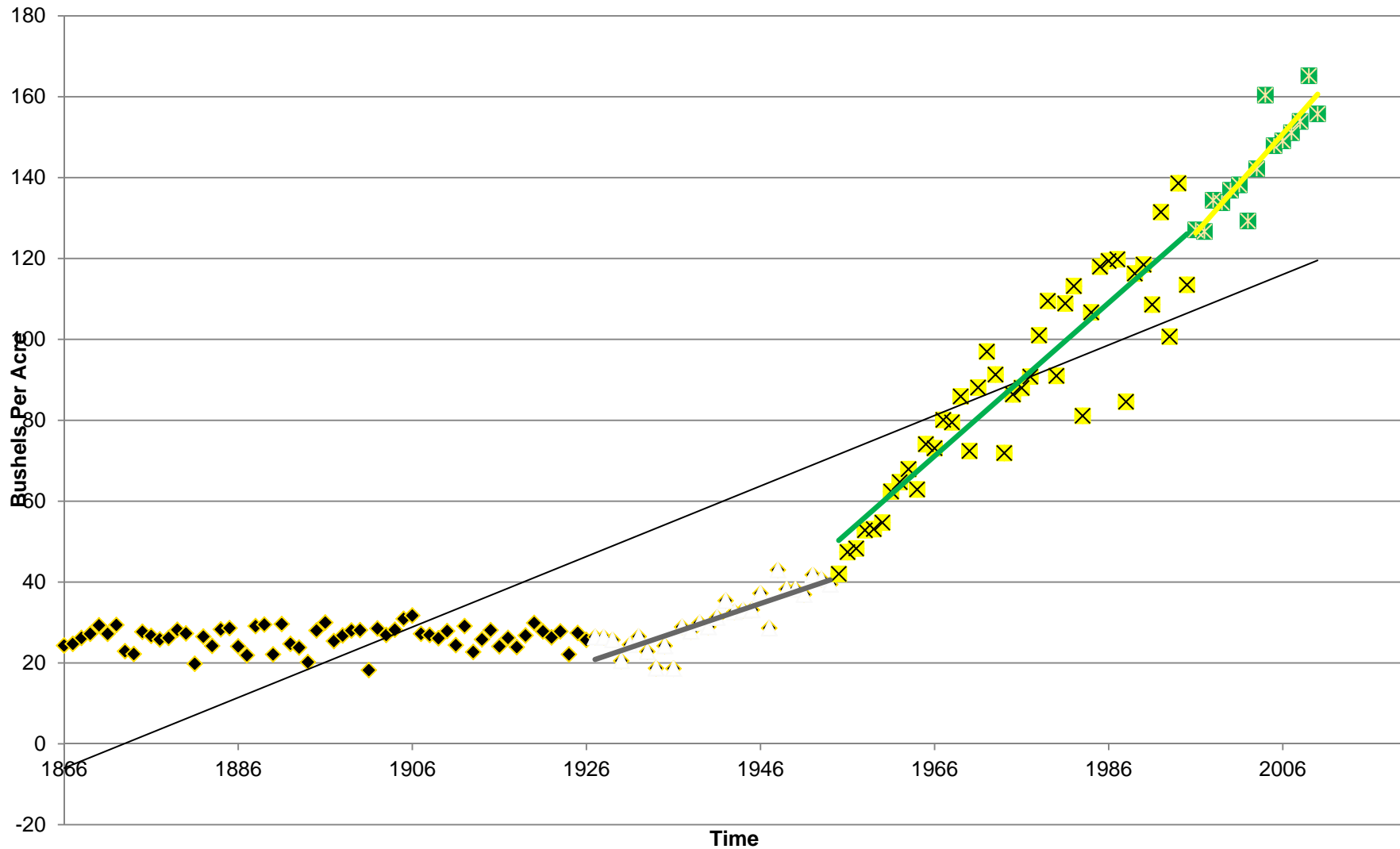
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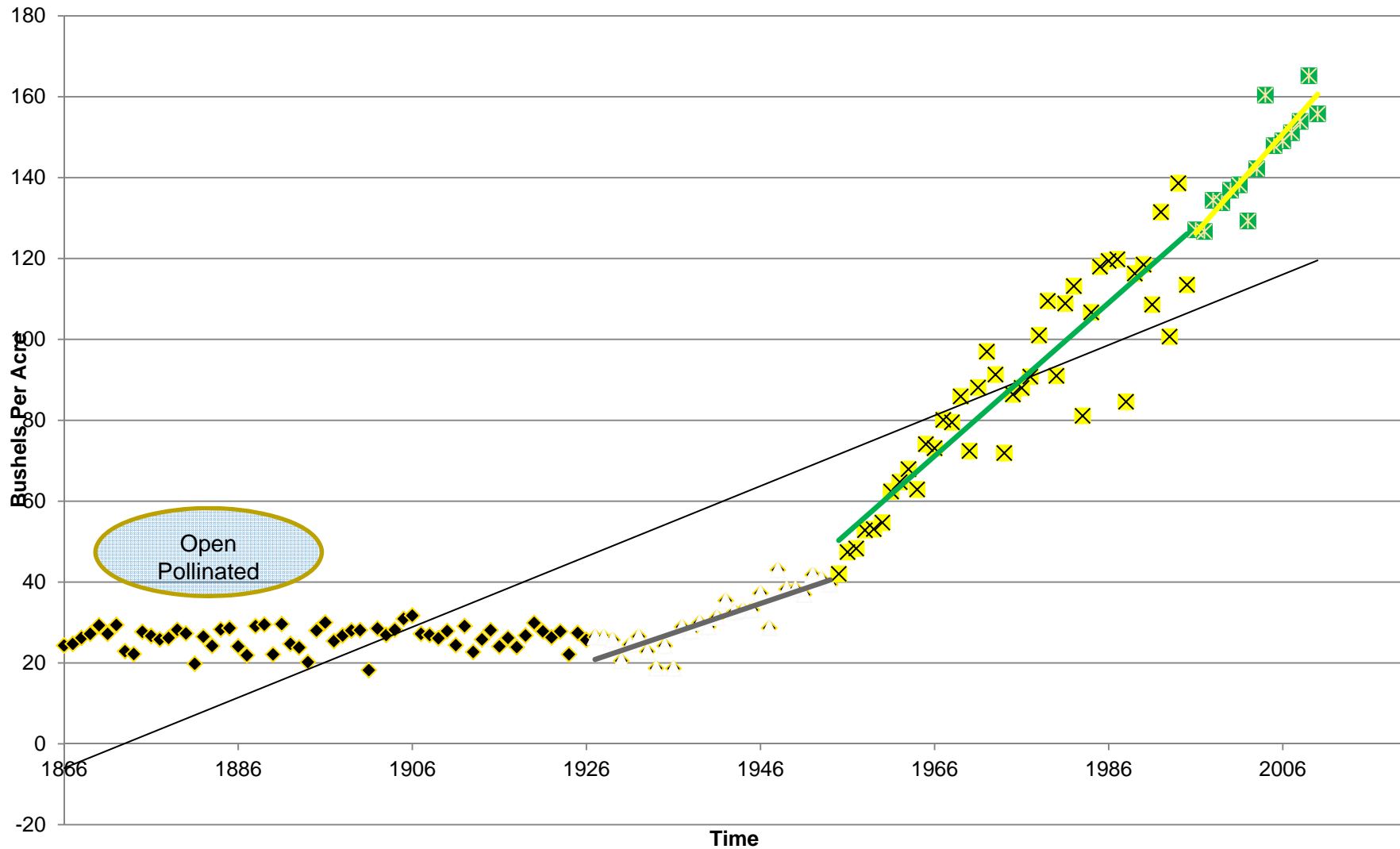


Can we grow enough corn?



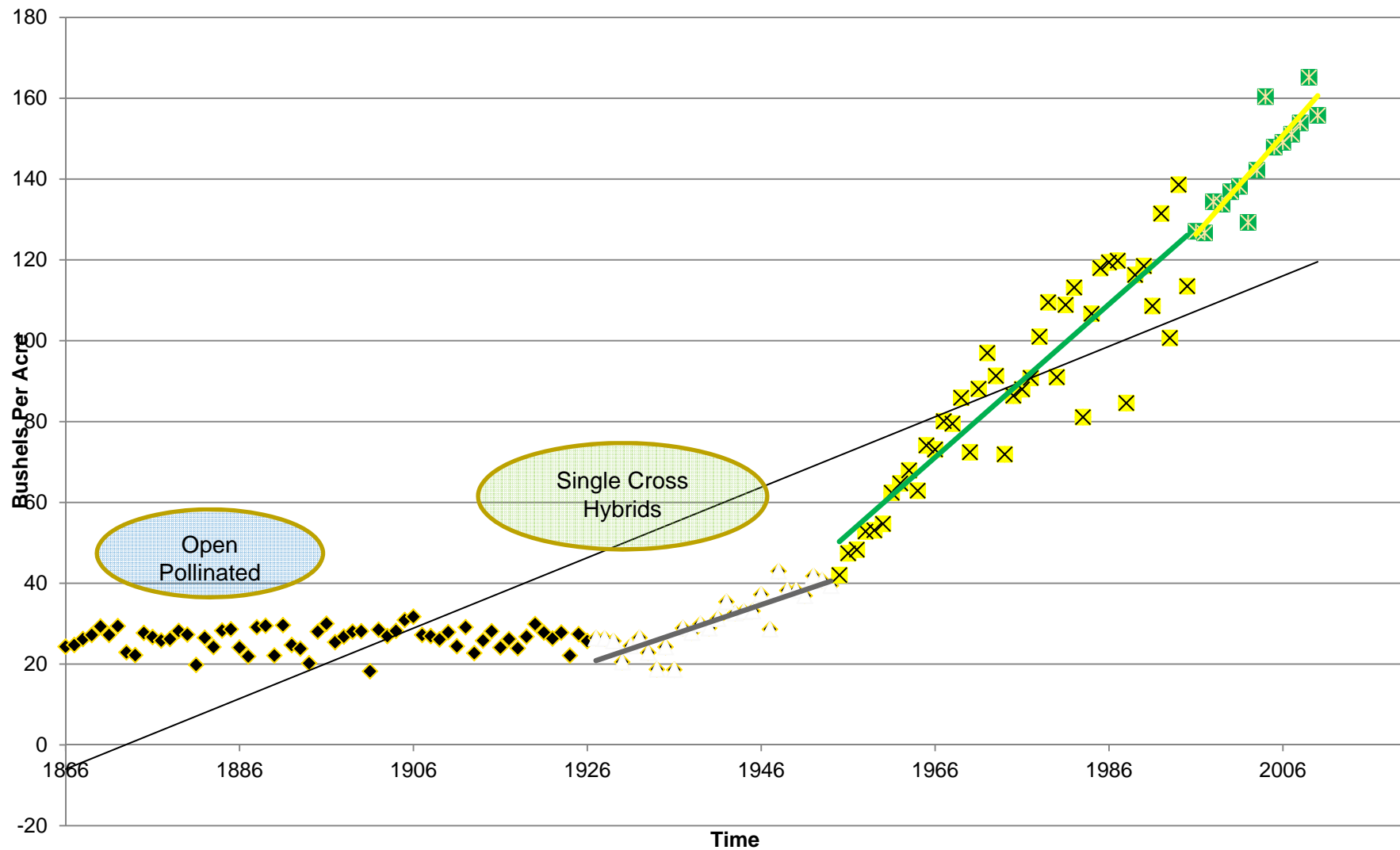


Historical Corn Yields 1866-2010



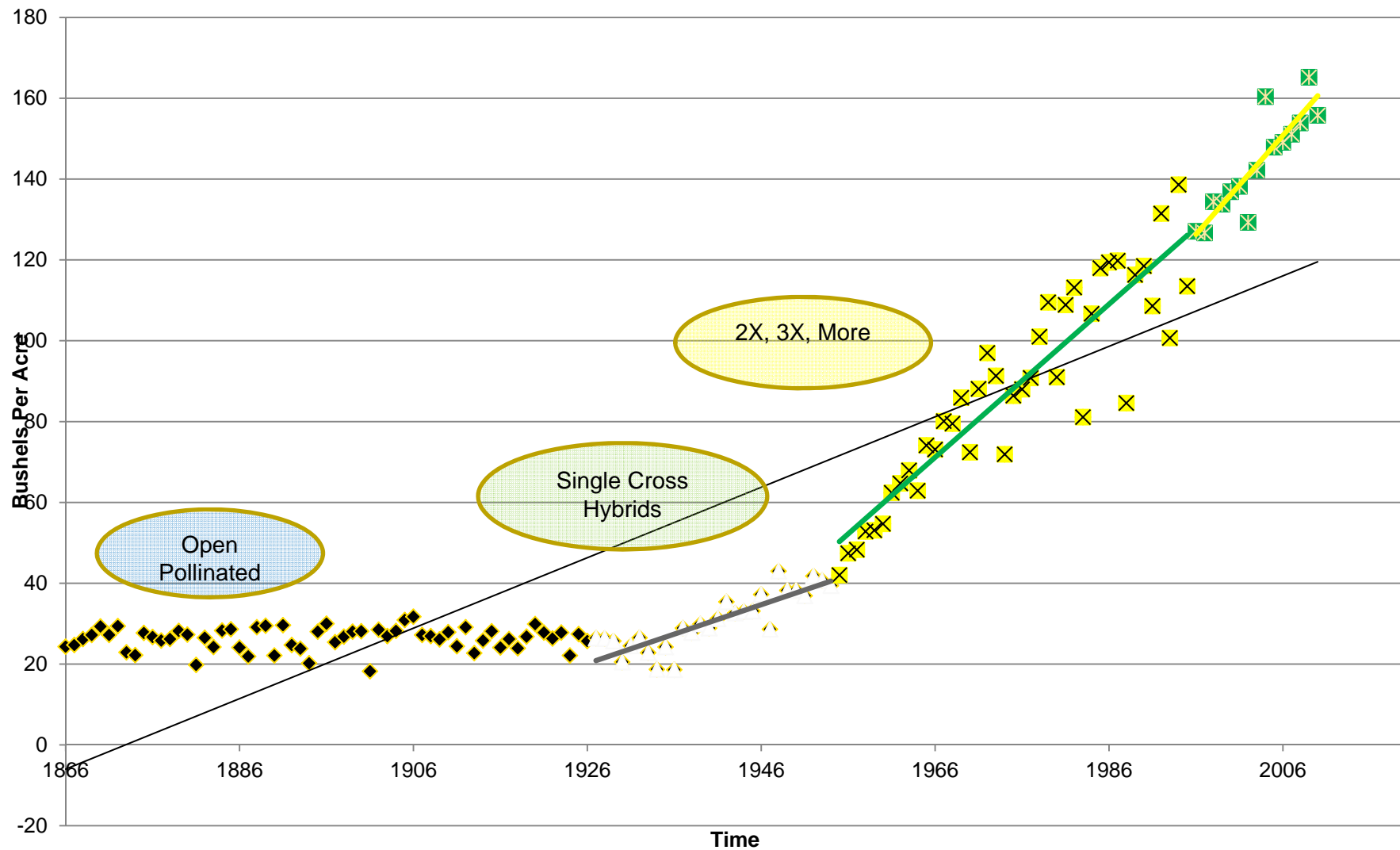


Historical Corn Yields 1866-2010



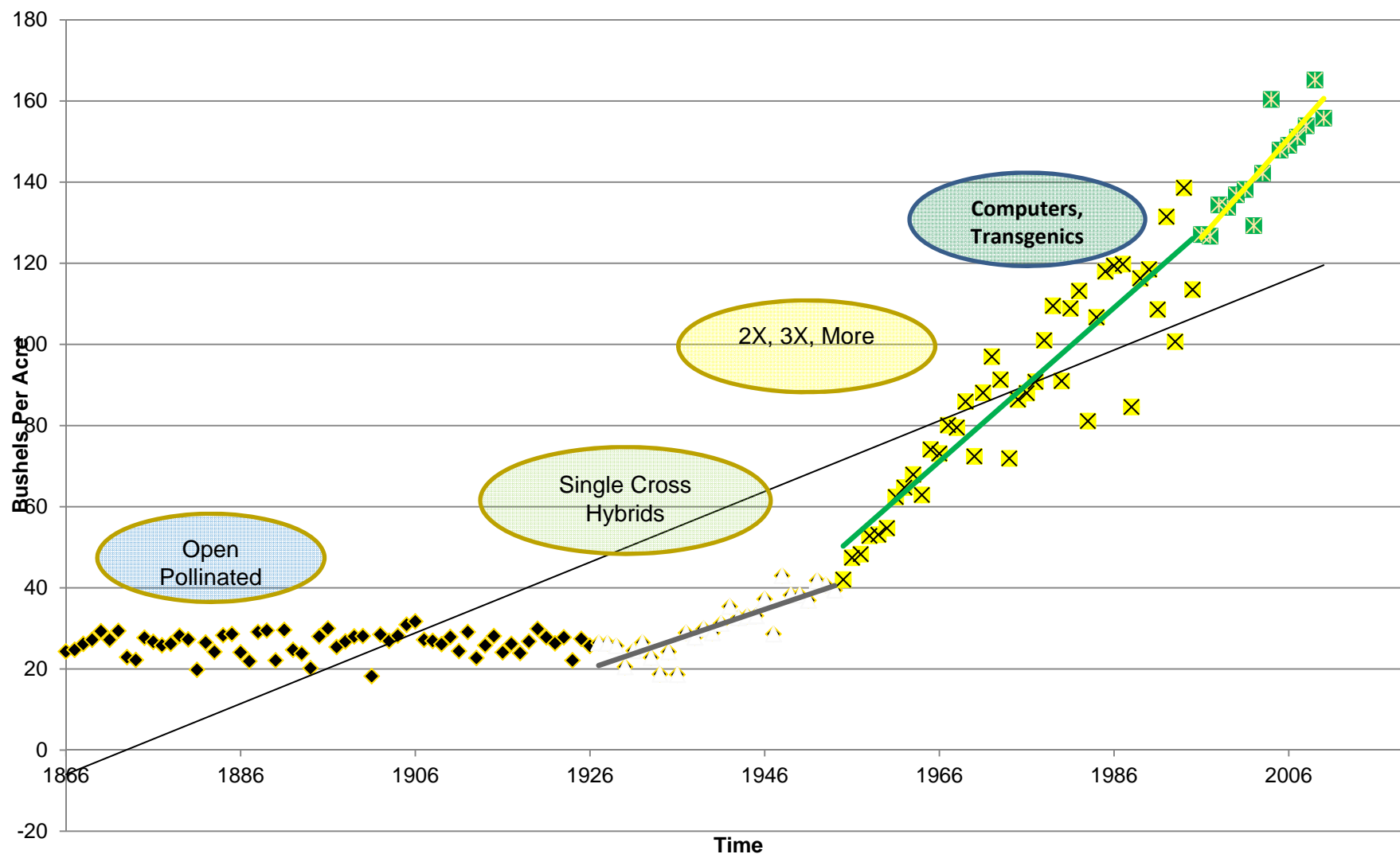


Historical Corn Yields 1866-2010



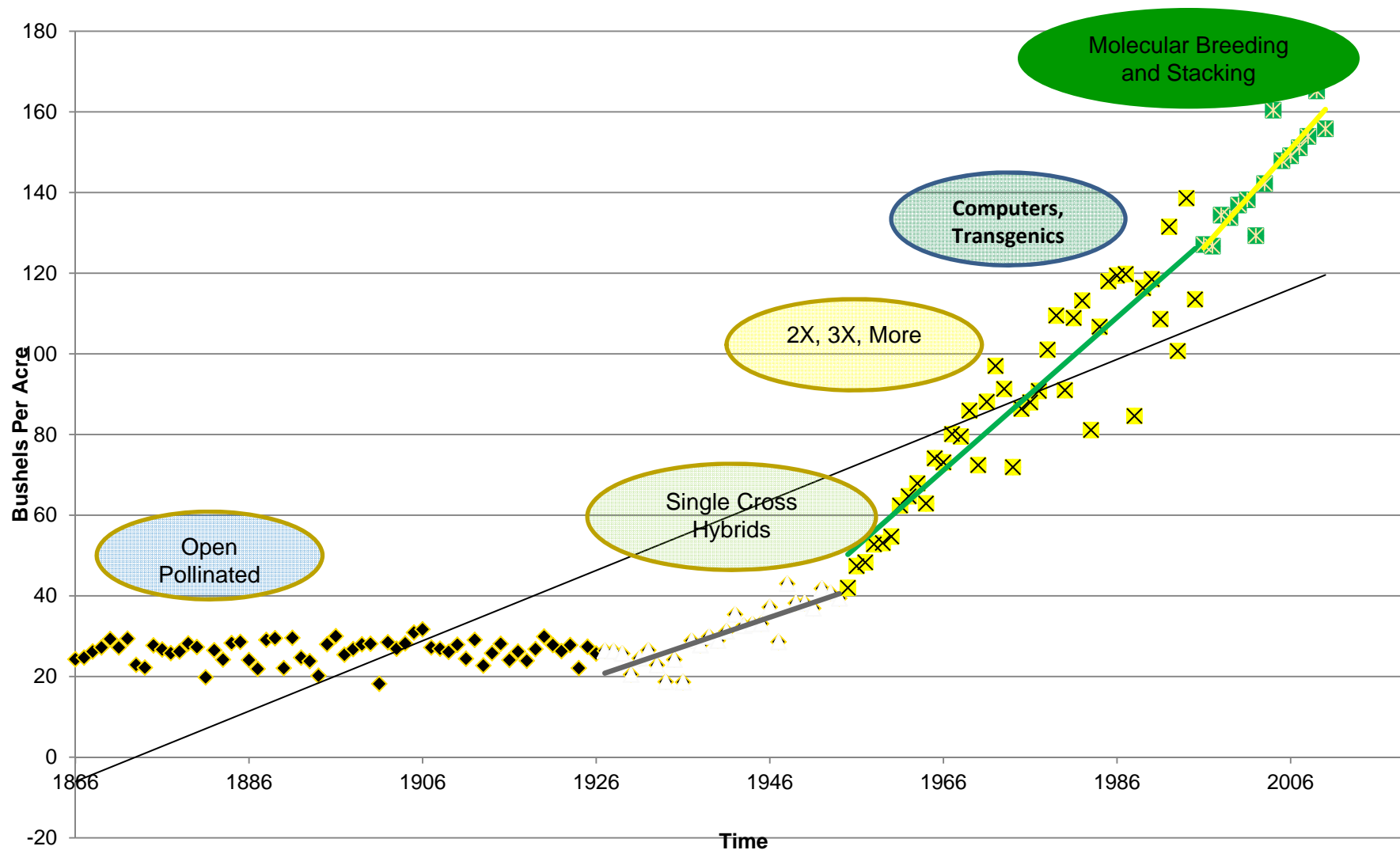


Historical Corn Yields 1866-2010



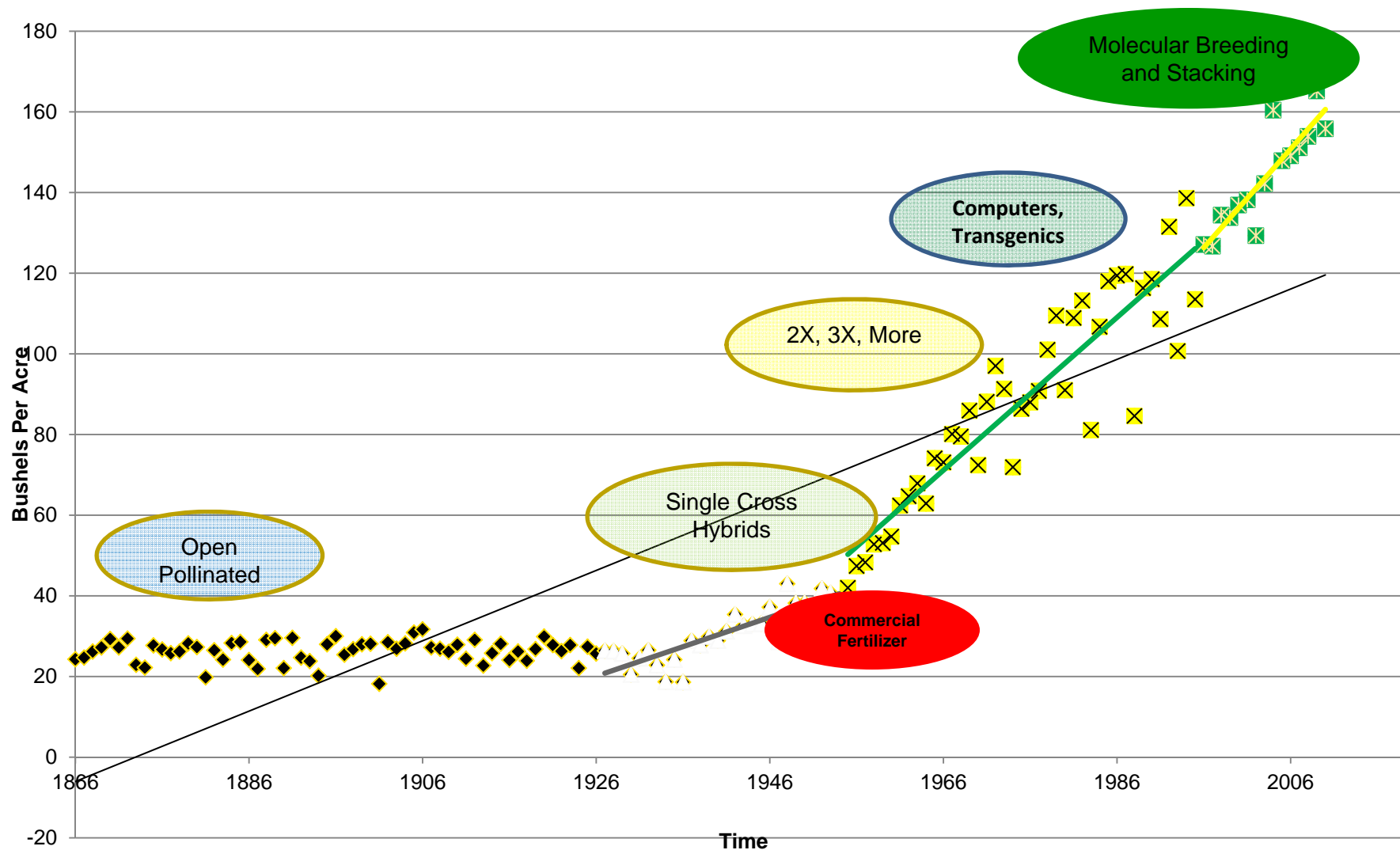


Historical Corn Yields 1866-2010



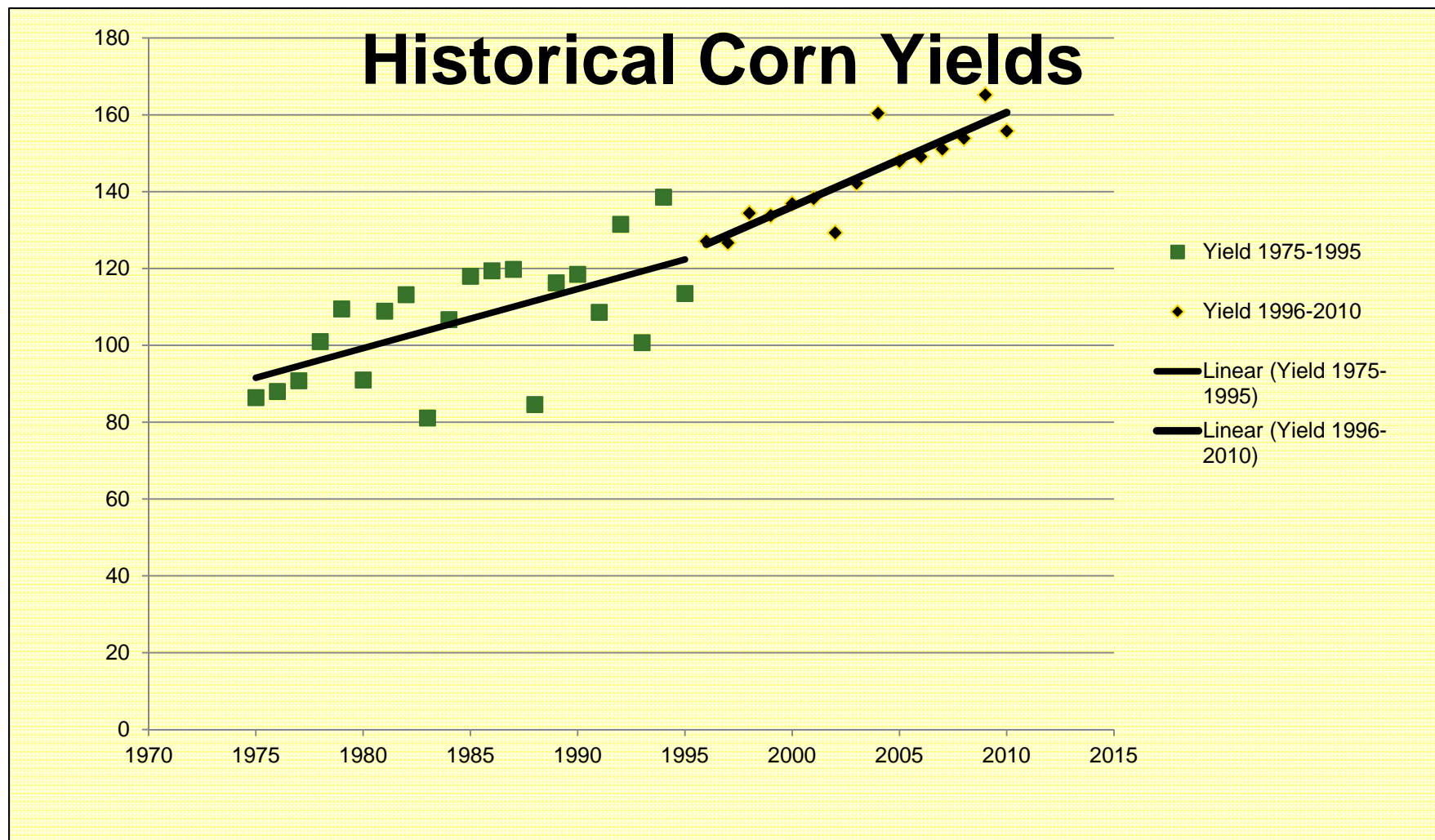


Historical Corn Yields 1866-2010





TECHNOLOGY EVOLVES





Productivity Per Acre

20 Years of Progress

	Yield (Bushels Per Acre)	Acres To Produce 13 Billion Bushels
1989	116.3	113,499,570
2009	165.2	79,603,148

**"Virtual" Acres
Created**

33,896,422



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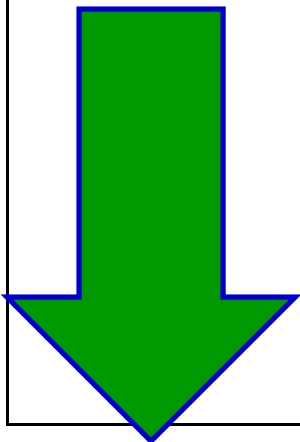
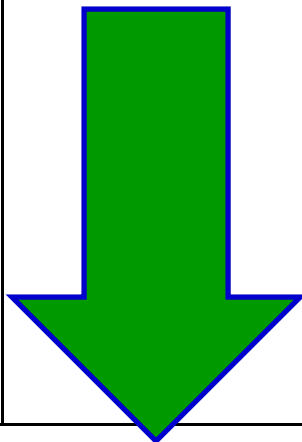
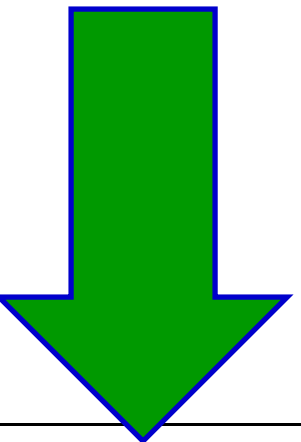
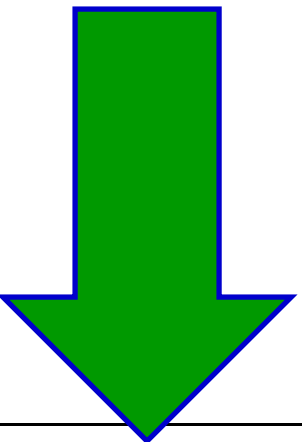
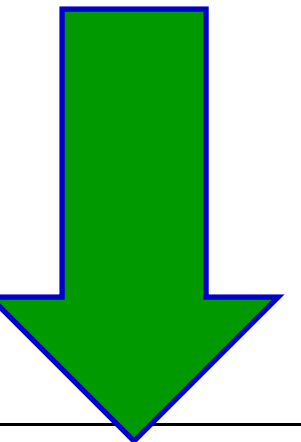
1982-2007

Farmland the size of Indiana lost to development– 23 Million Acres





Sustainability Gains 1987-2007

Land Use	Soil Loss	Irrigation	Energy	Climate
Amount of land to produce one bushel of corn	Soil loss per bushel, above a tolerable level	Irrigation water use per bushel	Energy used to produce one bushel	Emissions per bushel
				

37%

69%

27%

37%

30%

(USDA, U. of Nb., CTIC)



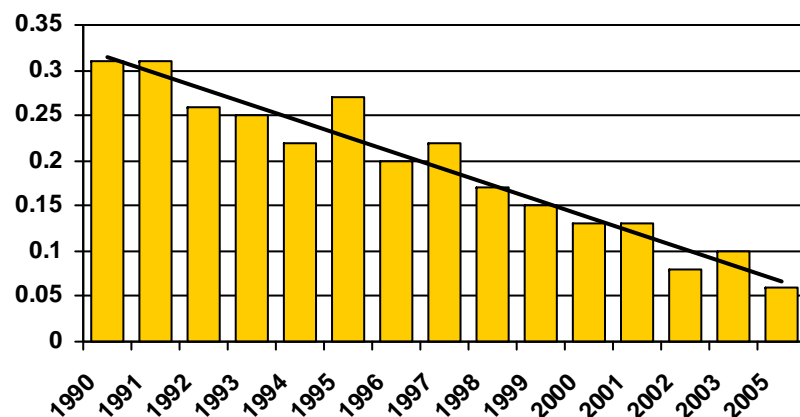
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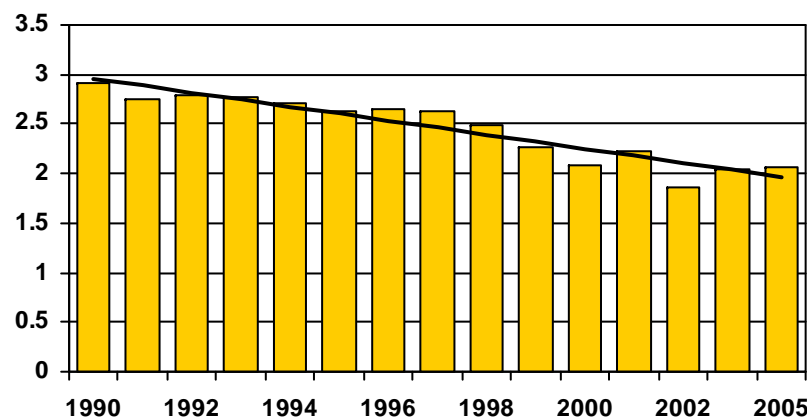
Sustainability Gains

Increasing adoption of hybrids with insect-resistant and herbicide-tolerant traits and precision application have greatly reduced the need for synthetic applications of herbicides and insecticides.

Insecticide Pounds Per Acre



Herbicide Pounds Per Acre



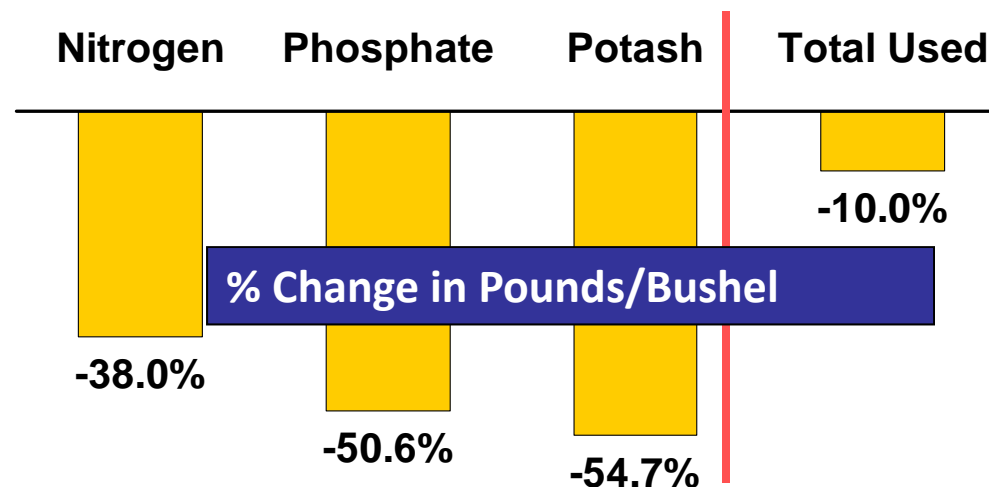
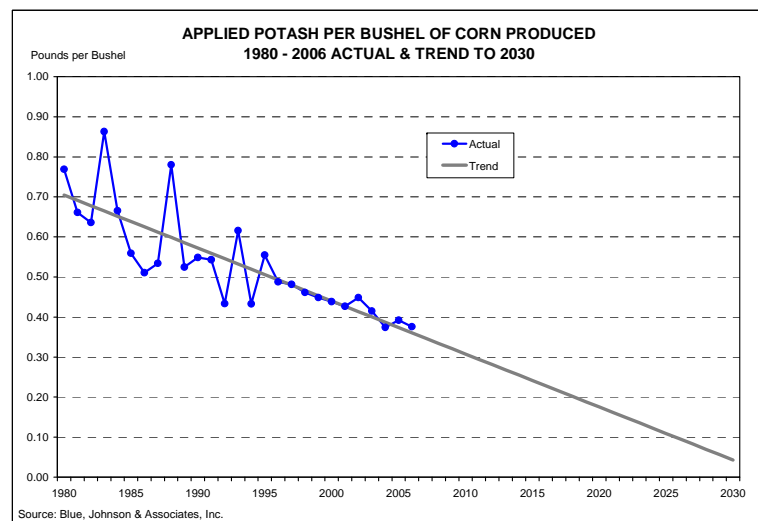
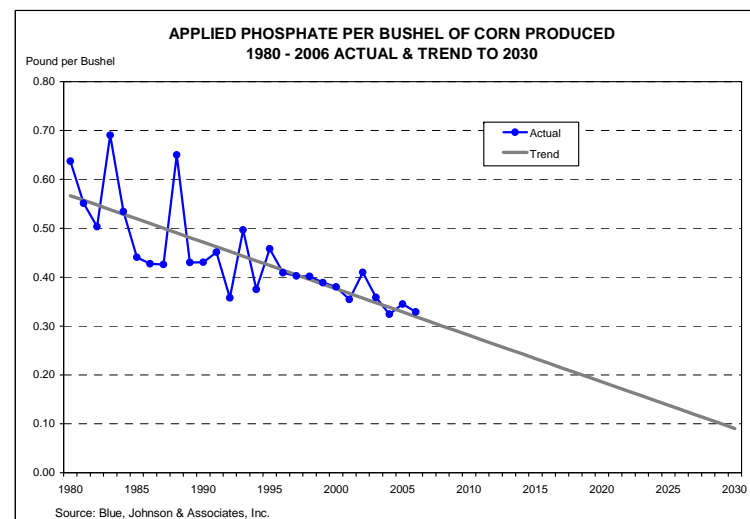
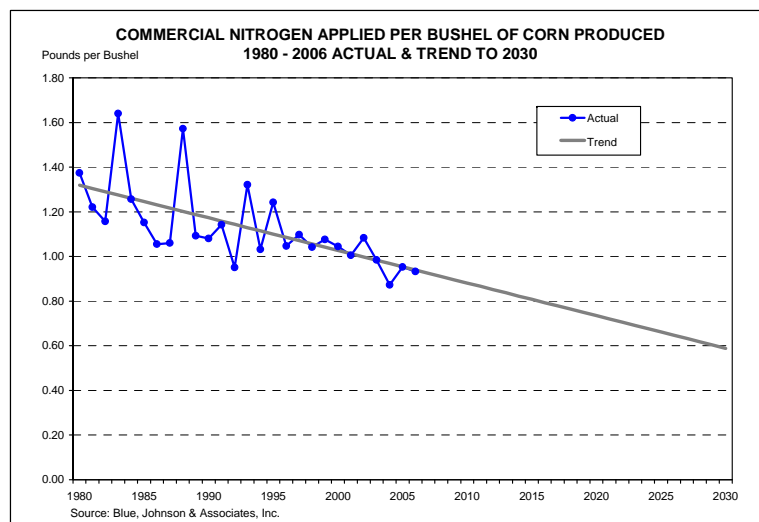
Source: USDA



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Sustainability Gains



Source: Blue, Johnson & Assoc. Inc. & The Fertilizer Institute

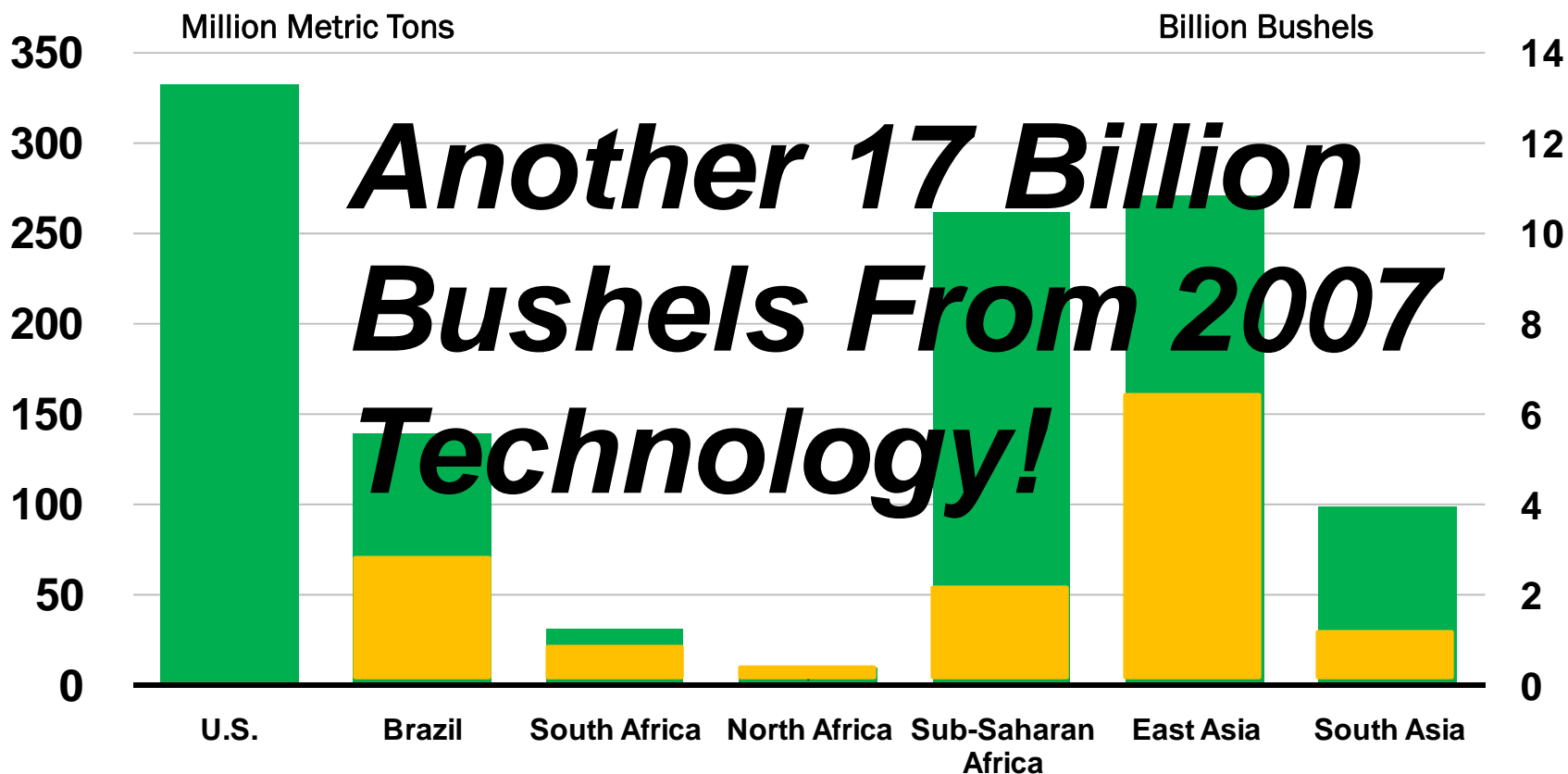




Productivity Per Acre

Developing World Productivity Opportunities

Corn production 2007, Actual and Potential with US yields.



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Sustainability Challenges

ases Green House Gases

the disputed issues include the trend is unprecedented or
uses of increased global within normal climatic varia-
air temperature, espe- tions, and what

Nitrogen Run-off Killing All the Wildlife

Top Soil Going Down the River

A major environmental concern known as topsoil erosion occurs when the topsoil layer is blown or washed away. Without topsoil, little plant life can grow. It takes approximately 500 years for one inch of topsoil to be deposited, but there are 25 billion tons of topsoil lost each year. Critics say environmental and erations have made platform for debate the nation's most cru



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Sustainability Challenges

Environmental Groups Ask EPA to Limit Pollution Into 'Dead Zone'

Conservation organizations from nine states along the Mississippi River this week petitioned EPA for rulemaking under the Clean Water Act to set and enforce numeric limits on nitrogen and phosphorus flowing into the northern Gulf of Mexico that contribute to the gulf's "dead zone."



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Fertilizer Technology

Apply:
**More Acres,
More Rapidly,
More Precisely,
More Efficiently,
More Sustainably.**



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Technology Evolves

The Biggerwider Solution



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THE BIGGERWIDER SOLUTION



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THE BIGGERWIDER SOLUTION





THE BIGGERWIDER SOLUTION





The Fork in the Road?

Biggerwider

- More horsepower
- More fuel consumption
- More carbon emissions
- More weight and compaction
- More capital expenditures



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Technology Evolves

The Smarterbetter Solution



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Technology Evolves

- Smarterbetter Technologies and Enablers
 - More soil friendly (less compaction)
 - Low draft loads (less horsepower, less carbon)
 - High residue capabilities
 - High speed operation
 - High speed “pit stops”
 - NH₃ or UAN (urea may require too much soil disturbance)
 - More precision
 - ***Emphasis on productivity through efficiency***



Technology Evolves

- Smarterbetter Cultural Practices
 - Enable split application—Make split applications practical and routine
 - Minimize carbon footprint
 - Minimize soil disturbance/erosion
 - Enable precise nutrient location
 - Silicone processors can be better than carbon processors at eliminating misapplication
 - Row by row control
 - Variable application tied to soil history, field location, permeability, etc



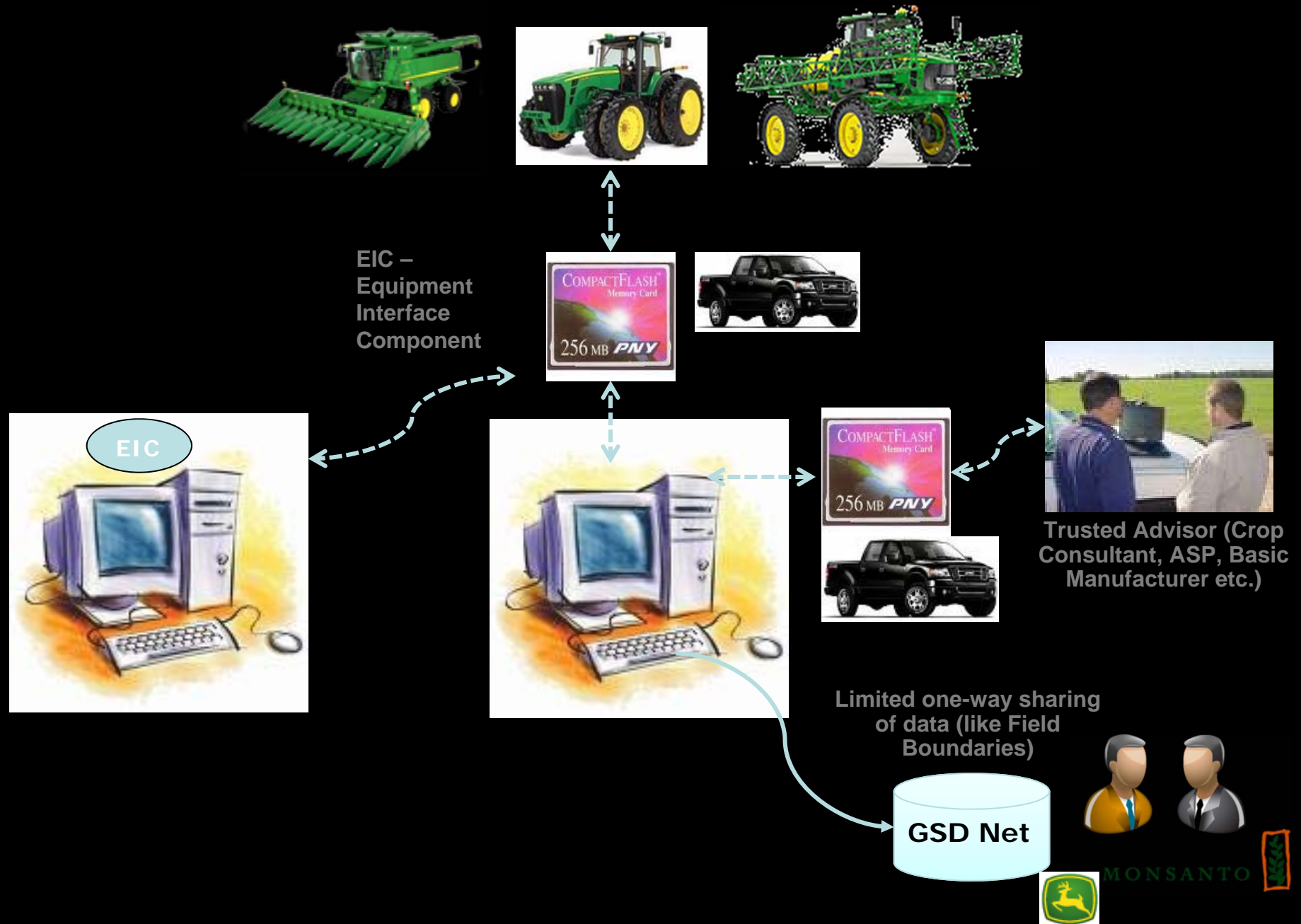
High Speed Nitrogen Applicator



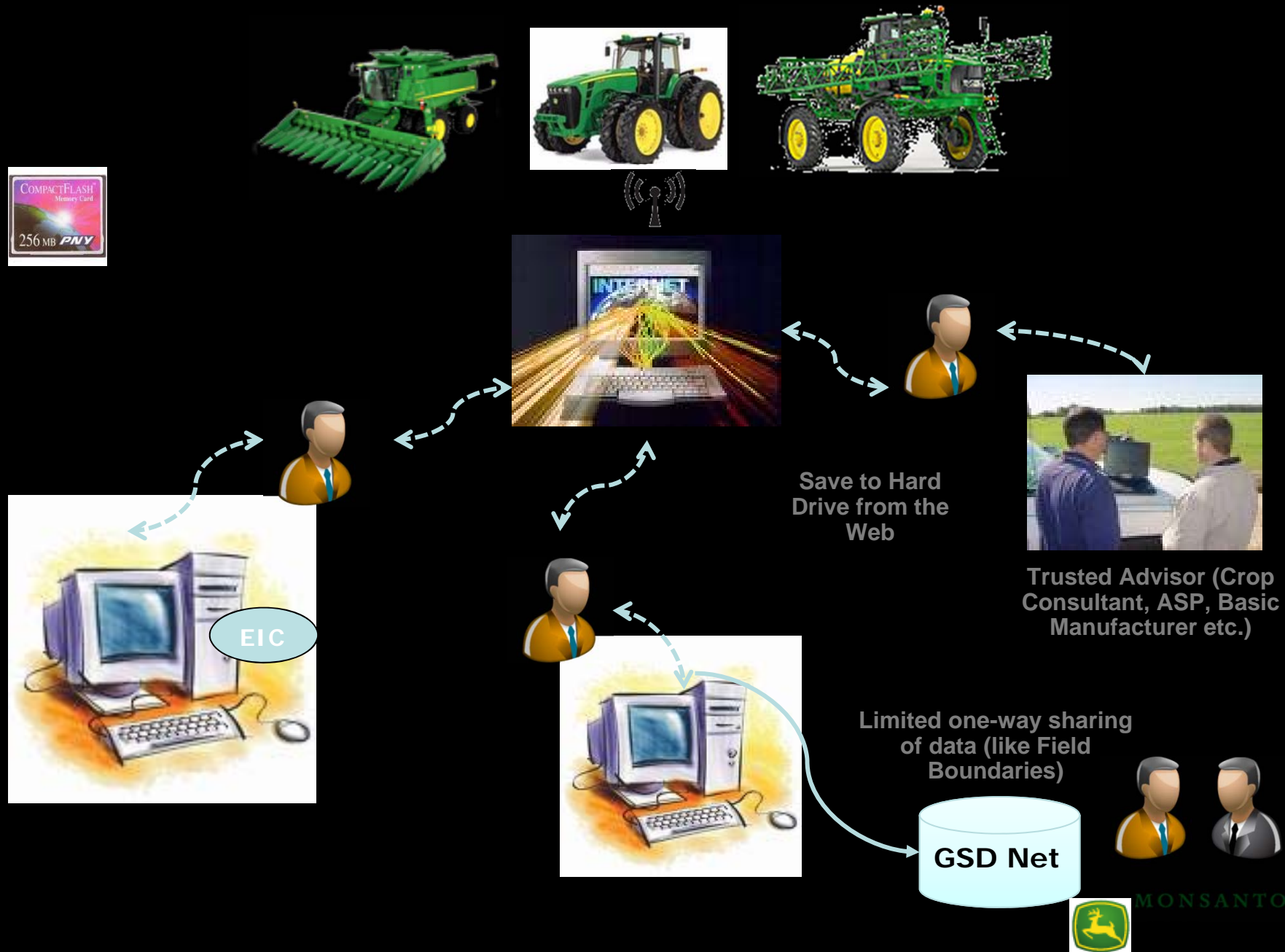
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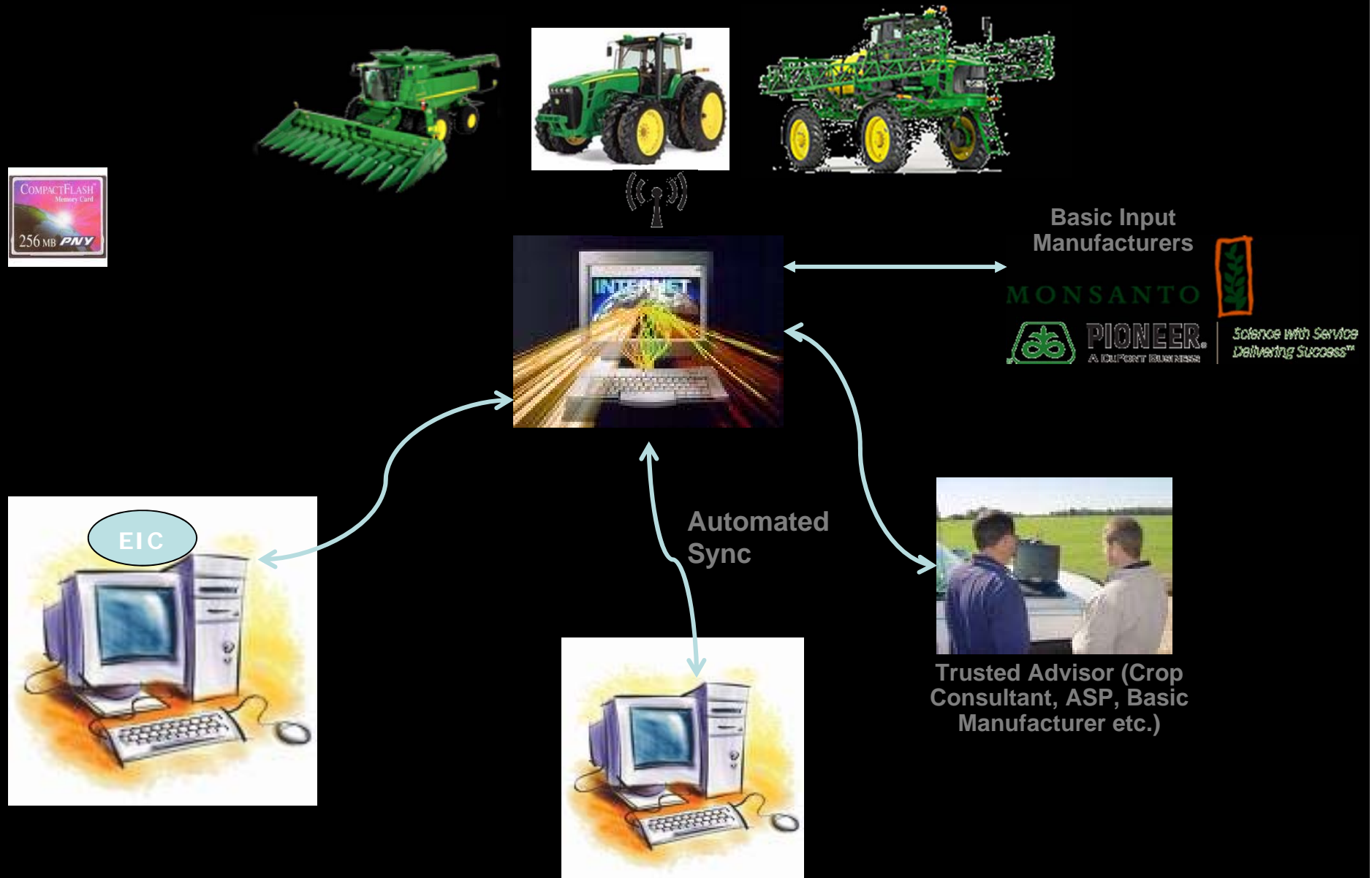
Agronomic Info – Process Flow Today



Agronomic Info – Process Flow 2012



Agronomic Info – Process Flow 2013+





The Immediate Future

- Biggerwider migrates to Smarterbetter
- Tier IV engine exhaust cleaner than air going in
- Replacing 'carbon computer' with silicone chips—more precise, more efficient.
- Sub-inch accuracy optimizes placement, enables speed
- Seamless data capture and transfer optimizes prescriptive inputs
- Split applications minimize environmental exposure, nitrogen run off, hypoxia



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Food *AND* Fuel

Can we produce enough to feed and fuel the world?

With appropriate policies and continued innovation—Absolutely!

**And we can do it
sustainably.**



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