

Investing in Global Farm Productivity

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Food and Agricultural
Policy Research Institute

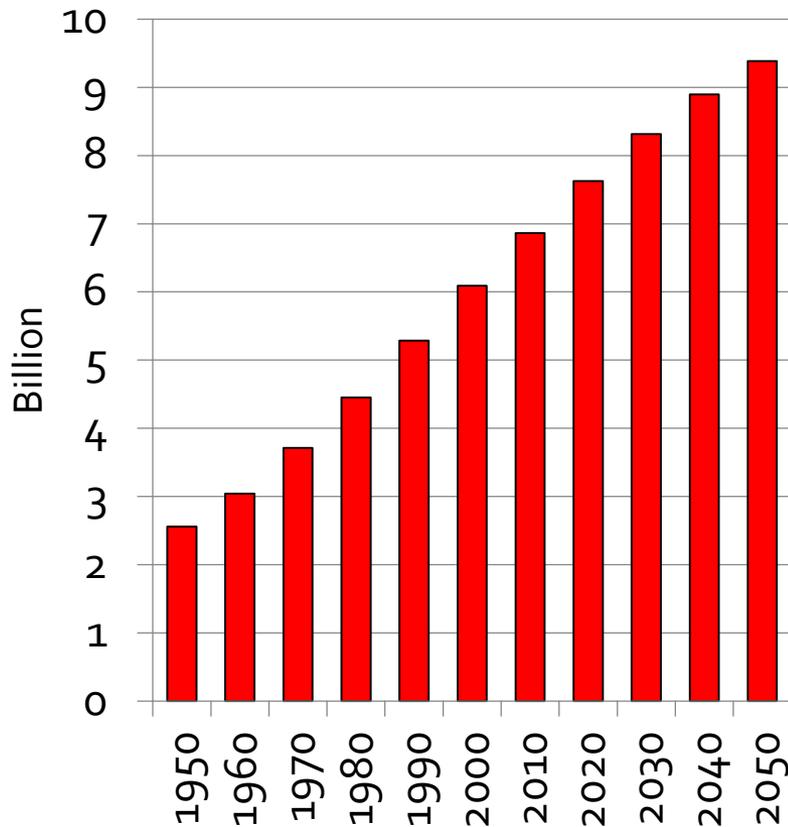


Agenda

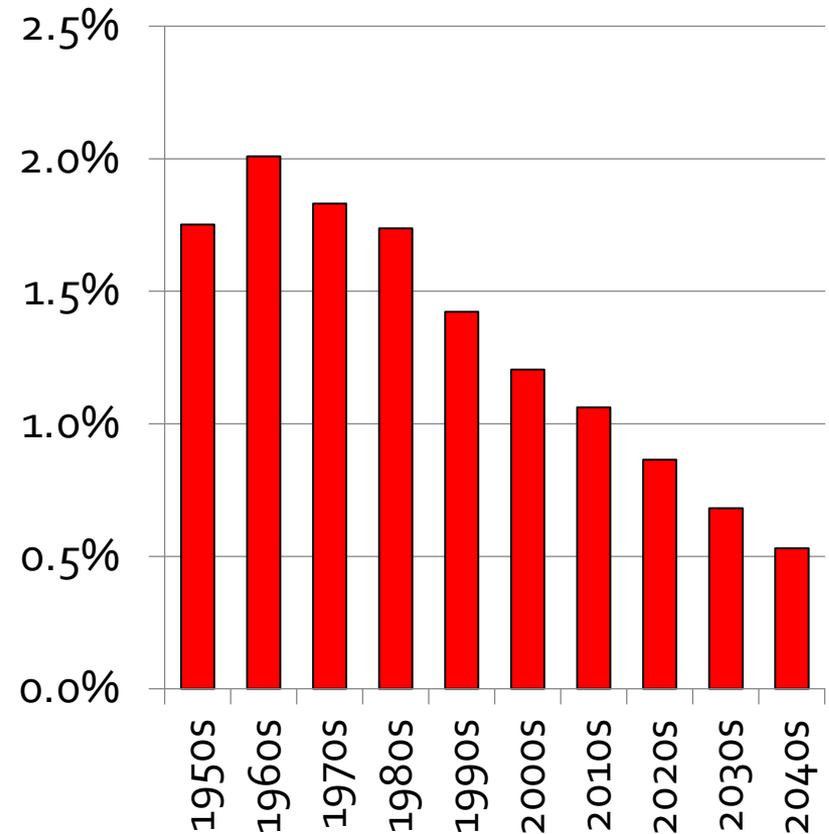
- Thesis: Future profitability of U.S. agriculture will depend on balance of...
 - local and global productivity gains relative to
 - expansion of global demand for food, feed, fuel and fiber
- Outline
 - Where we are and how we got here
 - Future prospects

World population growth

World population

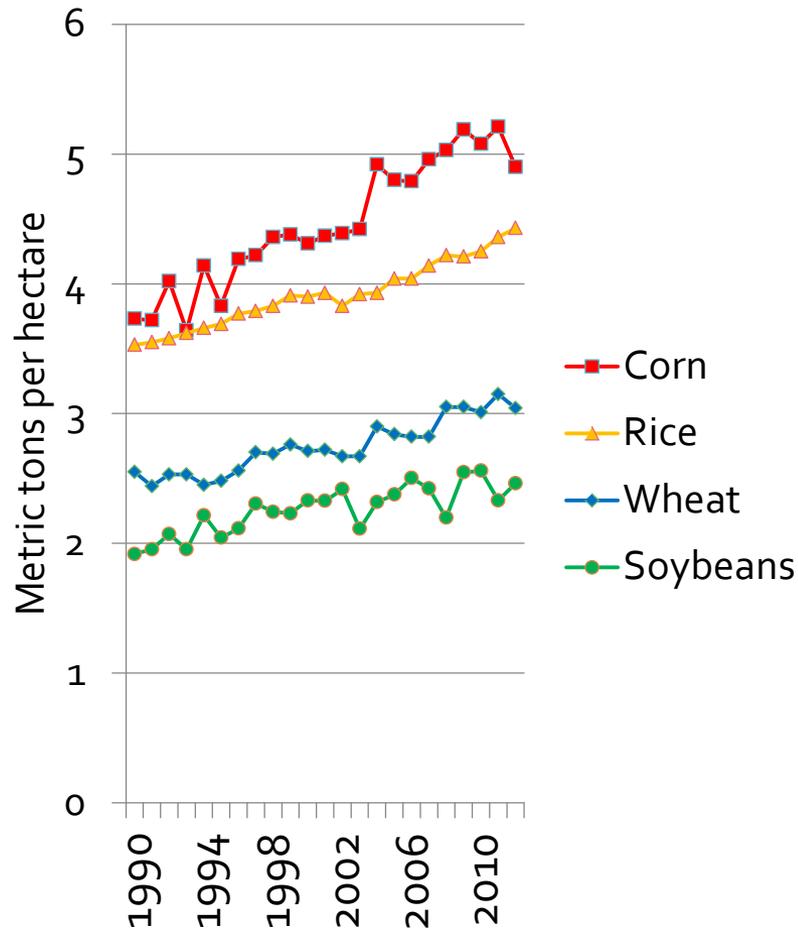


Population growth rate



Source: U.S. Census Bureau International Data Base, June 2013

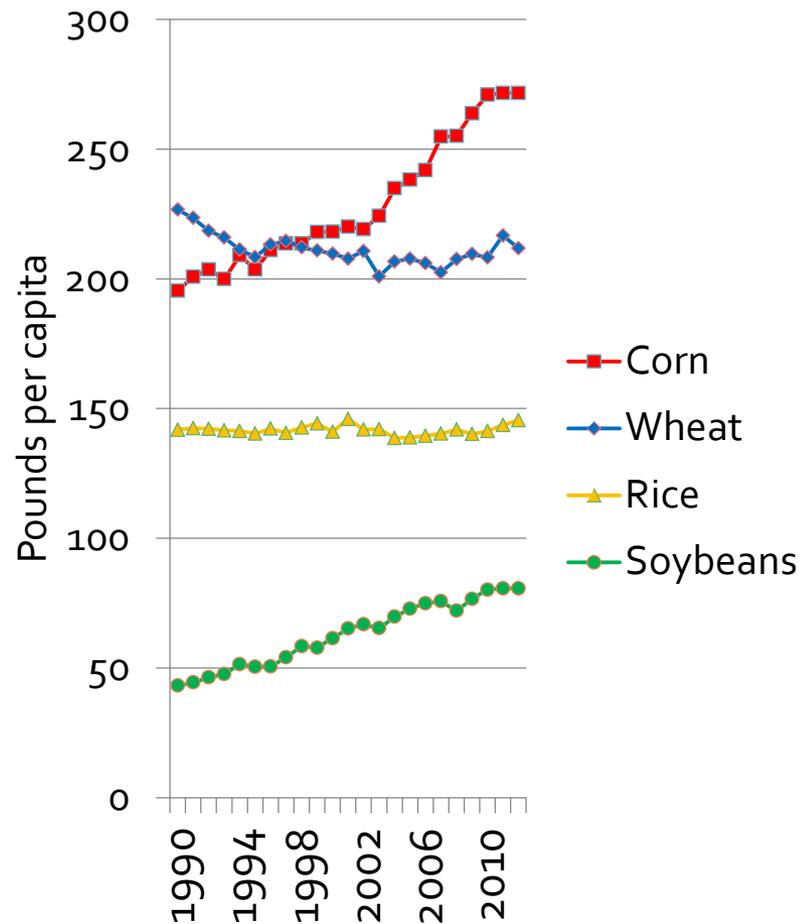
Global crop yields



	2010-12 average	Annual growth rate	Percent growth rate
Corn	5.06 mt/ha	0.07 mt/ha	1.4%
Rough rice	4.35	0.04	0.9%
Wheat	3.07	0.03	0.9%
Soybeans	2.45	0.02	0.9%
Corn	81 bu/a	1.1 bu/a	1.4%
Rough rice	3,878 lb/a	33 lb/a	0.9%
Wheat	46 bu/a	0.4 bu/a	0.9%
Soybeans	36 bu/a	0.3 bu/a	0.9%

Source: author calculations from PSD Online data. Trend is simple linear trend fit over 1990-2012.

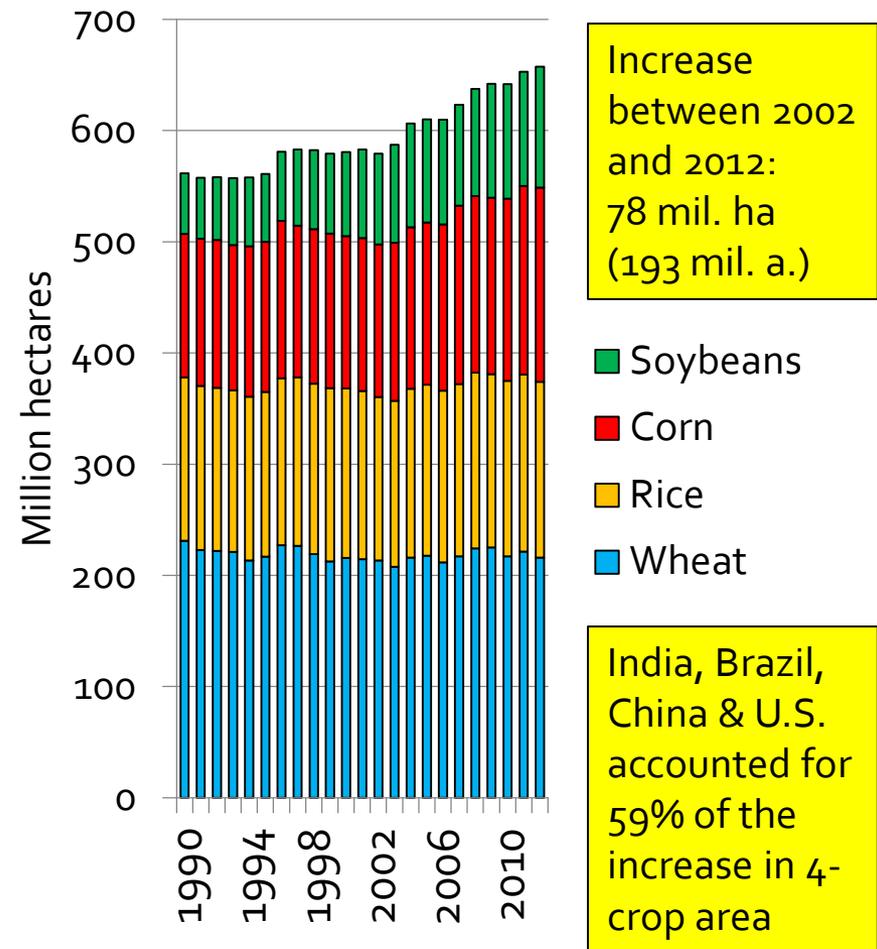
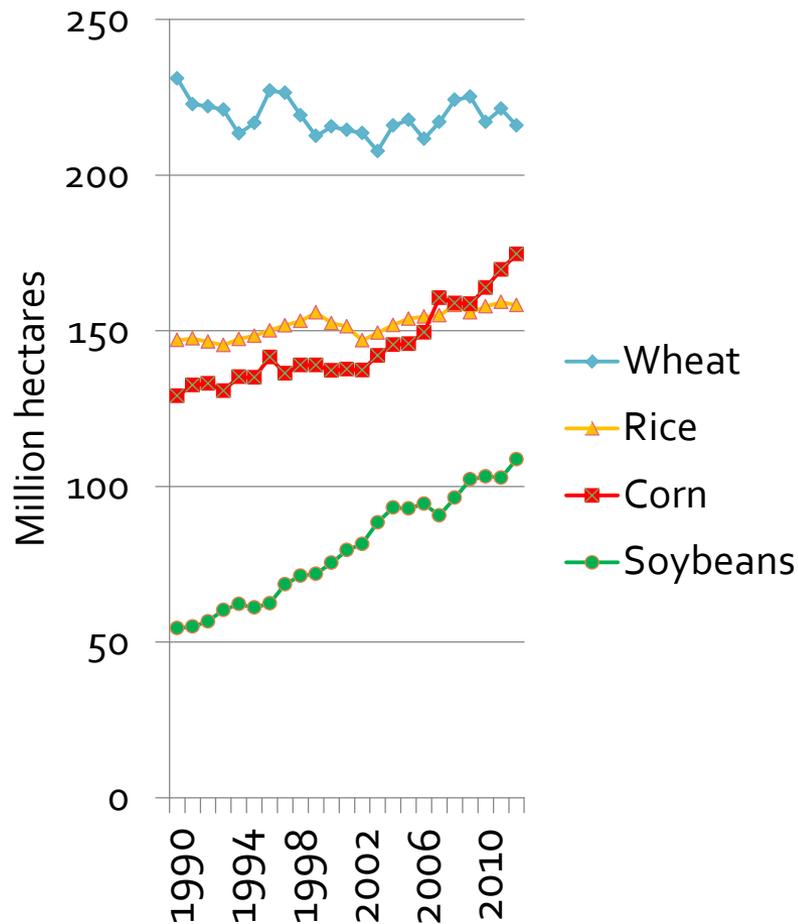
Global crop use, lbs./capita



	2010-12 average	Annual growth rate	Percent growth rate
Corn	271	3.6	1.3%
Wheat	212	-0.5	-0.2%
Milled rice	143	0.0	0.0%
Soybeans	81	1.8	2.3%

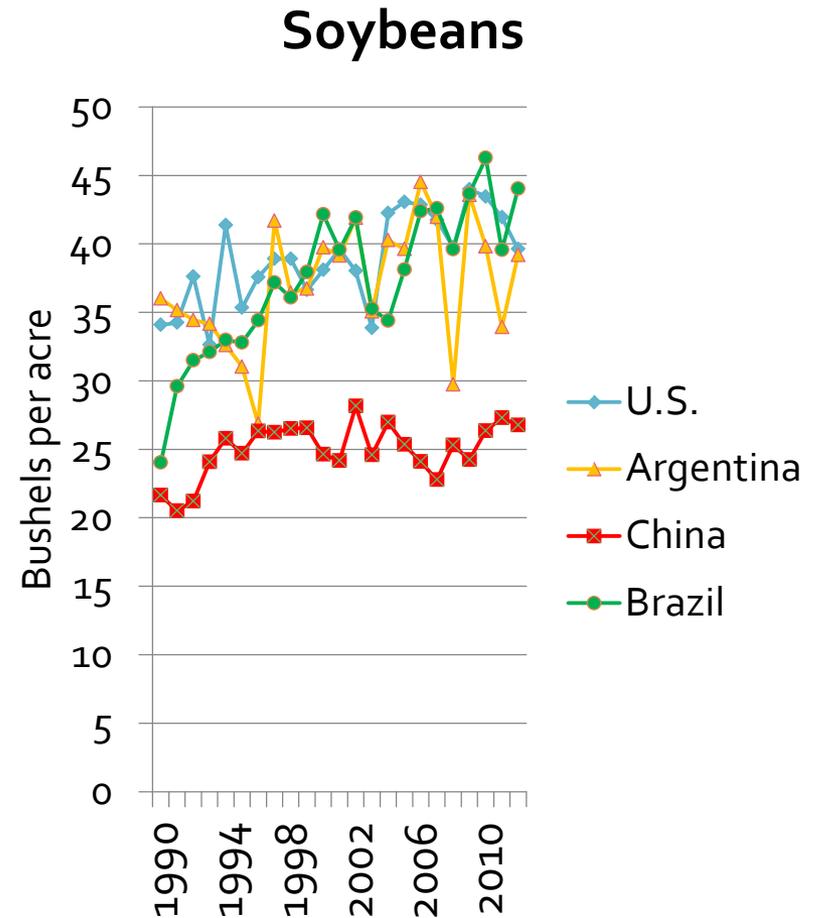
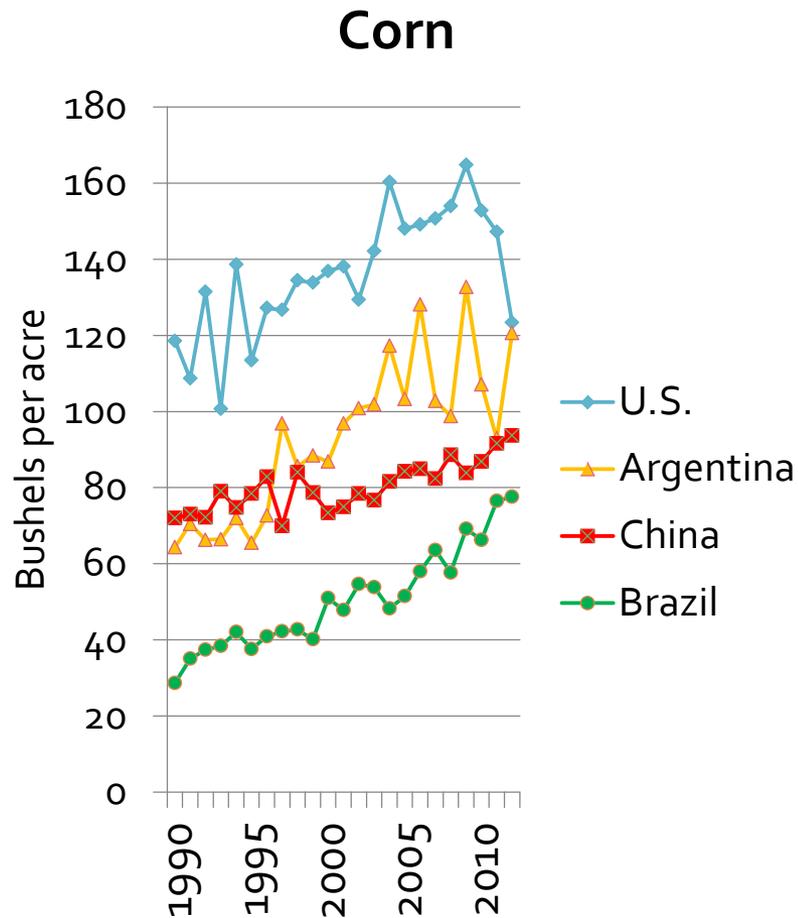
For corn, increases in per-capita feed use account for about 39% of the increase in per-capita use since 1990. Ethanol and other uses account for the rest. For soybeans, increased use of soymeal in livestock rations and soyoil in both food and industrial uses contributed to the growth in per-capita use.

World crop area harvested



Source: USDA PSD Online data, June 2013

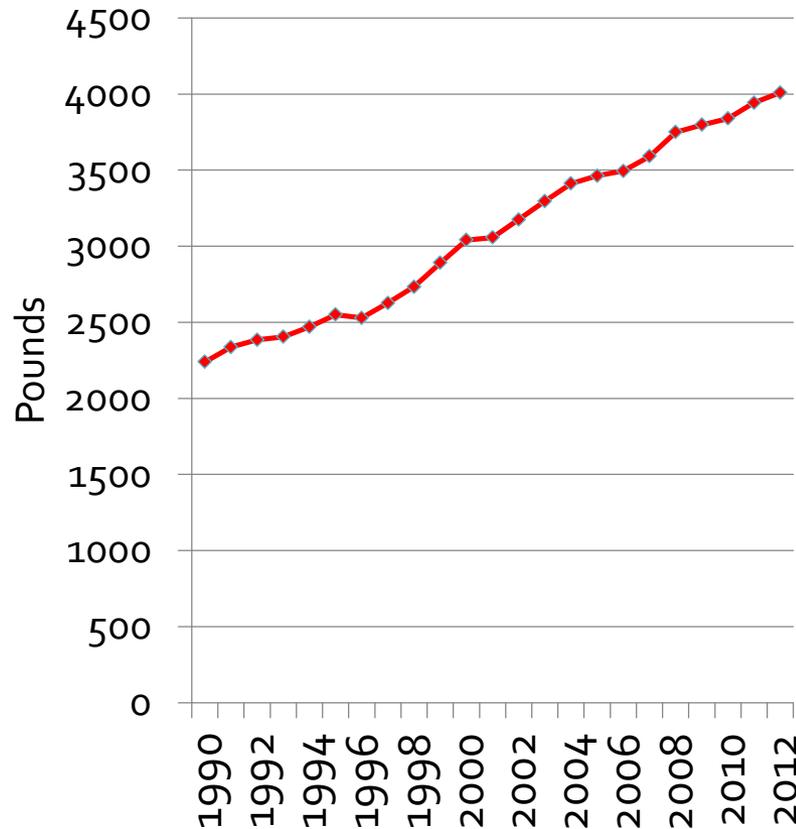
Corn and soybean yields



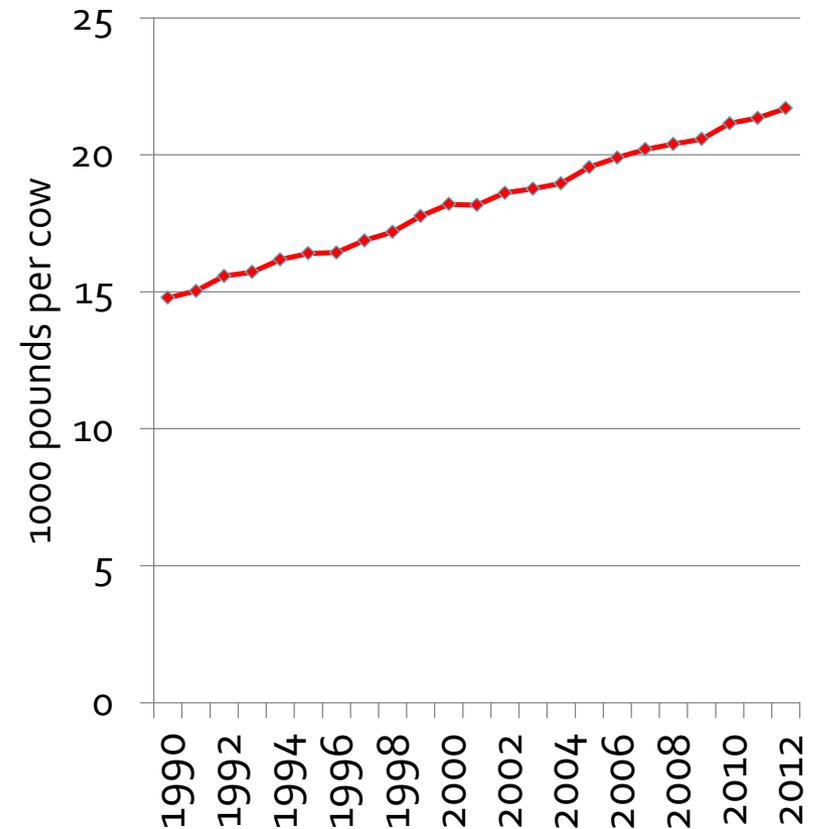
Source: Author calculations based on USDA PSD Online data, June 2013

U.S. livestock and dairy yields

Pork per sow



Milk per cow



Source: Author calculations based on MU Agricultural Markets and Policy (AMAP) database, Jan. 2013

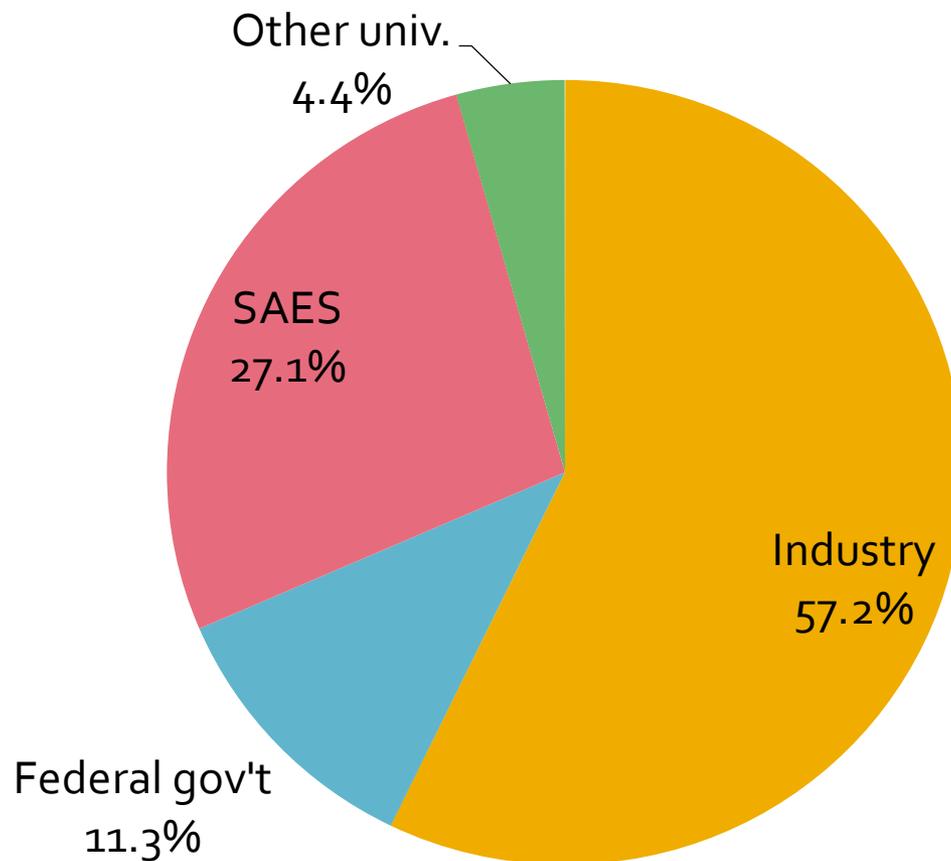
U.S. research and development and multifactor productivity growth

	Annual growth in real, total agricultural research & development spending		Annual growth in multifactor productivity in the agricultural sector
1950-1970	3.77%	1949-1990	2.02%
1970-1990	2.66%		
1990-2009	1.20%	1990-2007	1.18%

Notes: Research and development spending includes both public and private spending, in real, inflation-corrected terms. Multifactor productivity is a measure of outputs obtained relative to inputs used.

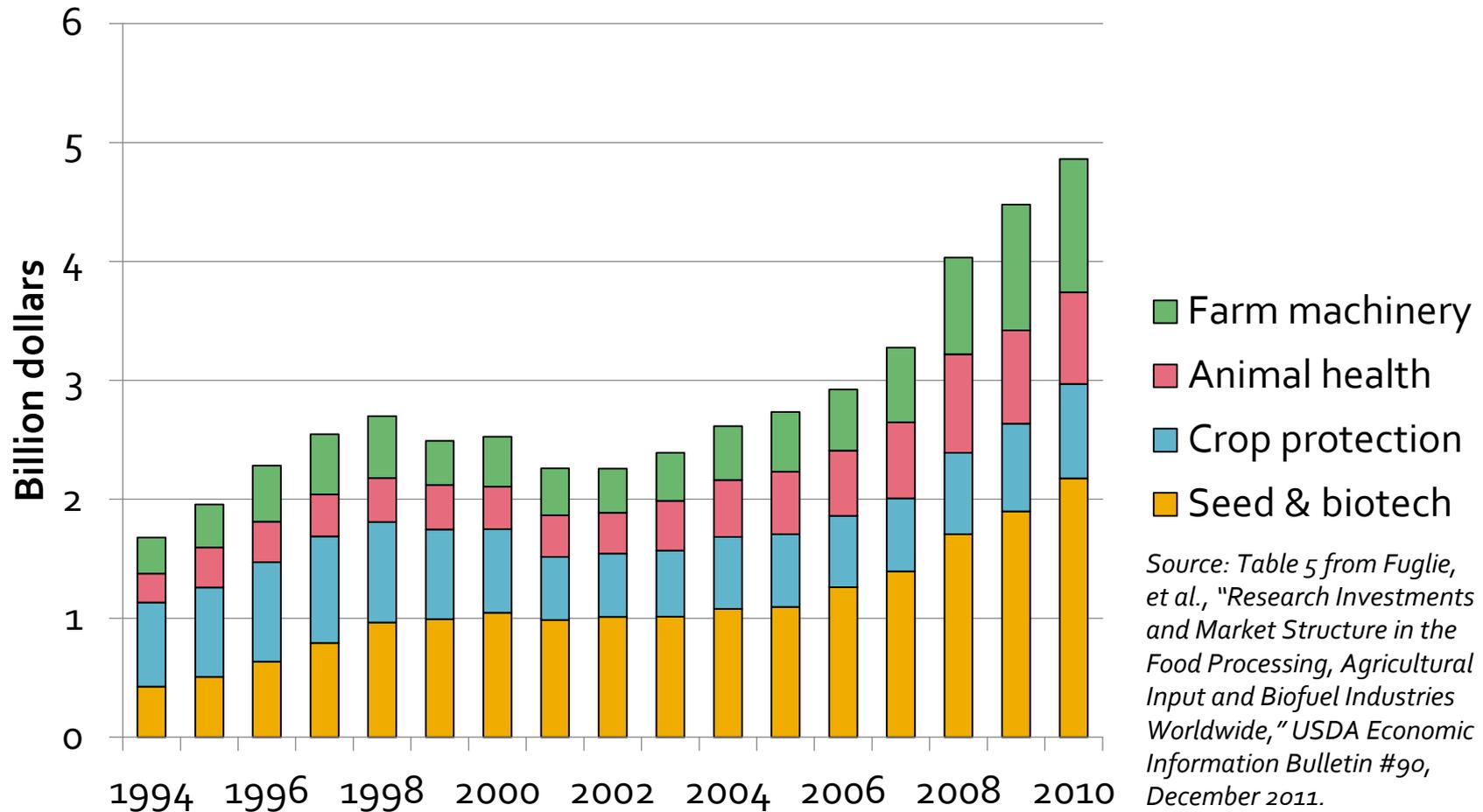
Source: Pardey, et al., "Public Food and Agricultural Research in the United States," AGree, April 2013, Table 1 and text on page 3.

U.S. agricultural research and development spending, 2009



Note: 2009 total: \$11.1 billion
Source: Pardey, et al., Figure 3

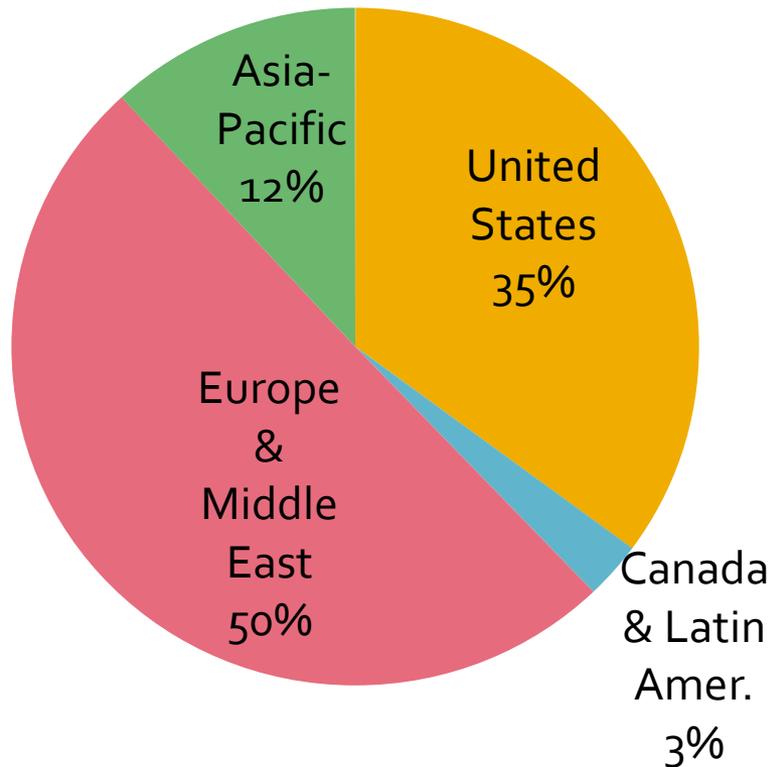
U.S. private agricultural research and development spending



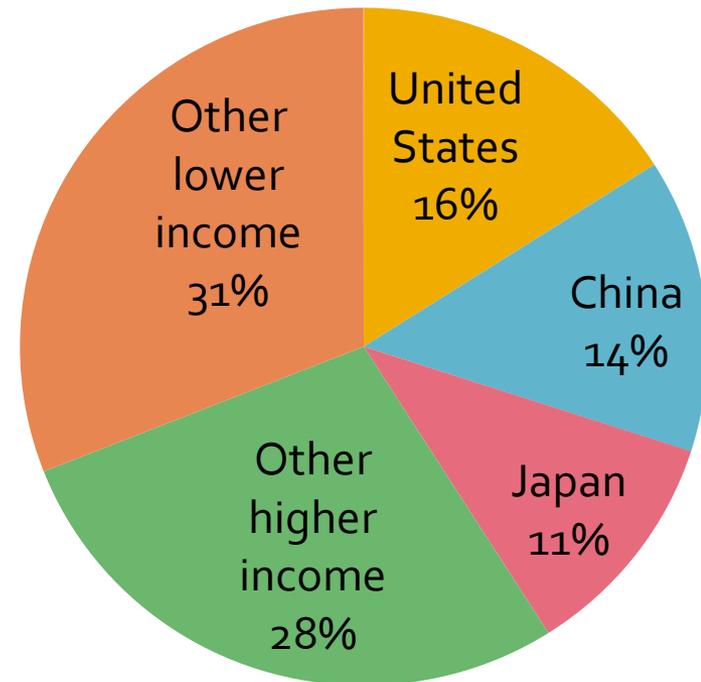
Source: Table 5 from Fuglie, et al., "Research Investments and Market Structure in the Food Processing, Agricultural Input and Biofuel Industries Worldwide," USDA Economic Information Bulletin #90, December 2011.

World agricultural research and development spending

Private, 2006, total \$8 bil.

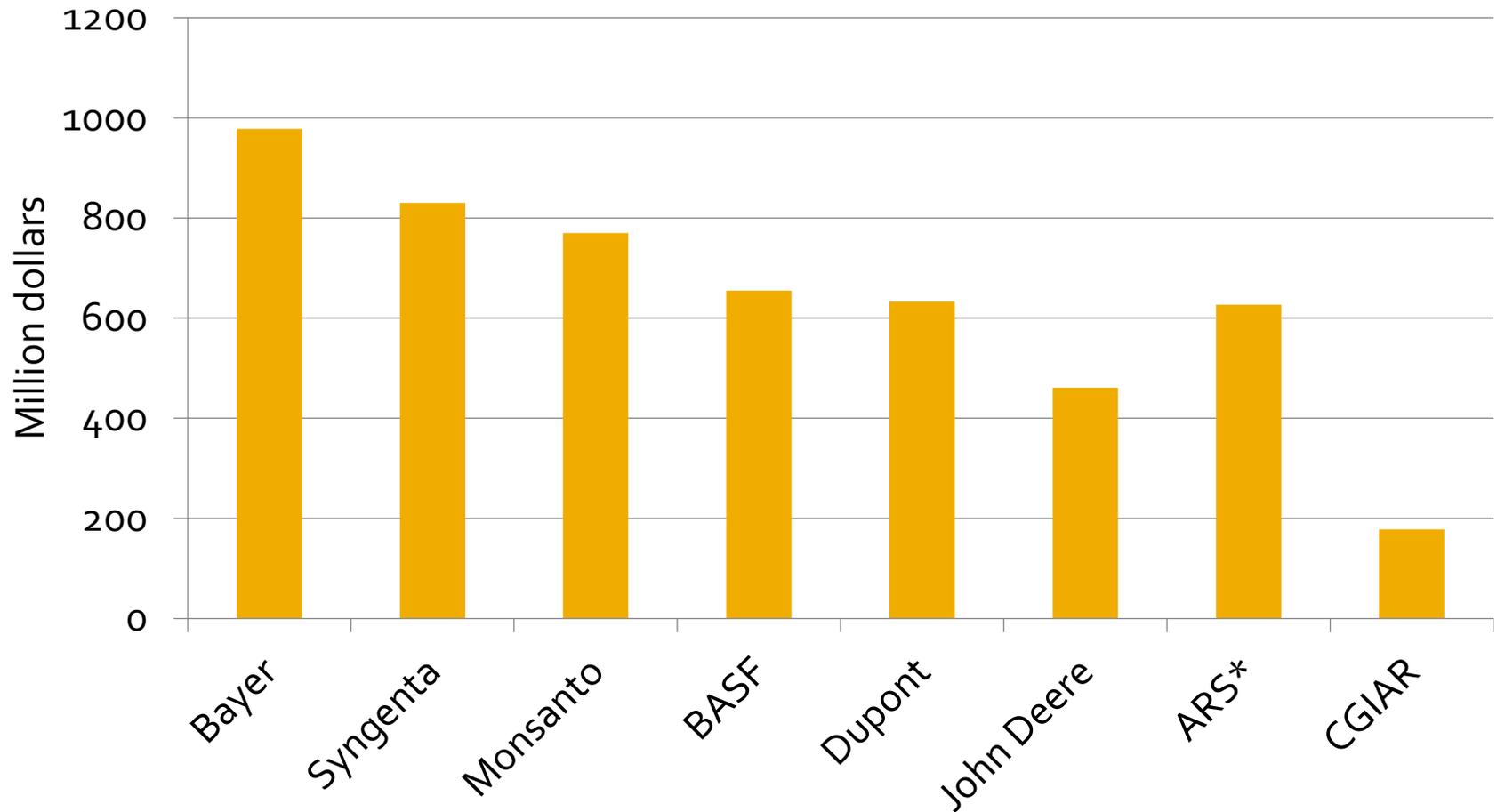


Public, 2005, total \$27 bil.



Sources: Private data is from Fuglie, et al., Table 4. Public data is from Pardey et al., Figure 5.

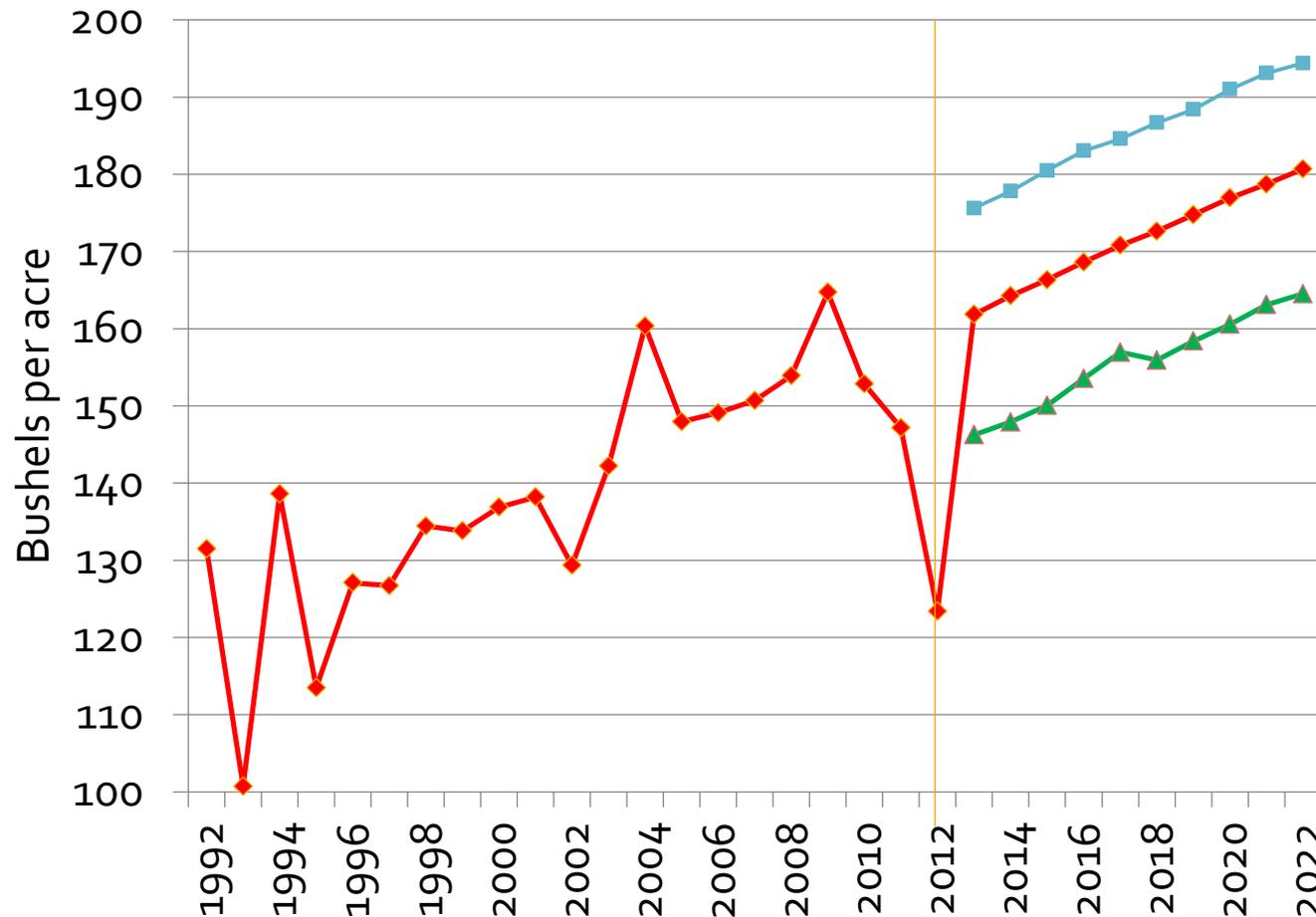
World agricultural research and development spending, 2007



*Crop and animal science

Source: Fuglie et al., Table 11

U.S. corn yields

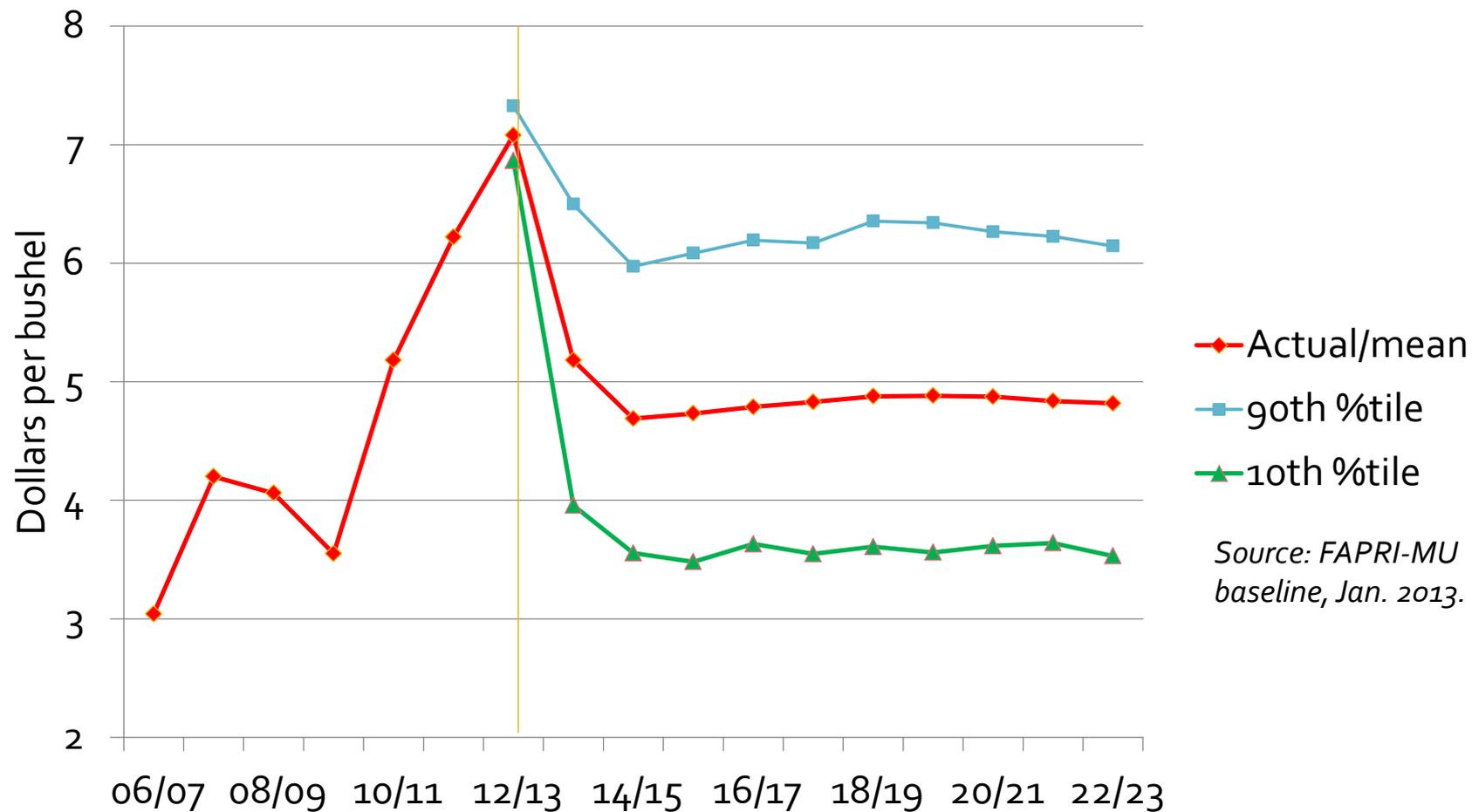


Note: these stochastic estimates allow weather, oil prices and several other factors to vary—but they assume a steady underlying rate of technology gain.

- Actual/mean
- 90th %tile
- 10th %tile

Source: USDA
NASS for history;
FAPRI-MU
baseline, Jan. 2013.

U.S. corn prices



Source: FAPRI-MU
baseline, Jan. 2013.

Summary points

- Agricultural productivity has increased here and around the world
- Future rate of growth will depend on public and private investments
- Balance of U.S. and foreign productivity growth and global growth in demand for food, feed, fuel and fiber will determine future U.S. farm profitability

Thanks!

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 - Julian Binfield
 - Scott Gerlt
 - Kateryna Goychuk
 - Lauren Jackson
 - Willi Meyers
 - Wyatt Thompson
 - Shannon Watson
 - Jarrett Whistance
 - Peter Zimmer
- Other major sources:
 - USDA PSD Online, June 2013
(<http://www.fas.usda.gov/data.asp>)
 - Philip Pardey, et al., "Public Food and Agricultural Research in the United States: The Rise and Decline of Public Investments, and Policies for Renewal," AGree, April 2013
(<http://www.foodandagpolicy.org/sites/default/files/AGree-Public%20Food%20and%20Ag%20Research%20in%20US-Apr%202013.pdf>)
 - Keith Fuglie, et al. "Research Investments and Market Structure in the Food Processing, Agricultural Input, and Biofuel Industries Worldwide," USDA ERS Economic Information Bulletin #90, December 2011
(http://www.ers.usda.gov/media/193646/eib90_1.pdf)