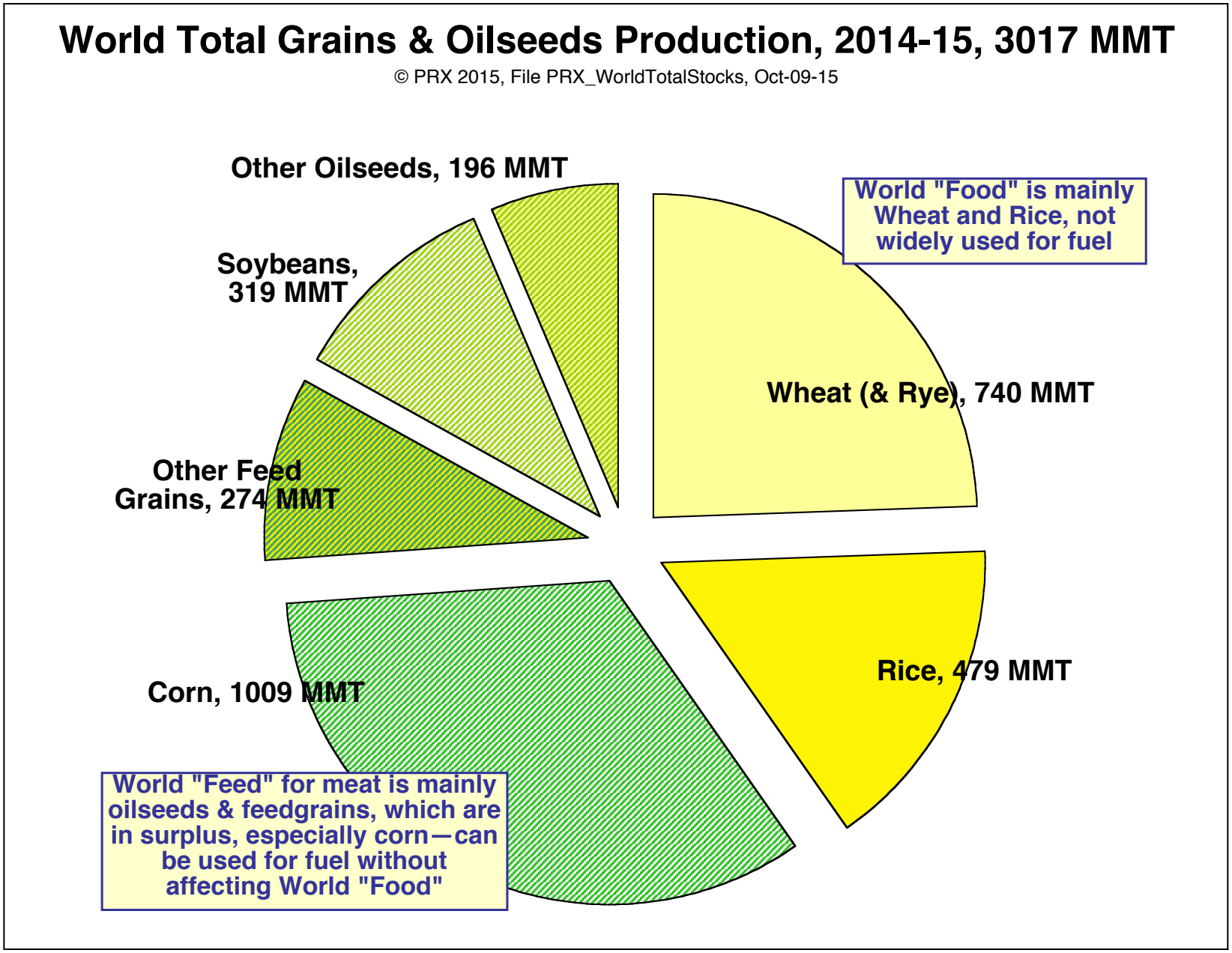
MID-LEVEL ETHANOL BLENDS
Can we produce enough fuel feedstocks?

Yes, due to Surplus Feedgrain Capacity of Three Main World Exporters

PRX Simplified US Corn Surplus Calculation, 2015-2030
for
AG-Auto-Ethanol Working Group
October 22, 2015 • PRX • Bill Hudson

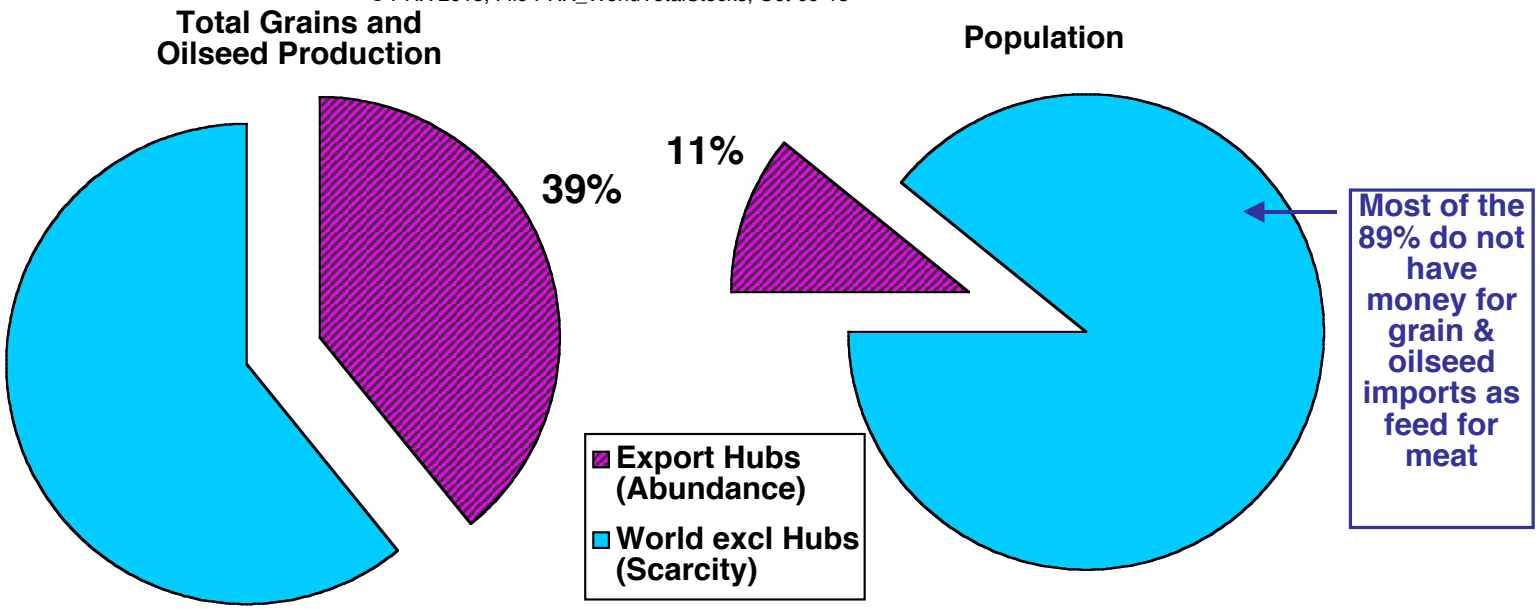
- World Grain and Oilseed Production, with Surplus Regions
- US Corn Yield Trend to 2030, based on USDA 2015 Baseline
- US Gasoline Volume in 2030, based on AEO 2015
- PRX Simplified Calculation of Ethanol & Corn Deficit/Surplus in 2030
- Footnote 1 on Crude Oil and Corn Market Price
- Footnote 2 on Advanced Biofuels
- Footnote 3 on Drivers of US Corn Efficiency Gains
- Question on Acreage Increase of Corn since 2007

From Current Official USDA Data



World Total Grains & Total Oilseeds by Origin: Geography Causes Surplus

WORLD GRAIN & OILSEED PRODUCTION STRUCTURE, 2014-15



Total Grains and Oilseed Production

Crop Yr	World	Export Hubs	Rest of World
	mmt	mmt	mmt
14-15	3017	1182	1834
		pct	pct
		39%	61%

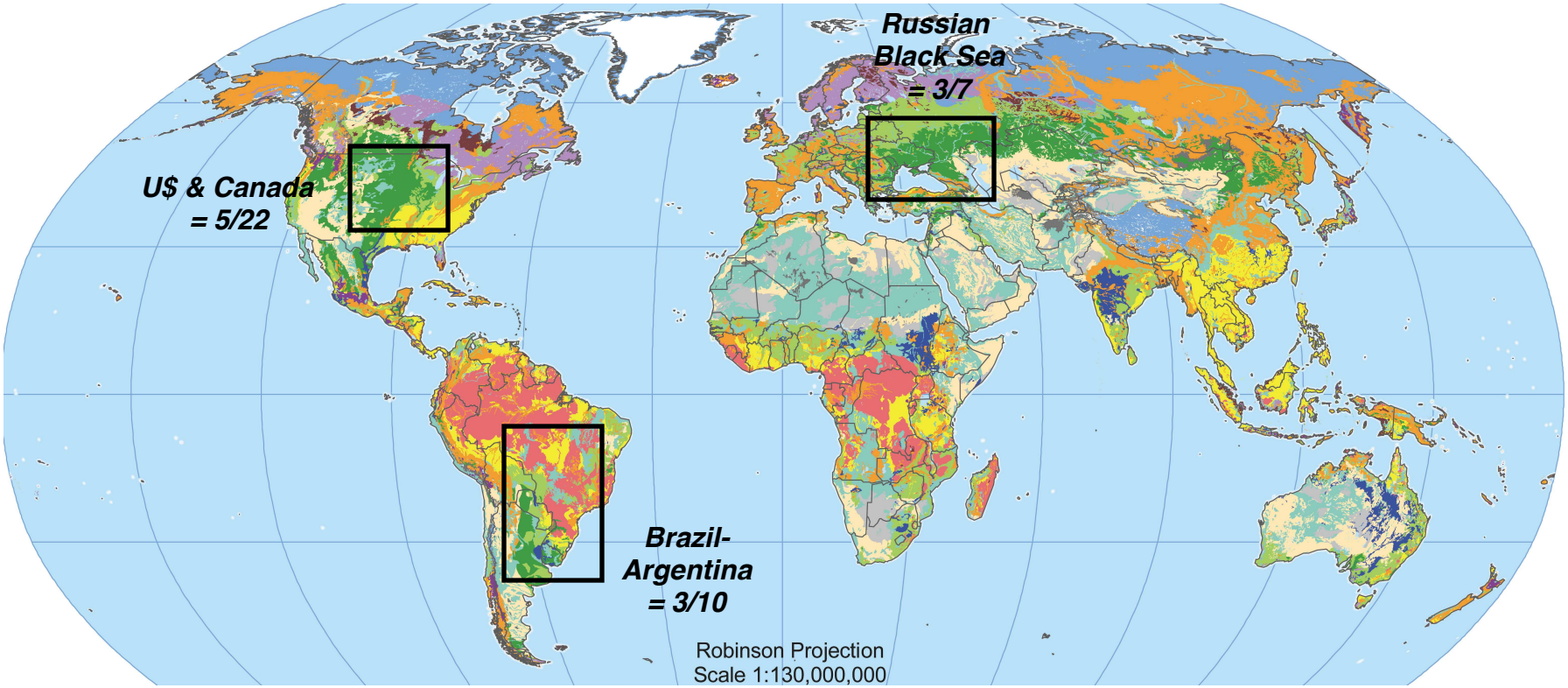
Population

Crop Yr	World	Export Hubs	Rest of World
	mil	mil	mil
14-15	7244	789	6454
		pct	pct
		11%	89%

The Three Major Export Hubs are (1) US/CN, (2) Brazl/Arg, & (3) Black Sea

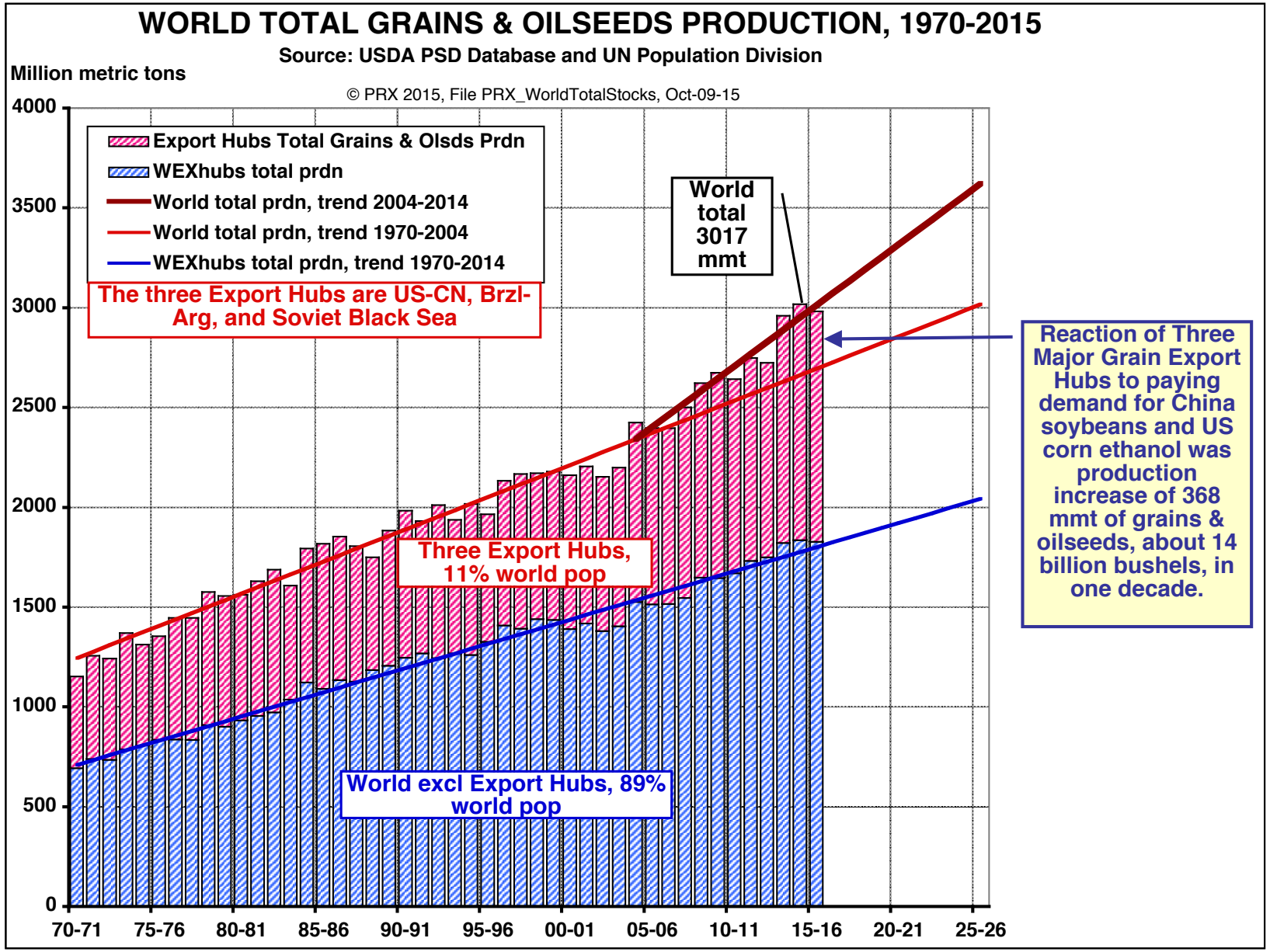
World Grains & Oilseeds by Surplus Export Hubs

Three Export Hubs = 11% World Population,
but 39% World Grain/Oilseed Production =“11/39”
= Perennial Regional Feedgrains/Oilseed Surpluses

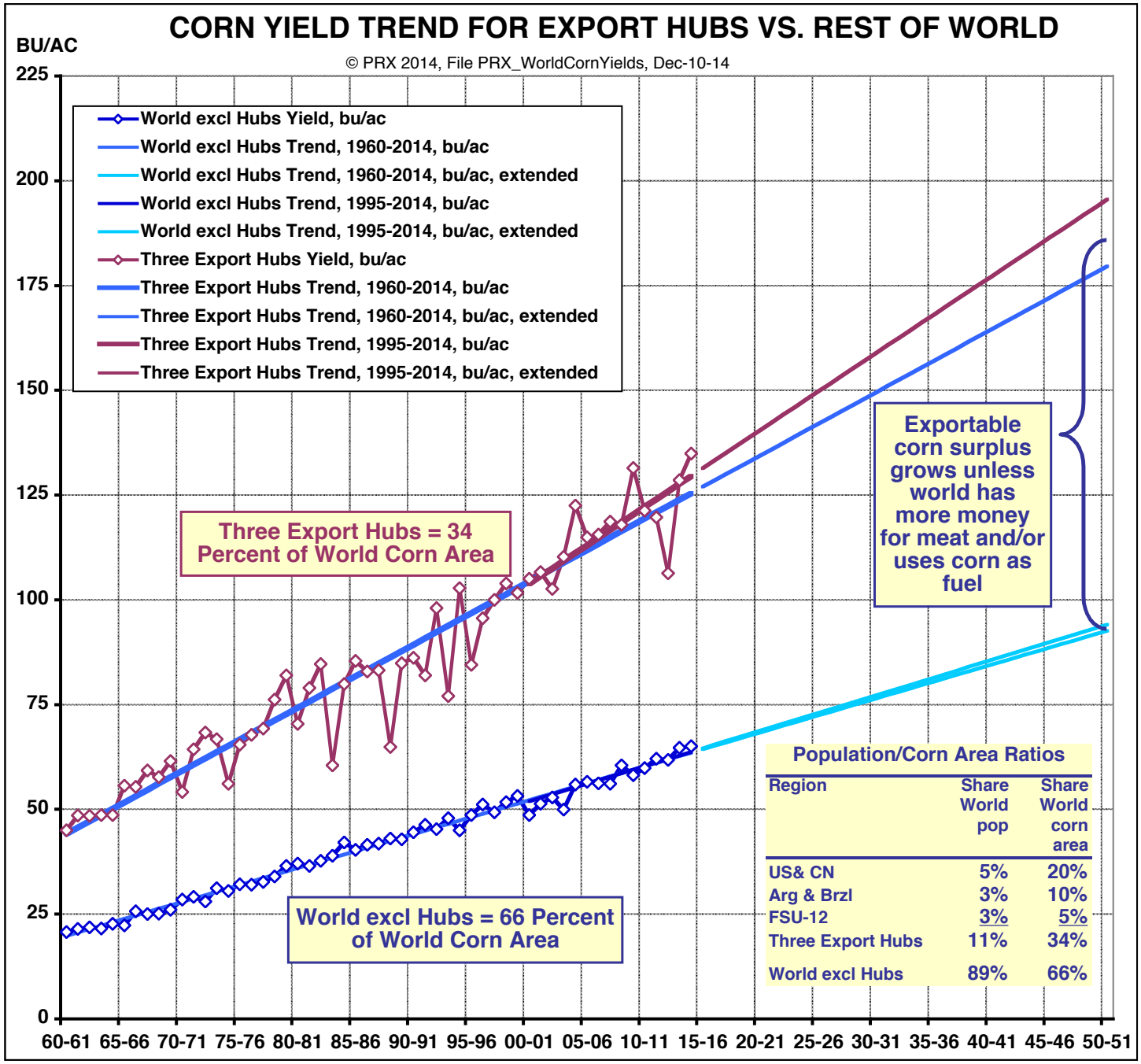


. . . Unless rest of World (89/61) has money to buy meat, or unless surpluses used for fuel.

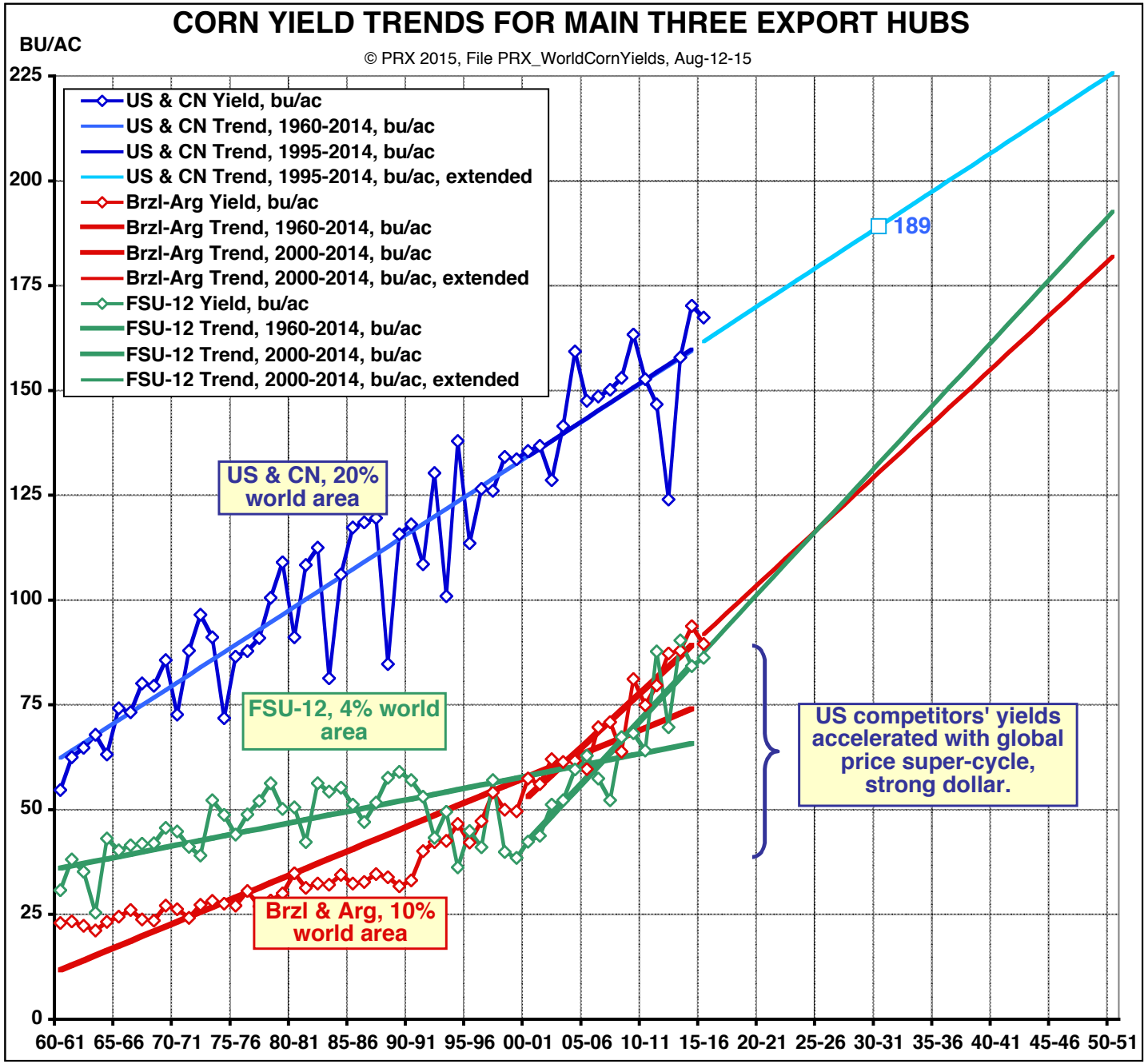
World Grains & Oilseeds INCREASE is by Export Hubs



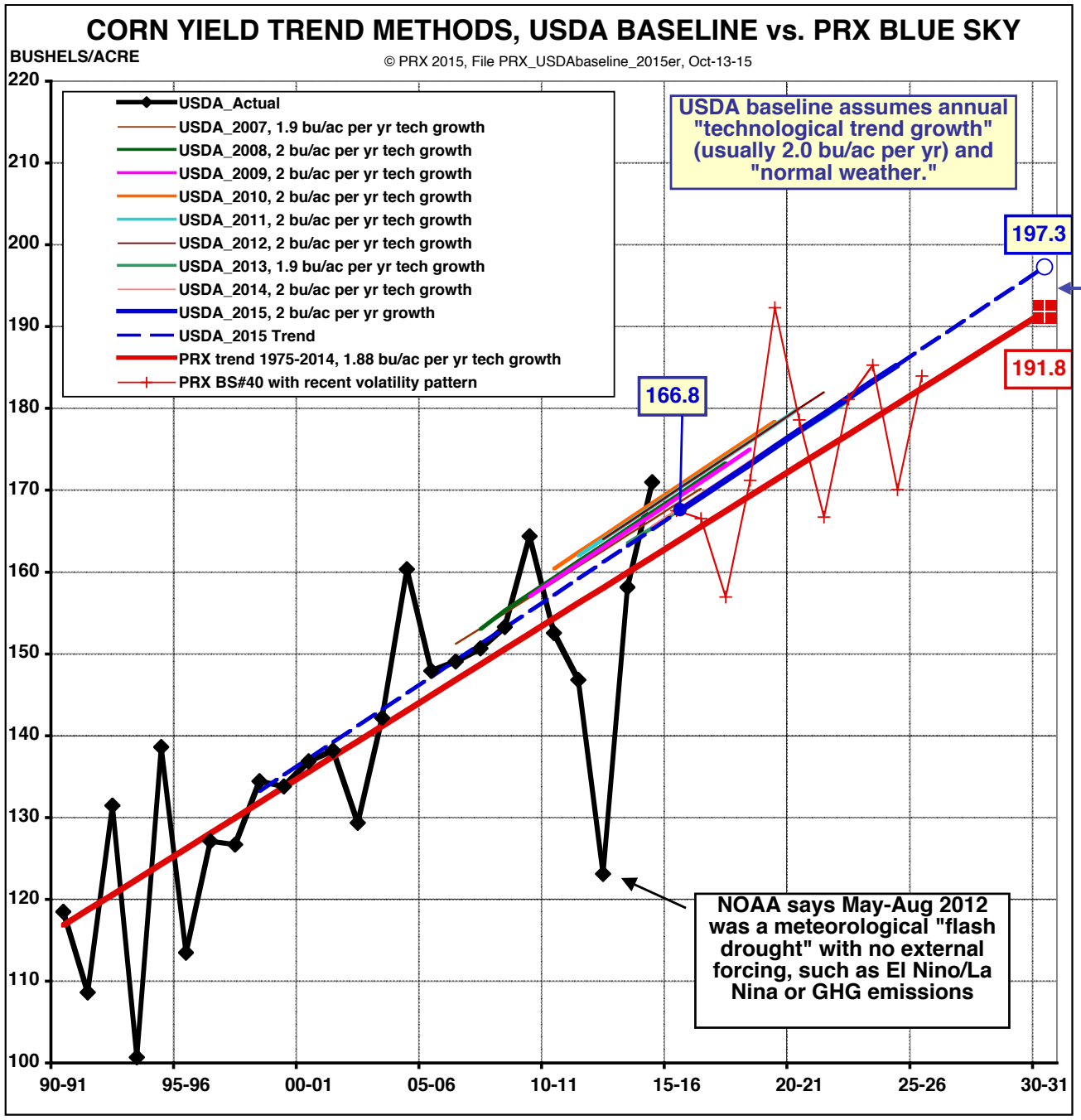
World Corn, per official USDA data



US & CN Corn, Long-term



US Corn, 2030

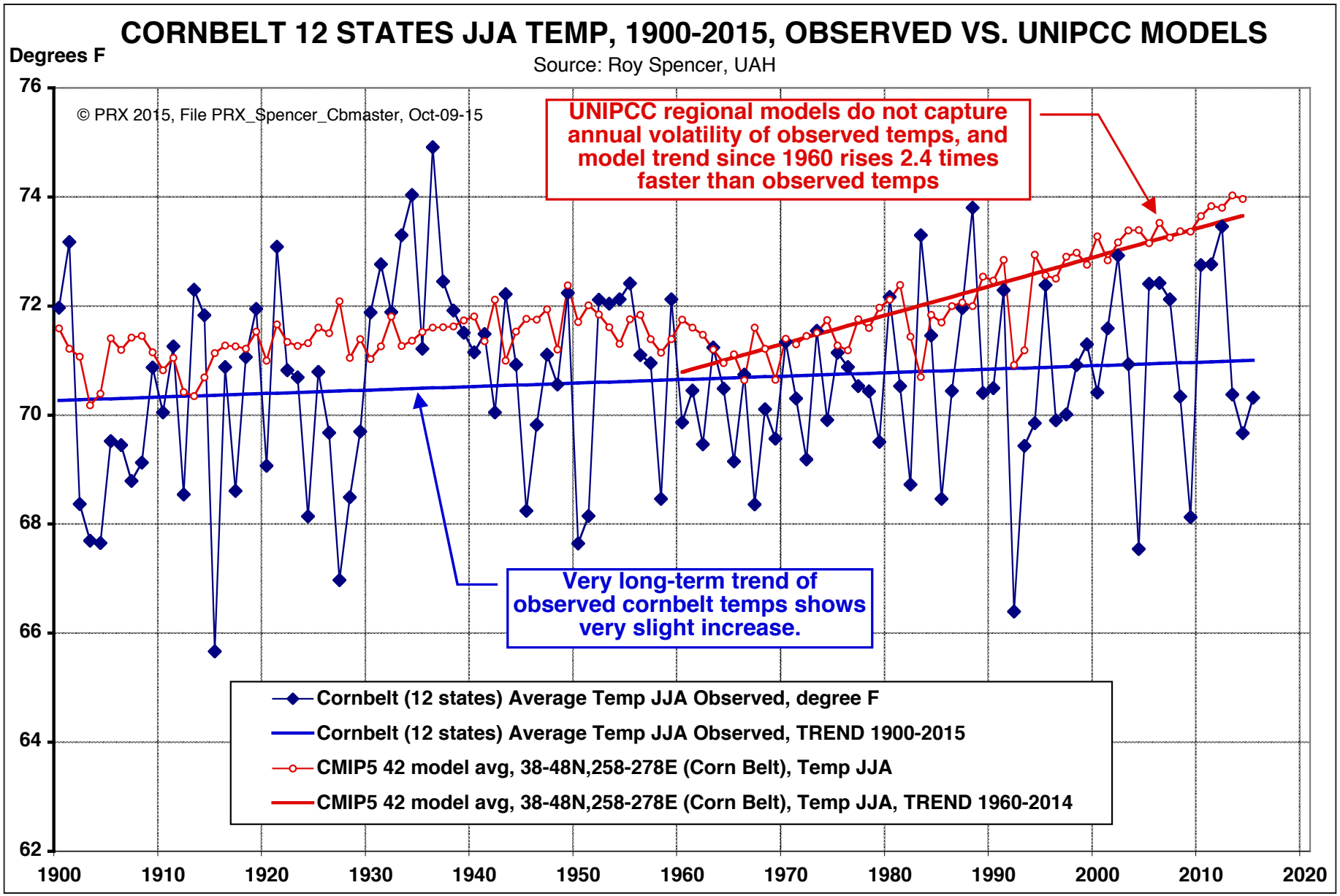


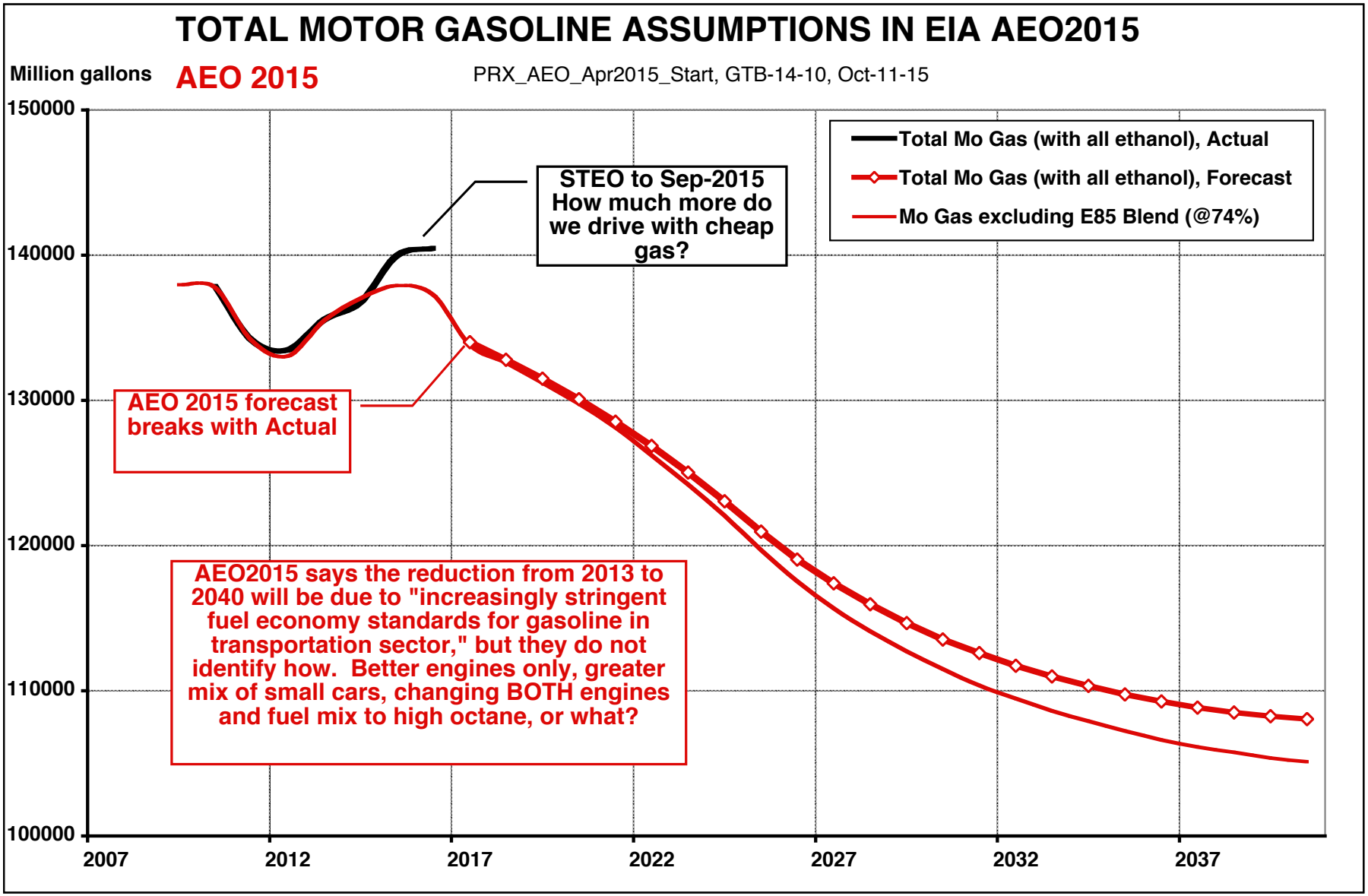
Use 195 for PRX 2030 calculation.

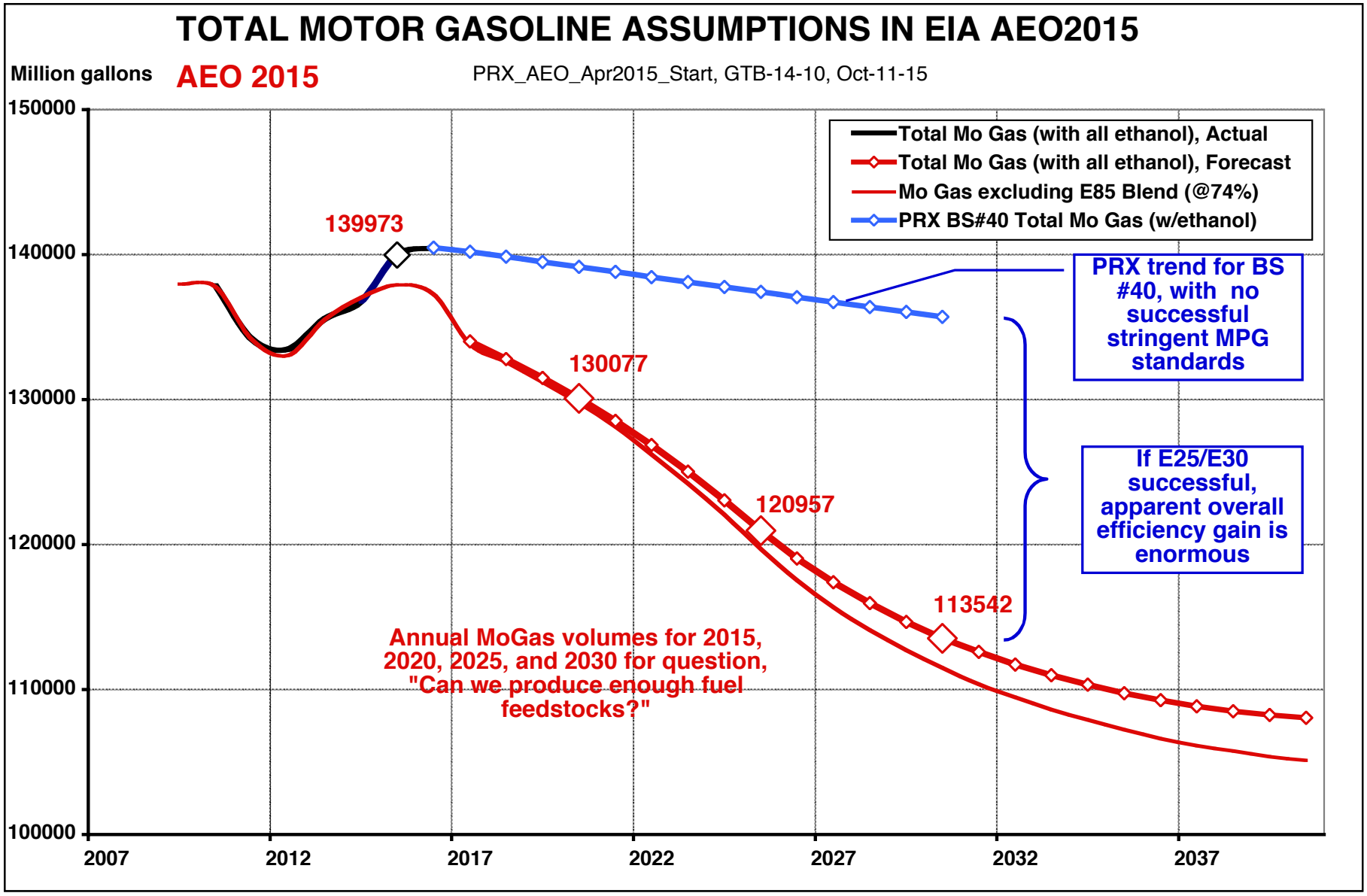
The "genetic potential" yield is more than double this figure, as shown by NCGA corn contest winners.

BTW, what about Climate Change?

USDA Baseline Team not willing to adopt UNIPCC regional temp-precip models







US CORN SUPPLY-DEMAND TABLE, 2015-16, *PRX, with Today's Questions*			
SUPPLY			
Carry-in	1731	*Mil bu*	
Acreage planted	88.9	*Mil ac*	Recent record of 97.3
Acreage harvested	81.1	*Mil ac*	
Yield	168	*Bu/ac*	Trend growth about 2 bu/ac/yr = ~195 in 2030
Production	13585	*Mil bu*	*Can we produce enough for 2030 70% E25?*
Supply	15316	*Mil bu*	
DEMAND			
Feed & Residual Use	5300	*Mil bu*	Flat
Exports	1825	*Mil bu*	Flat, due to Black Sea, Brzl/Arg, & China = 0 US
Industrial, non-fuel	1318	*Mil bu*	Very slight growth
Fuel Ethanol Grind	5224	*Mil bu*	*What is increased grind in 2030 for 70% E25?*
Total Use (Demand)	13667	*Mil bu*	
Carry-out	1649	*Mil bu*	

WITH GASOLINE USAGE IN AEO 2015, ESTIMATED ETHANOL VOLUME & BUSHELS OF CORN DEMAND WITH E25 @ 70% ACCEPTANCE

			Eventual E25					
			GASOLINE USE					2030-2015
			2010	2015	2020	2025	2030	Change
			STEO		AEO 2015			
1	Domestic gas use	mil gals	137857	139973	130077	120957	113542	
2	used as E0	pct			2.0%	2.0%	2.0%	
3	used as E10	pct			93.0%	60.5%	28.0%	
4	used as E25 (or E15 above)	pct			5.0%	37.5%	70.0%	
5	Ethanol domestic volume used							
6	used as E10, conventional	mil gal			12097	7318	3179	
7	used as E25, conventional	mil gal			1626	11340	19870	
8	Total used, conventional	mil gal	12858	13432	13723	18658	23049	
9	used as cellulosic	mil gal	0	75	100	100	350	
10	Ethanol domestic volume used	mil gal	12858	13507	13823	18758	23399	
11	Ethanol domestic volume used	pct	9.3%	9.6%	10.6%	15.5%	20.6%	
12	Total conventional ethanol used	mil gal	12858	13357	13623	18558	22699	
13	Conventional ethanol net exports	mil gal	439	1092	1264	1464	1664	
14	Conventional ethanol production	mil gal	13298	14448	14887	20021	24363	9915

Approx additional ethanol needed for 70% E25 in 2030

WITH GASOLINE USAGE IN AEO 2015, ESTIMATED ETHANOL VOLUME & BUSHELS OF CORN DEMAND WITH E25 @ 70% ACCEPTANCE

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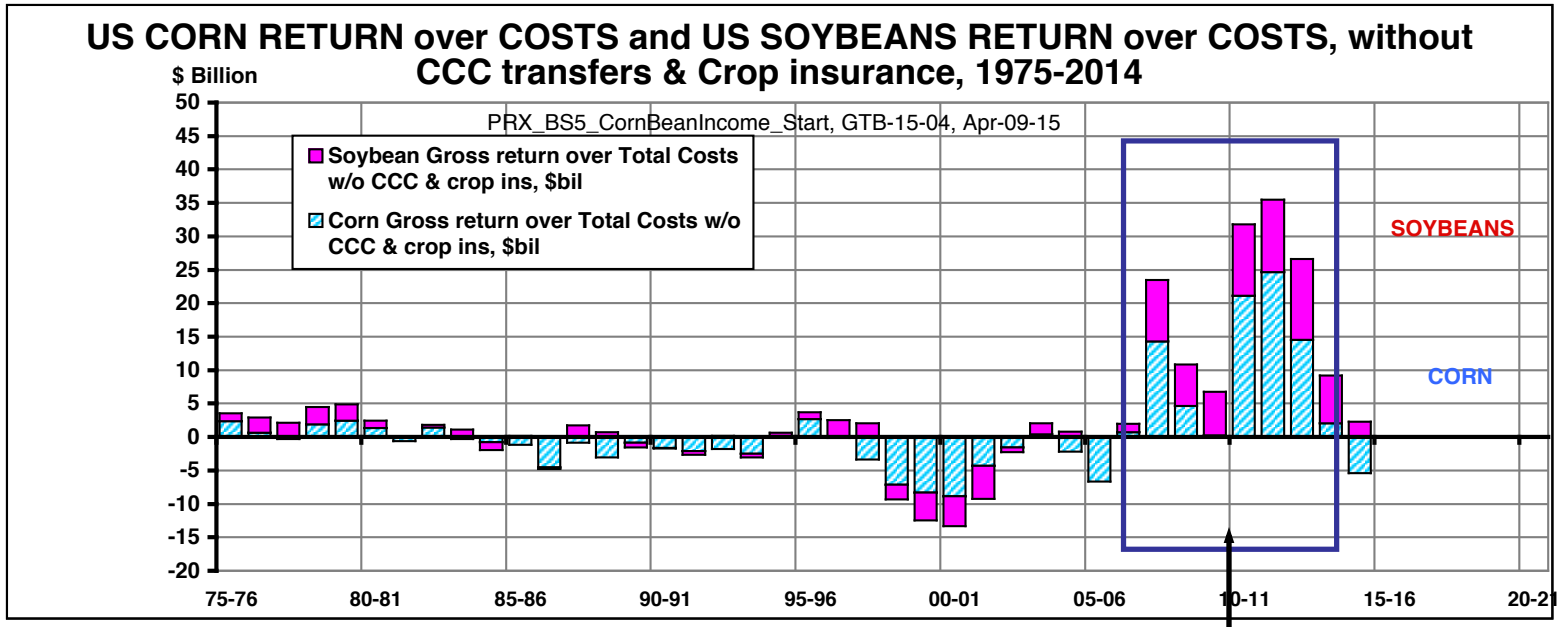
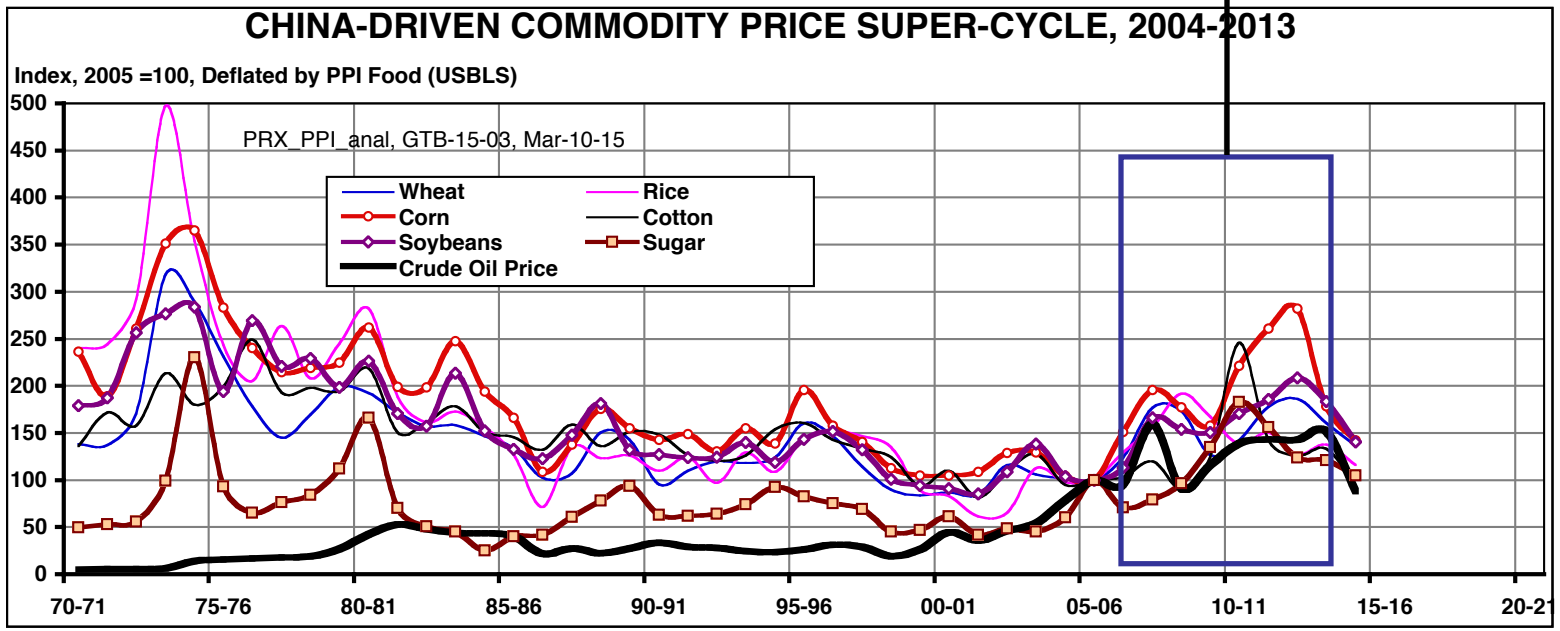
14	Conventional ethanol production	mil gal	13298	14448	14887	20021	24363	9915
15								
16	PRX Ethanol yield	gals/bu	2.75	2.80	2.85	2.89	2.94	
17	PRX calc corn/milo ethanol prdn	mil bu	4840	5166	5232	6917	8277	
18								
19	PRX DDG prdn estimate	mt/bu	0.0068	0.0068	0.0068	0.0068	0.0068	
20	PRX DDG prdn estimate	mmt	33	35	36	47	57	
21	PRX DDG domestic fed	pct	74.2%	67.8%	63.1%	58.1%	53.1%	
22	PRX DDG domestic fed	mmt	25	24	23	28	30	
23	PRX DDG domestic fed corn displ	bu/mt	38	38	38	38	38	
24	PRX DDG domestic fed corn displ	mil bu	924	901	849	1034	1131	
25								Total
26	PRX calc corn/milo excl DDG fed displ	mil bu	3916	4265	4382	5883	7146	2881
27								
28	PRX DDG export estimate	pct	25.8%	32.2%	36.9%	41.9%	46.9%	
29	PRX DDG export estimate	mmt	9	11	13	20	27	
30	PRX DDG export estimate	mil bu	321	427	496	745	997	
31								
32	PRX Area Planted & Trend	mil ac	88.2	88.9	92.0	92.0	94.0	
33	PRX Area Harvested & Trend	mil ac	81.4	81.1	83.9	83.9	85.7	
34	PRX Yield and Trend	bu/ac	153	168	175	185	195	
35	PRX Corn Production trend	mil bu	12447	13585	14687	15526	16721	3136
36	Surplus (-), Deficit (+)	mil bu						-255

Annual corn surplus 2030

Footnote 1. Corn and Soybean Market Prices





Global commodity price super-cycle drove wealth build in cornbelt.

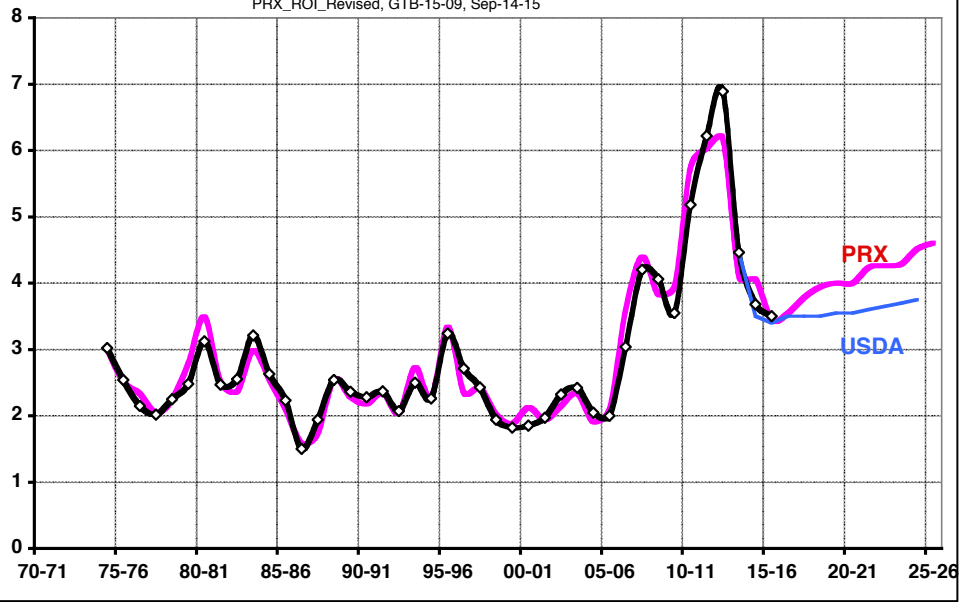
The episode was real, but it's over.

Corn fuel use played supporting role.

US CORN FARM PRICE, 1974-CURRENT, ACTUAL & MODELS

PRX_ROI_Revised, GTB-15-09, Sep-14-15

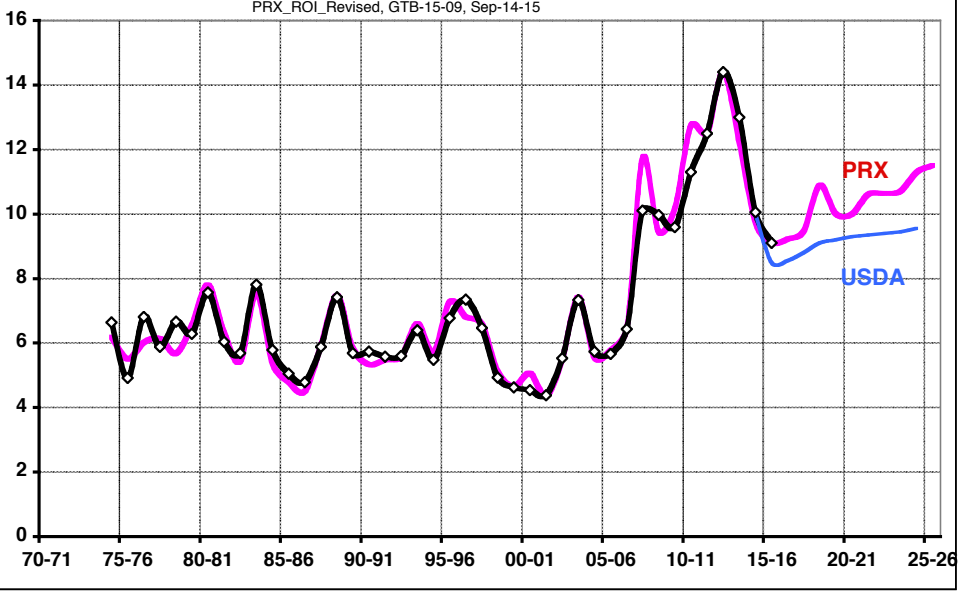
Regression Statistics	
Multiple R	0.96
R Square	0.92
Adjusted R Square	0.91
Standard Error	0.37
Observations	56.00
Coefficients	
Intercept	2.3063
Spply % Prv Yr Use	-1.2280
Crude Oil Price	0.0196
Carry Out to Use	-1.0847
Loan rate	0.4802
Monetary Deflator	0.2139



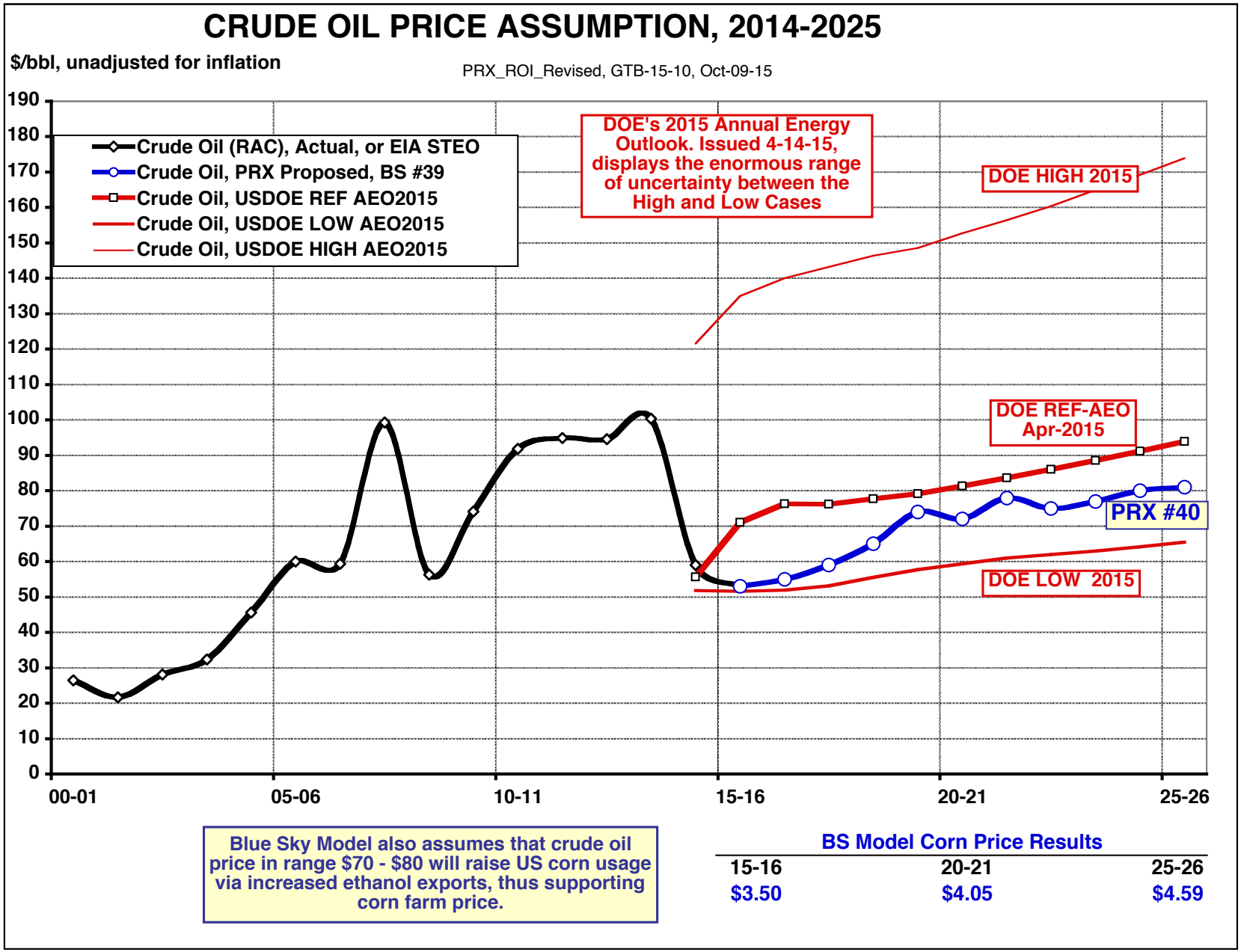
US SOYBEAN FARM PRICE, 1974-CURRENT, ACTUAL & MODELS

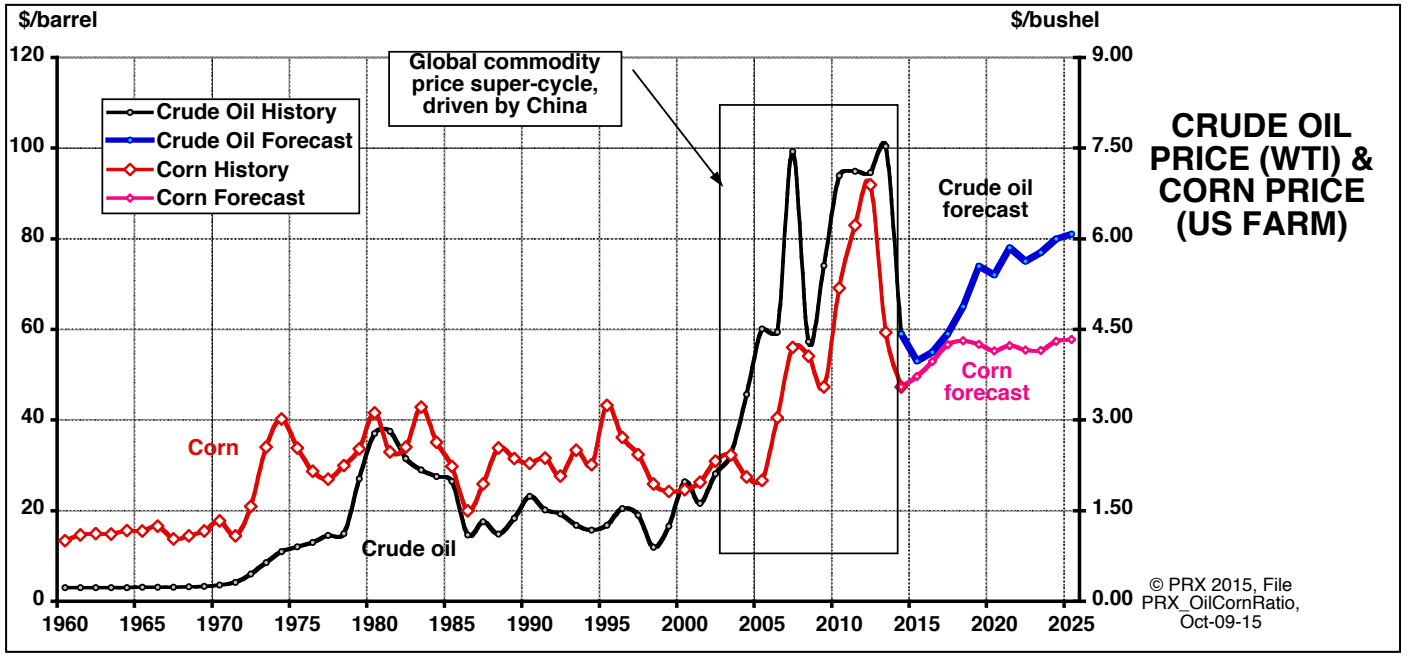
PRX_ROI_Revised, GTB-15-09, Sep-14-15

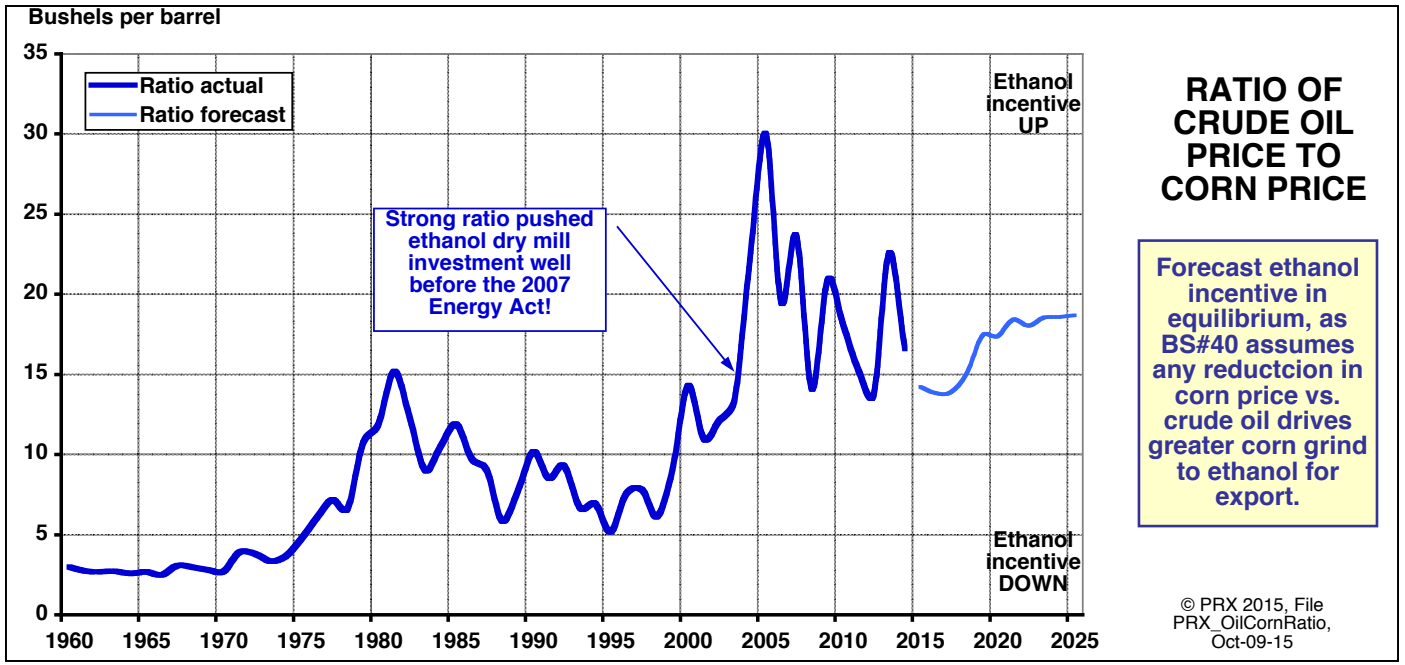
Regression Statistics	
Multiple R	0.97
R Square	0.95
Adjusted R Square	0.93
Standard Error	0.62
Observations	40.00
Coefficients	
Intercept	1.4128
Total Soybean Use	0.0030
Prod Estimate	-0.0051
Prev Yr Farm Price	0.7515
Current Carry In	-0.0009
Crude Oil Price	0.0258
Current yr use	0.0018



PRX differs from USDA in volume of ethanol domestic use and exports—and prevailing crude oil price.



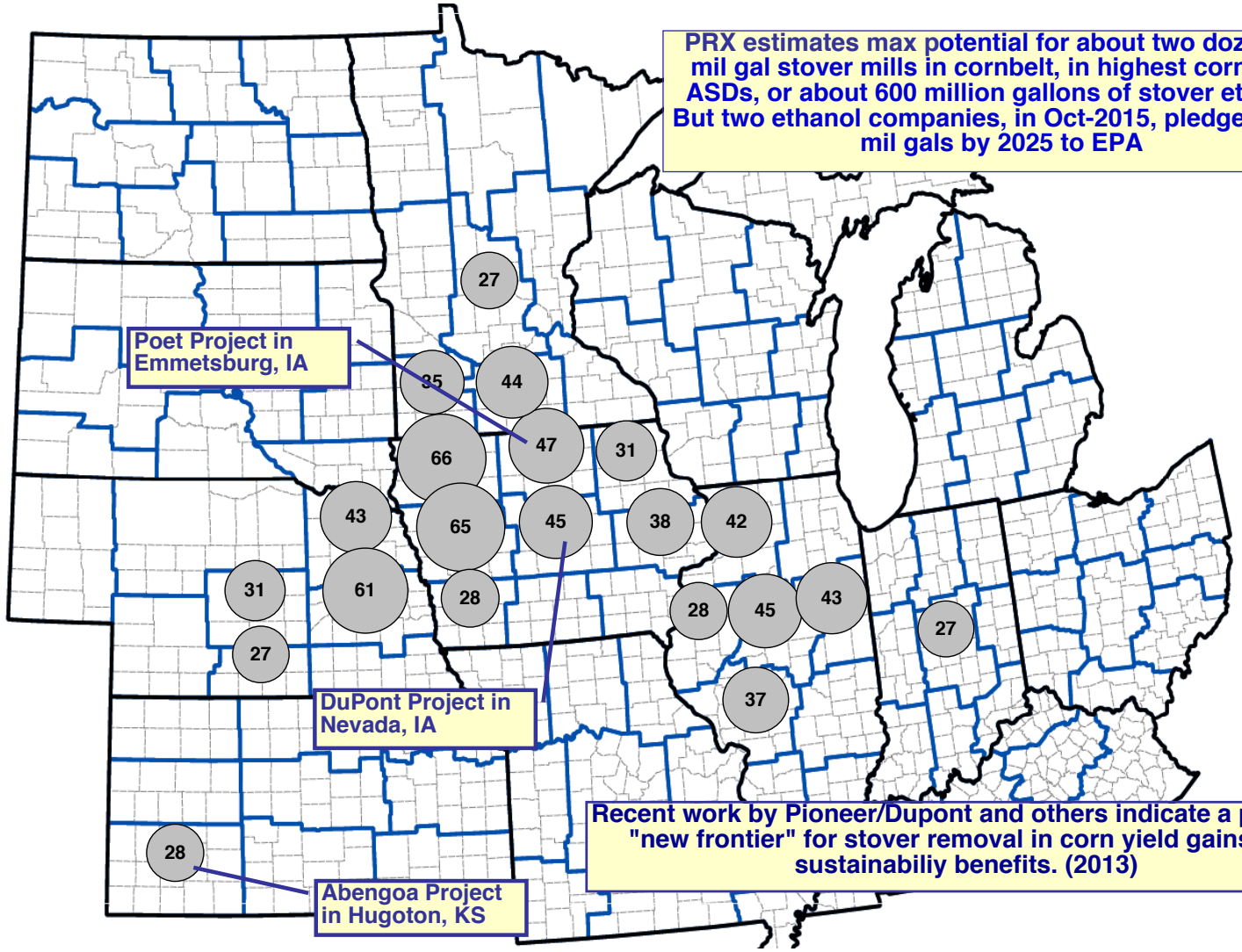




Footnote 2. Advanced Ethanol potential from US Corn Stover overestimated by DOE. Cost competitiveness is in hands of unelected officials at EPA, reluctant to allow high RIN prices.

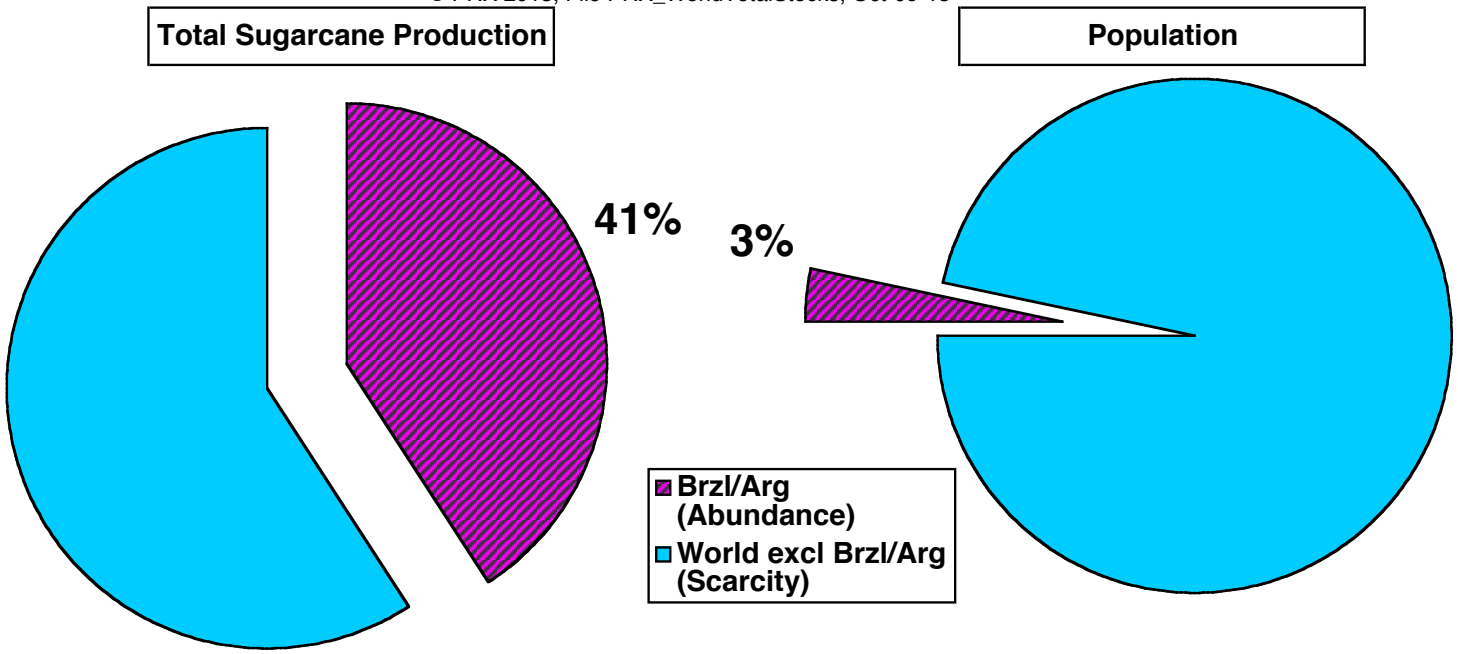
SUSTAINABLE STOVER ETHANOL POTENTIAL BY AGRICULTURAL STATISTICS DISTRICT (ASD), RECENT YEAR, MIL GAL

PRX_ASD_Map4_Start, GTB-15-10, Oct-11-15



Brazil has vast potential advanced sugarcane surplus, but advanced export availability hampered by Government policies and world sugar price

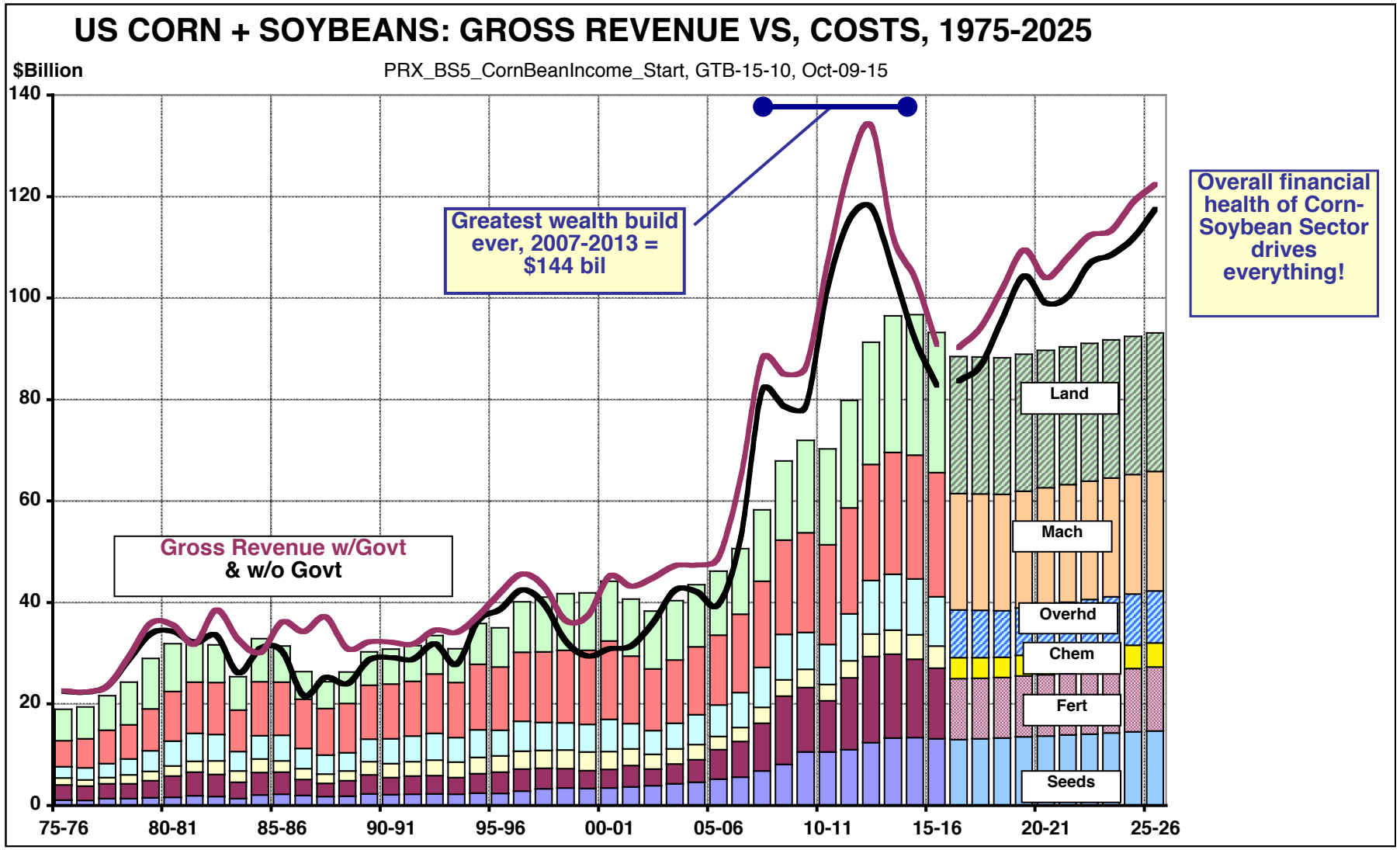
WORLD SUGARCANE PRODUCTION STRUCTURE



	Total Sugarcane Production		
Crop Yr	World	Brazil Arg	Rest of World
	mmt	mmt	mmt
2006	1422	504	918
2012	1833	746	1086
Change	411	242	168
		pct	pct
2006		35%	65%
2012		41%	59%

	Population		
Crop Yr	World	Brazil Arg	Rest of World
	mil	mil	mil
2006	6593	227	6366
2012	7080	240	6840
Change	487	13	474
		pct	pct
2006		3%	97%
2012		3%	97%

Footnote 3. Drivers of US Corn Efficiency Gains: (a) Large domestic feed market, (b) Good domestic & export transportation system, (c) $90 bil+ ag inputs industry, (d) New value-added dry milling industry for domestic use and exports of ethanol, (e) Entrepreneurial farm ownership & financial structure, & (f) Stable gov't farm support.



Question from AAE-WG audience: "What is increase in corn planted acres since the 2007 Energy Act?" The subtotal of corn + soybean acres has increased as a share of principal crops + CRP, but the overall total of all major crops + CRP acres has declined—and is well within the EPA rule.

US MAJOR FIELD CROPS AREA PLANTED, 94-95 to 15-16 CROP YEARS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Crop	All	Feedgrains					Oilseeds				Corn +		Total	All Hay	Other	Principal		Subtotal	Total	Other
year	Wheat	Corn	Sorghum	Barley	Oats	Total	Soy	Sunseed	Canola	Total	Soy	Cotton	Major		Major	Crops*	CRP	w/CRP	EPA*	(19-18)
	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac	mil ac
95-96	69.0	71.5	9.4	6.7	6.2	93.8	62.5	3.5	0.4	66.4	134.0	16.9	246.2	59.8	12.3	318.3	35.0	353.3		cropland
96-97	75.1	79.2	13.1	7.1	4.6	104.1	64.2	2.5	0.4	67.1	143.4	14.7	260.9	61.2	11.6	333.7	34.5	368.2		pasture
97-98	70.4	79.5	10.1	6.7	5.1	101.4	70.0	2.9	0.7	73.6	149.5	13.9	259.2	61.1	11.8	332.1	32.8	364.9		& fallow
98-99	65.8	80.2	9.6	6.3	4.9	101.0	72.0	3.6	1.1	76.7	152.2	13.4	256.9	60.0	13.0	330.0	30.1	360.1		
99-00	62.7	77.4	9.3	5.2	4.7	96.5	73.7	3.6	1.1	78.4	151.1	14.9	252.5	63.2	13.6	329.3	29.8	359.1		
00-01	62.5	79.6	9.2	5.9	4.5	99.1	74.3	2.8	1.6	78.7	153.8	15.5	255.8	60.4	12.5	328.7	31.4	360.1		
01-02	59.4	75.7	10.3	5.0	4.4	95.3	74.1	2.6	1.5	78.2	149.8	15.8	248.7	63.5	12.3	324.6	33.6	358.2		
02-03	60.3	78.9	9.6	5.0	5.0	98.5	74.0	2.6	1.5	78.0	152.9	14.0	250.8	63.9	12.6	327.3	34.0	361.2		
03-04	62.1	78.6	9.4	5.4	4.6	98.0	73.4	2.3	1.1	76.8	152.0	13.5	250.4	63.4	11.9	325.7	34.1	359.8		
04-05	59.6	80.9	7.5	4.5	4.1	97.0	75.2	1.9	0.9	77.9	156.1	13.7	248.3	61.9	12.1	322.3	34.7	357.0		
05-06	57.2	81.8	6.5	3.9	4.2	96.3	72.0	2.7	1.2	75.9	153.8	14.2	243.6	61.6	12.4	317.6	34.9	352.5		
06-07	57.3	78.3	6.5	3.5	4.2	92.4	75.5	2.2	0.9	78.6	153.8	15.3	243.7	60.6	11.3	315.6	36.0	351.6		
07-08	60.5	93.5	6.5	4.0	3.8	107.9	64.7	2.1	1.2	68.0	158.3	10.8	247.1	61.0	12.2	320.4	36.8	357.1	401.6	44.4
08-09	63.2	86.0	7.7	4.2	3.2	101.1	75.7	2.5	1.0	79.2	161.7	9.5	253.0	60.2	11.8	325.0	34.6	359.6	408.3	48.7
09-10	59.2	86.4	8.3	3.6	3.4	101.6	77.5	2.0	0.8	80.3	163.8	9.1	250.3	59.8	9.2	319.3	33.7	353.0	401.2	48.3
10-11	53.6	88.2	6.6	2.9	3.1	100.8	77.4	2.0	1.4	80.8	165.6	11.0	246.2	59.9	10.7	316.7	31.3	348.0	398.2	50.2
11-12	54.4	91.9	5.4	2.6	2.5	102.4	75.0	1.5	1.1	77.7	167.0	14.7	249.2	55.6	10.3	315.1	31.1	346.3	392.0	45.7
12-13	55.3	97.3	5.5	3.7	3.0	109.4	77.2	1.9	1.8	80.9	174.5	12.3	257.9	54.7	11.8	324.3	29.5	353.8	384.0	30.2
13-14	56.2	95.4	8.1	3.5	3.0	109.9	76.8	1.6	1.3	79.8	172.2	10.4	256.4	57.9	10.6	324.9	26.8	351.7		
14-15	56.8	90.6	7.1	3.0	2.7	103.4	83.7	1.6	1.7	87.0	174.3	11.0	258.3	57.1	11.4	326.8	25.4	352.2		
15-16	56.1	88.9	8.8	3.4	3.1	104.2	85.1	1.6	1.7	88.4	174.0	9.0	257.7	57.1	10.9	325.7	25.0	350.7		
Change from previous year, based on Jun-30-2015 USDA Acreage Report																				
	-0.7	-1.7	1.7	0.4	0.3	0.8	1.4	0.0	0.0	1.5	-0.3	-2.0	-0.5	0.0	-0.6	-1.1	-0.4	-1.5		

*Principal Crops 2014 reported by NASS in Jun-2015. EPA black numbers are officially reported. EPA compliance uses USDA-FSA in November, not to exceed the 402 of 2007. Red estimates by PRX, today's date. EPA for 2013, 2014 n/a, will be published by EPA later..

Corn + soybean acreage has grown as a share of other crops (see previous page).

Chart shows paid diversion of CCC corn programs, but not of other feedgrains, wheat, and CRP (beginning in mid-1980s).