

U.S. Cotton Acreage Response Due to Subsidized Crop Insurance, 1995 to 2011

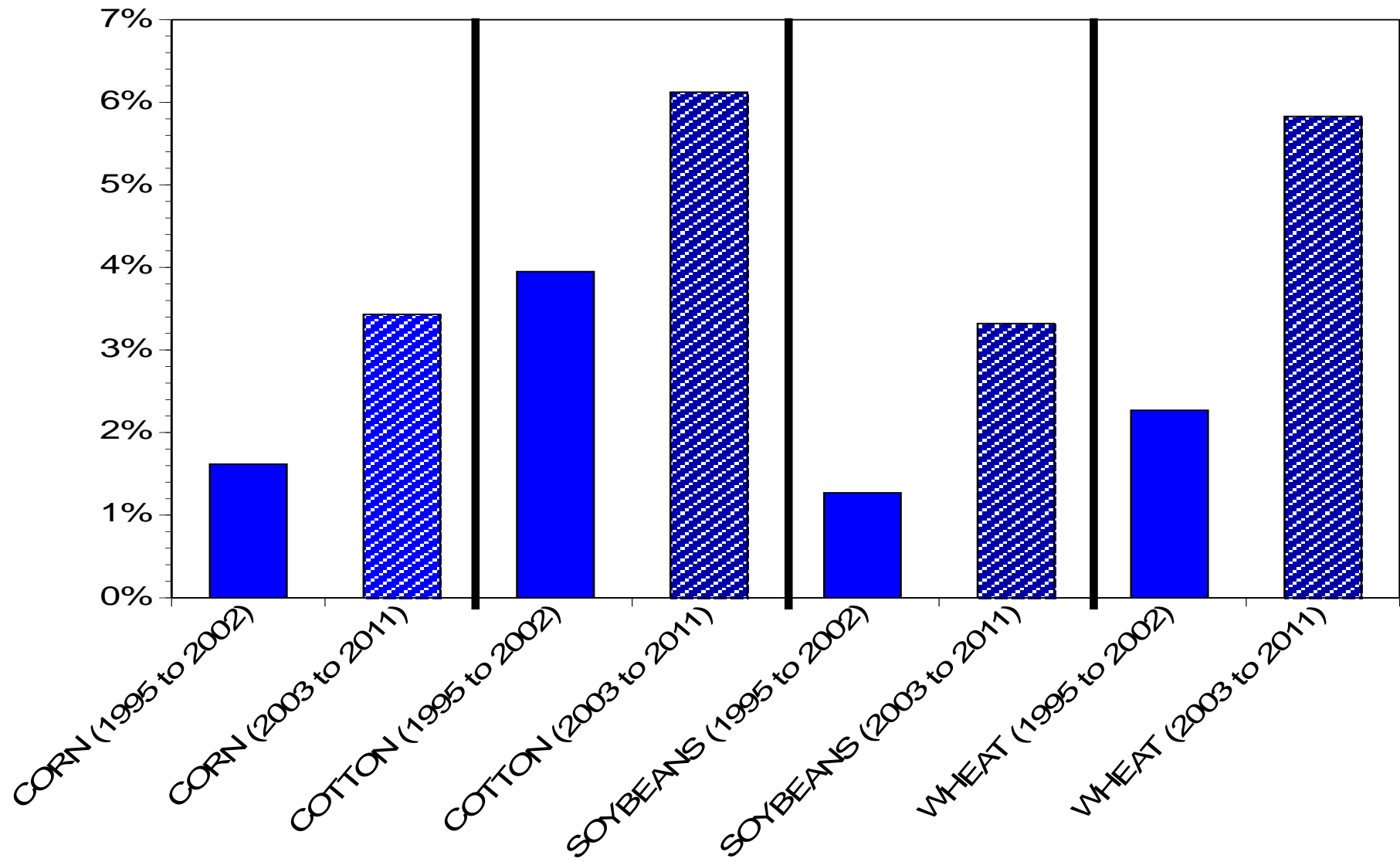
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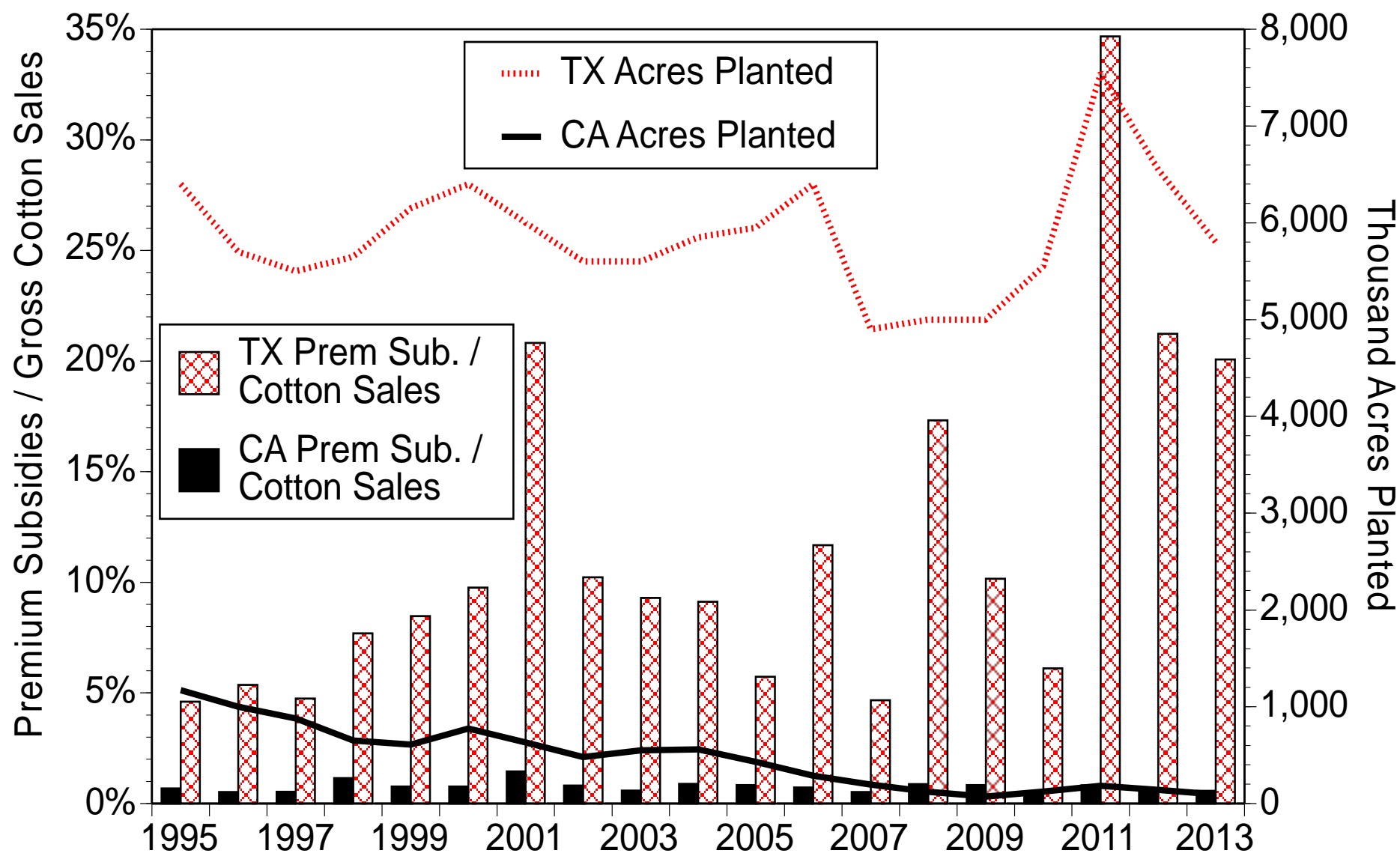


THE U.S. COTTON BELT

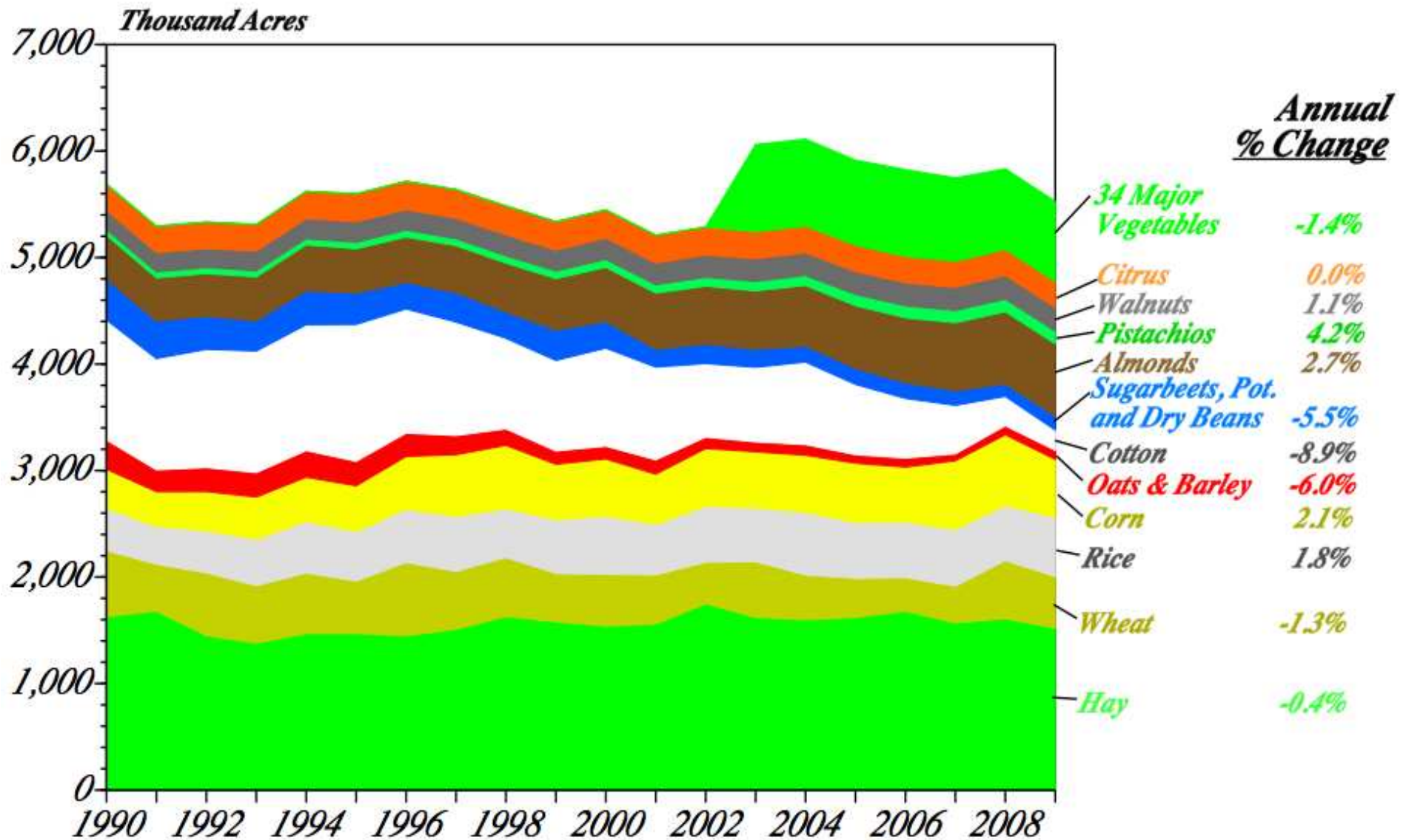
U.S. Crop Subsidy/Gross Sales Comparison, 1995-02 vs. 2003-11



Subsidy/Gross Sales Comparison



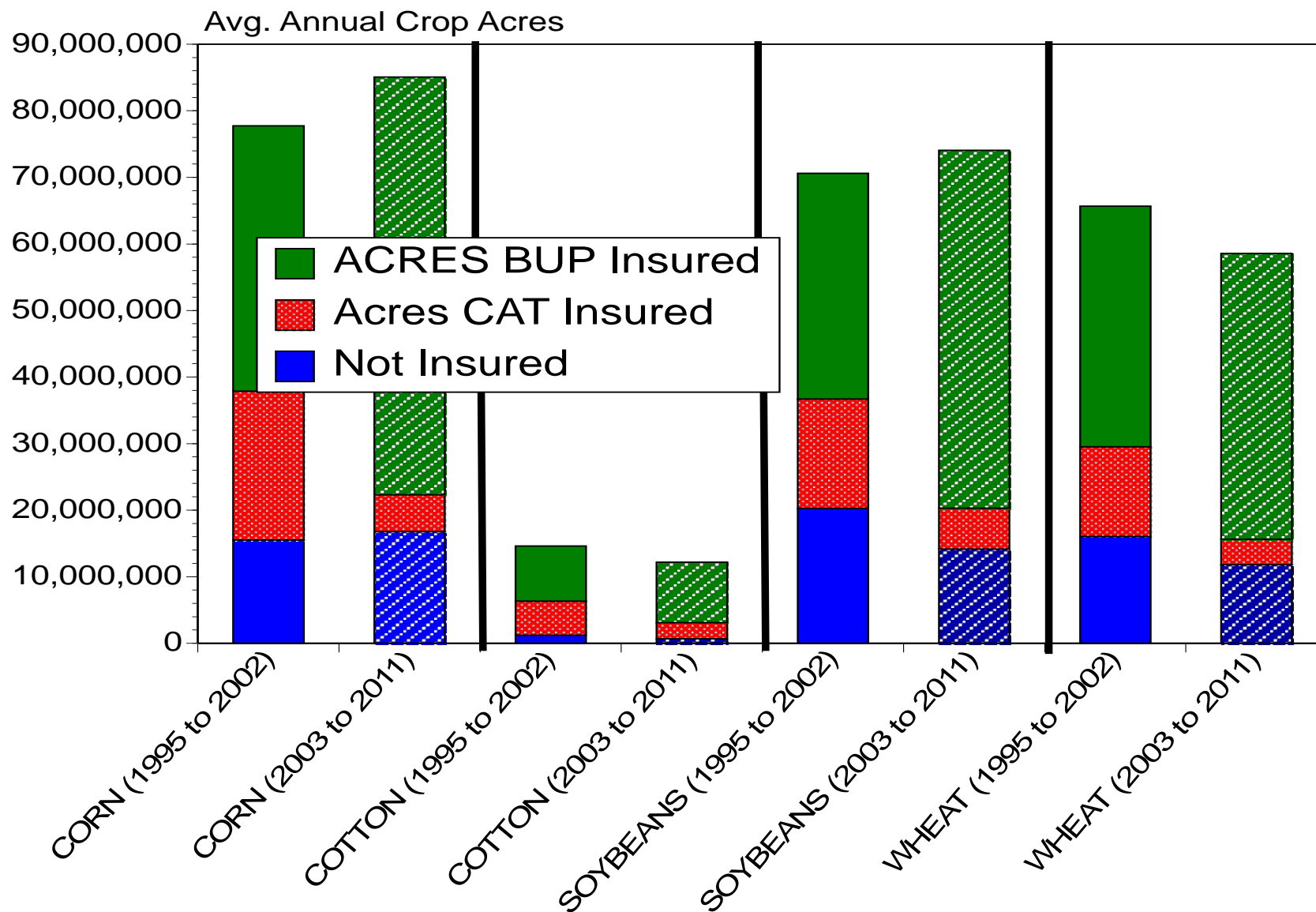
Most Crop Acres for CA, 1990-09



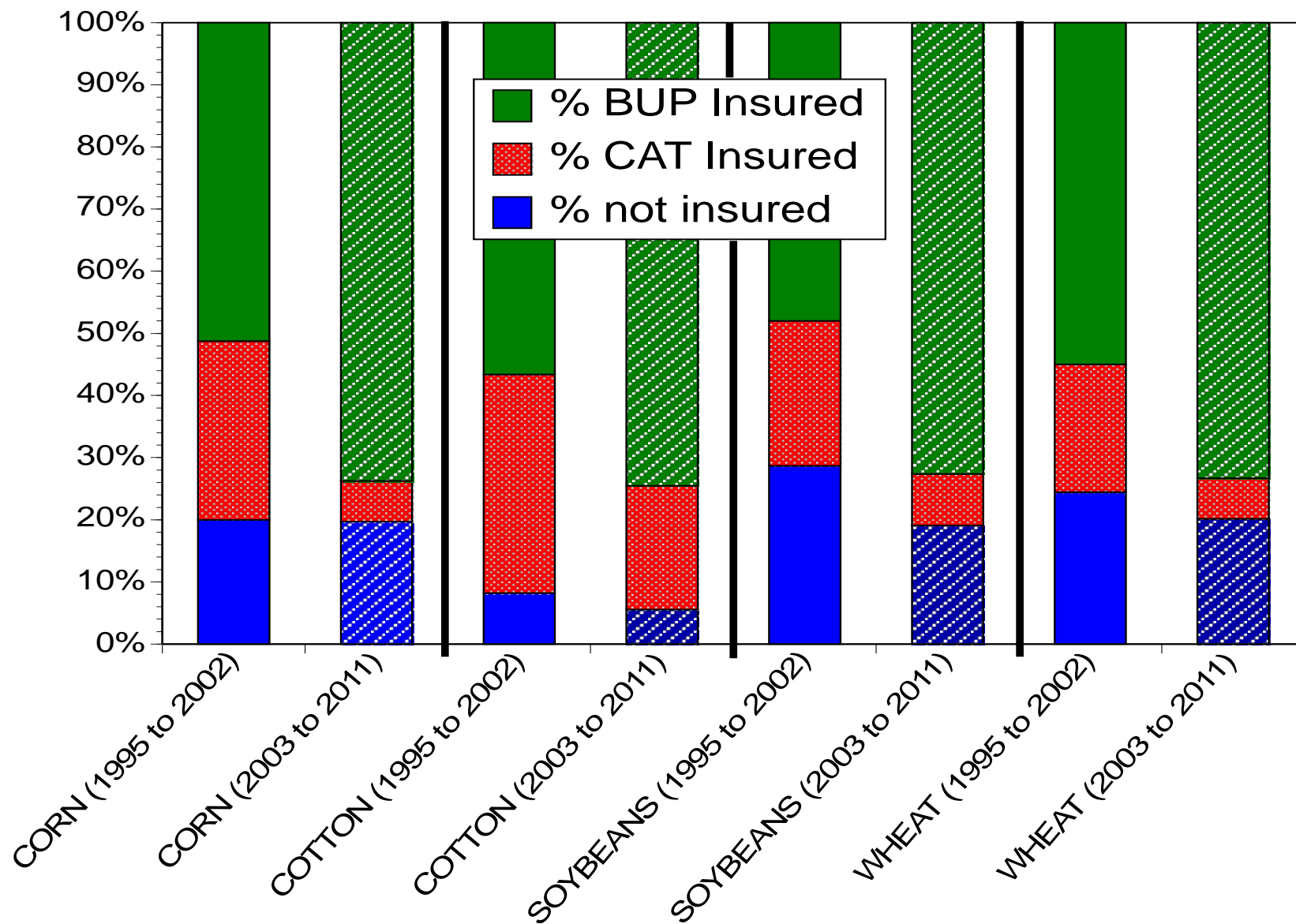
Source: USDA/NASS, ERS Tree Situation & Outlook, Various Years



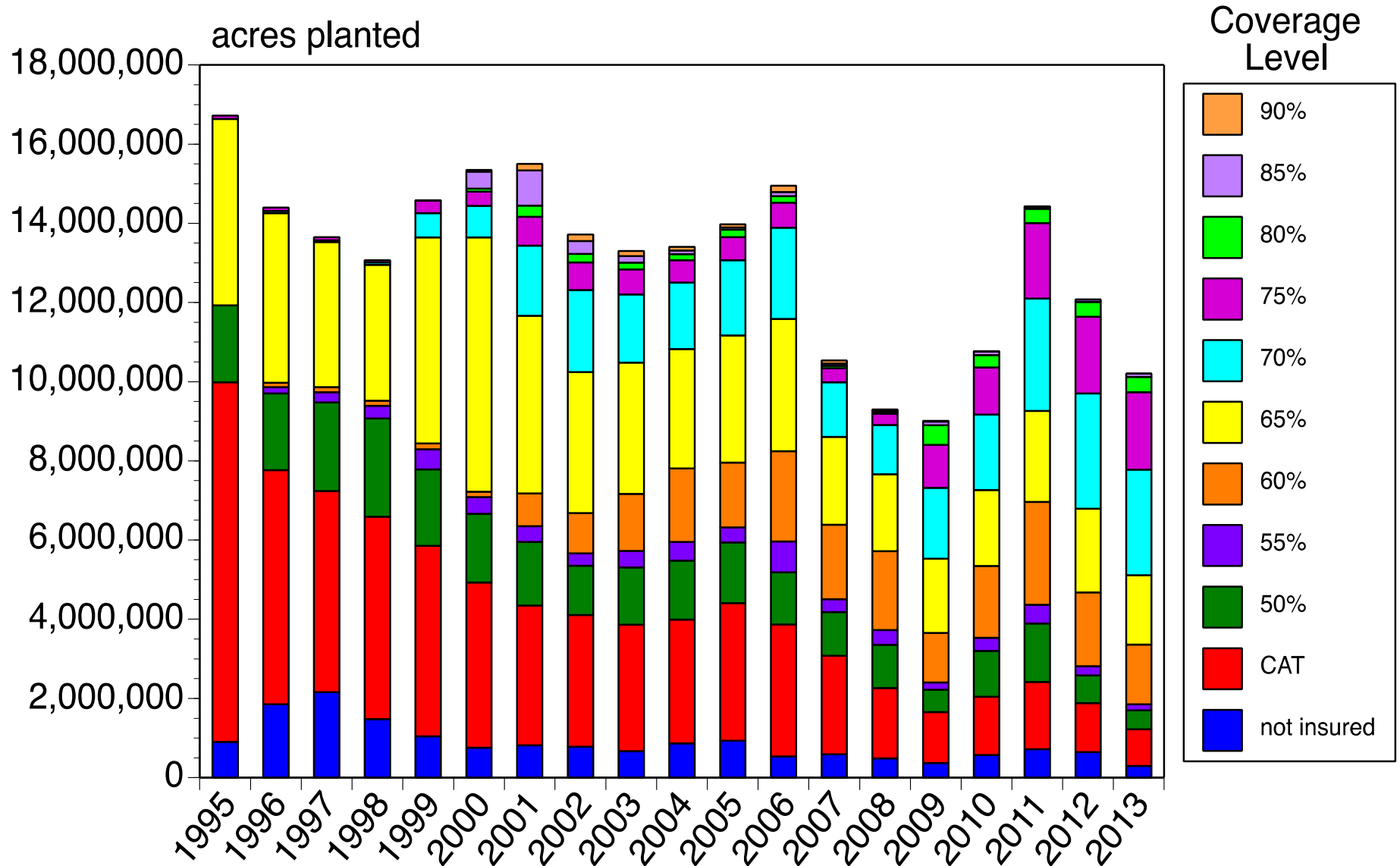
Comparison of U.S. Crop Acres Insured, 1995-02 vs. 2003-11



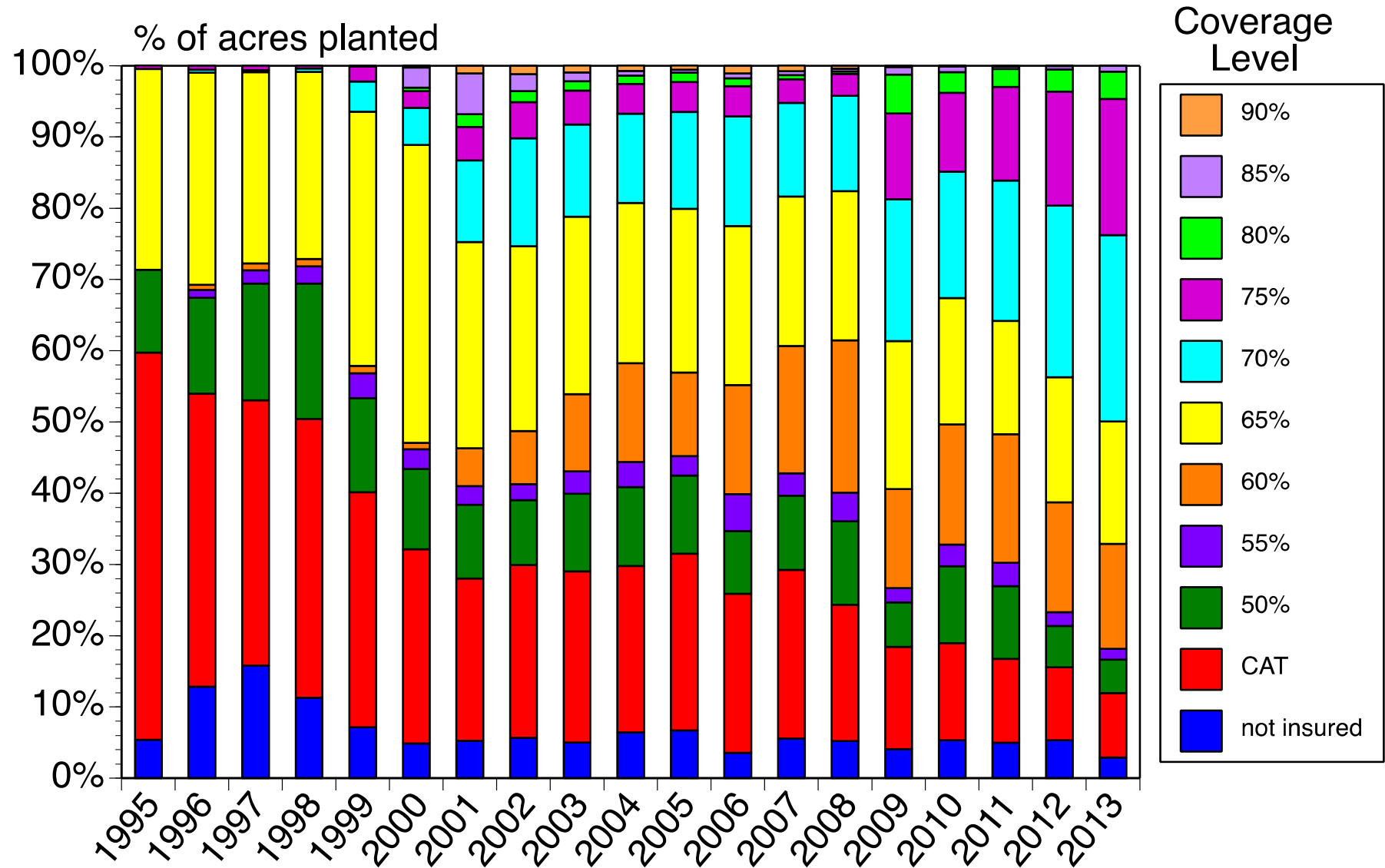
Comparison of U.S. Crop Acres Insured, 1995-02 vs. 2003-11



Cotton Coverage Levels, 1995 to 2013



Cotton Coverage Levels, 1995 to 2013



Key Issues to Address

- Increasing subsidy rates over period
- 1996 -- first real window for planting flexibility
- Impact of increased subsidies on cotton plantings by region??

Fixed Effects Simultaneous Model

$$PINSUR_{it} = \alpha + \beta_1 PCOTACRES_{it} + \beta_2 SUBSIDYPERLB_{it-1} + \beta_3 PROR_{it-1} + \beta_4 E[P_{cot,it}] + \beta_5 YLD_{it-1} + \beta_6 E[P_{cot,it}] YLD_{it-1} + \beta_7 YLDVAR_{it} + \beta_8 PBT_{it} + \beta_9 D1_t + \beta_{10} D2_t + \mu_{1it} \quad (1)$$

$$PCOTACRES_{it} = \gamma + \delta_1 PINSUR_{it} + \delta_2 E[P_{cot,it}] + \delta_3 YLD_{it-1} + \delta_4 E[P_{cot,it}] YLD_{it-1} + \delta_5 YLDVAR_{it} + \delta_6 PBT_{it} + \delta_7 PICC_{it} + \delta_8 D1_t + \delta_9 D2_t + \mu_{2it} \quad (2)$$

where $PINSUR_{it}$ is total liability county / total possible liability (5 yr. yld avg.),
 $PCOTACRES_{it}$ is the percent of tillable acreage planted to cotton in county i in year t ,
 $SUBSIDYPERLB_{it-1}$ is the expected premium subsidy (5-yr. moving avg. yld),
 $PROR_{it-1}$ is the % rate of return (ratio between total indemnity and producer costs),
 $E[P_{cot,it}]$ is the expected cotton price for county i (LDP, Dec. Futures, state basis),
 YLD_{it-1} is average yield (lbs./acre) for county i in year $t-1$,
 $E[P_{cot,it}] YLD_{it-1}$ is expected revenue,
 $YLDVAR_{it}$ represents yield variability for years $t-1$ through $t-10$,
 PBT_{it} is the percentage adoption rate for Bt cotton in county i (CIL)
 $PICC_{it}$ is a price index of competing crops for wheat, corn, and soybeans for county i ,
 $D1$ and $D2$ are period dummies for 2000 to 2001 and 2002 to 2011

Expected Price and PICC

$$E[LDP_t] = \frac{\sum_{i=1}^{100} \max[(52 - G(E[AWP_{it}])), 0]}{100} \quad (3)$$

$$E[AWP_t] = DecFutFeb_t + E[BasisLDP_t] \quad (4)$$

$$E[BasisLDP_t] = AWPlq_{t-1} - DecFutlq_{t-1} \quad (5)$$

$$PICC_{it} = \sum_{k=1}^3 \left(\frac{E[P_{k,it}]}{P_{k,i1996}} \right) \left(\frac{acres_{k,it}}{acres_{1,it} + acres_{2,it} + acres_{3,it}} \right) \quad (6)$$

$$E[P_{k,it}] = \text{Max} \begin{cases} RMAPlantP_{kt} + E[Basis_{k,it}] \\ CLR_{k,it} \end{cases} \quad (7)$$

$$E[Basis_{k,it}] = P_{k,state,t-1} - RMAPlantP_{k,t-1} \quad (8)$$

Boswell Farms, Corcoran CA



Regional Means and Std. Errors

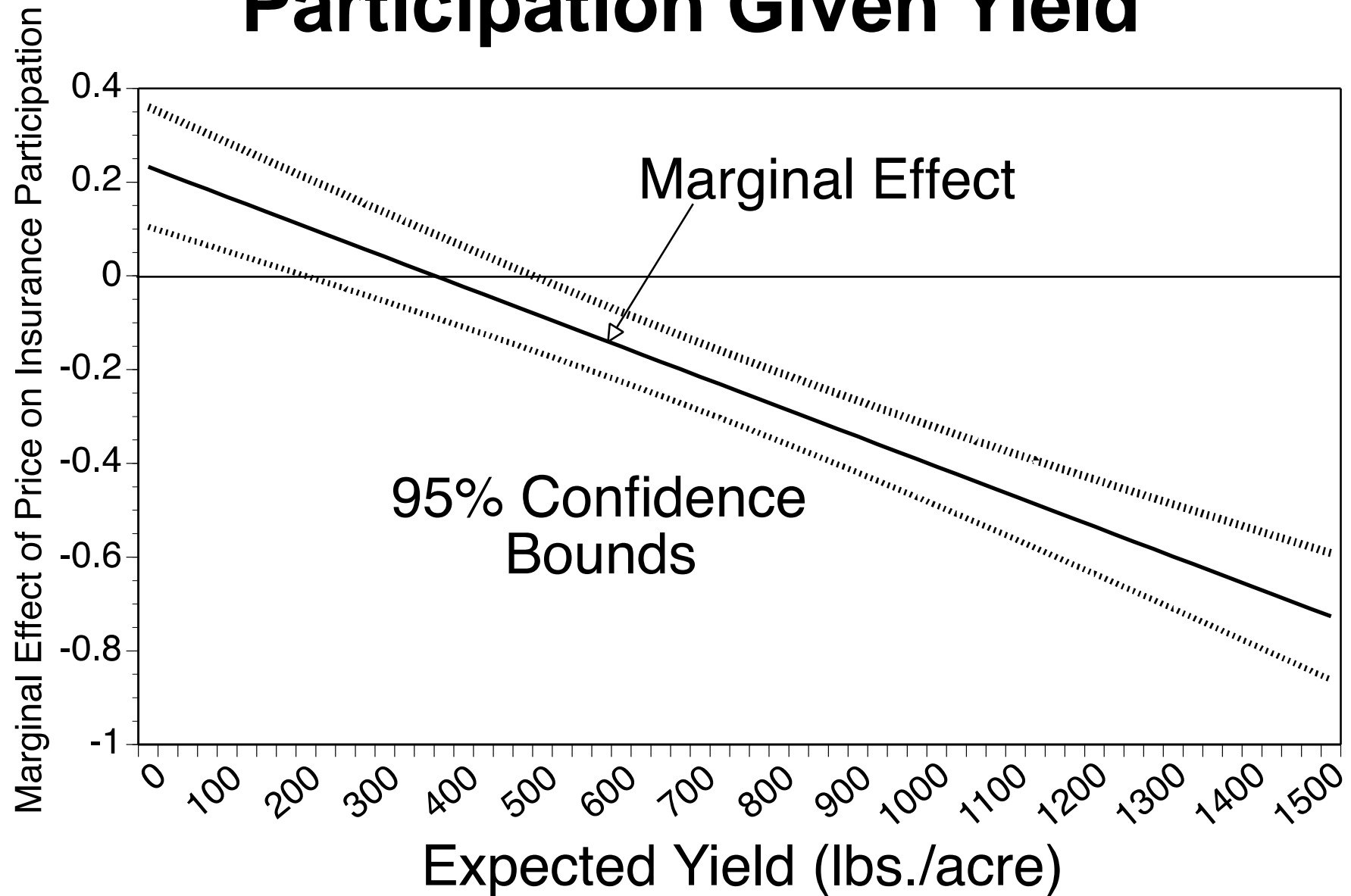
Region (# of observations)	Delta (940)	Southeast (2,197)	Southwest (1,728)	West (221)	U.S. (5,086)
Dependent variables					
$PINSUR_{it}$	47.916 (0.693)	64.960 (0.474)	62.470 (0.584)	44.748 (1.293)	60.084 (0.333)
$PCOTACRES_{it}$	22.195 (0.444)	26.742 (0.356)	19.169 (0.449)	12.915 (0.902)	22.730 (0.241)
Independent variables					
$SUBSIDYPERLB_{it-1}$	1.702 (0.038)	2.834 (0.043)	3.690 (0.068)	1.223 (0.094)	2.846 (0.324)
$PROR_{it-1}$	455.81 (52.070)	273.32 (11.820)	281.40 (10.059)	261.88 (25.034)	309.30 (11.507)
$E[P_{icot,it}]$	75.496 (0.406)	78.241 (0.288)	73.633 (0.290)	84.378 (1.159)	76.435 (0.186)
YLD_{it-1}	791.94 (5.925)	665.58 (3.902)	544.41 (6.066)	1,094.99 (21.235)	666.42 (3.502)
$YLDVAR_{it}$	18.295 (0.156)	23.737 (0.155)	27.869 (0.219)	17.341 (0.573)	23.857 (0.119)
PBT_{it}	69.922 (0.881)	65.764 (0.547)	31.792 (0.744)	25.962 (1.903)	53.261 (0.462)
$PICC_{it}$	87.930 (2.715)	133.61 (1.944)	87.128 (2.683)	147.671 (8.741)	109.987 (1.430)

Fixed Effects Estimated Results

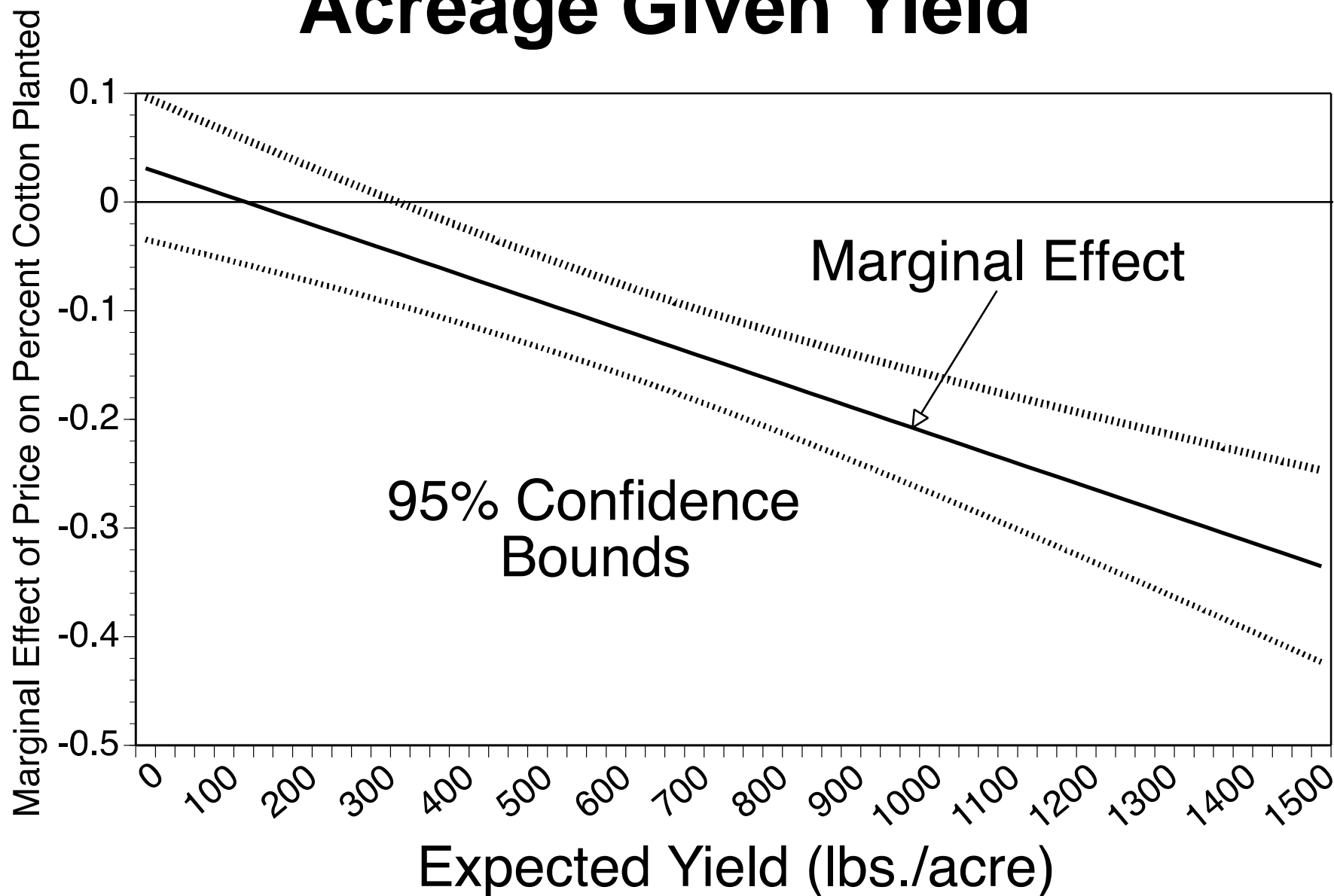
Dependent Variable	Equation for $PINSUR_{it}$ (insured/max insurance•100)					Equation for $PCOTACRES_{it}$ (cotton planted /cropland acres • 100)				
Independent Variables	Delta	SE	SW	West	U.S.	Delta	SE	SW	West	U.S.
Intercept	10.053** (1.755)	3.684* (1.581)	-5.264** (1.908)	-1.236 (9.965)	2.875** (0.837)	5.307* (2.354)	6.167** (1.022)	0.1684 (0.5155)	-2.269 (1.223)	2.222** (0.4627)
$E[P_{icot,it}]$	-0.4626** (0.1761)	0.3336** (0.1281)	0.0398 (0.1270)	-2.828 (0.3516)	0.2326** (0.0653)	-0.4128 (0.1765)	-0.0329 (0.074)	0.1142** (0.0387)	-0.0773 (0.0633)	0.0311 (0.0335)
YLD_{it-1}	-0.0755** (0.0142)	0.0390** (0.0106)	0.0120 (0.0145)	-0.0415 (0.0345)	0.0273** (0.0057)	-0.2540 (0.0165)	0.0135* (0.0068)	0.2374** (0.0043)	-0.0103 (0.0058)	0.0107** (0.0030)
$E[P_{icot,it}] YLD_{it-1}$	0.0005** (0.00019)	-0.0007** (0.0014)	-0.0004* (0.0002)	0.0003 (0.00035)	-0.0006** (0.00007)	0.000005 (0.00016)	0.0002** (0.00009)	-0.00039** (0.00006)	0.00008 (0.00006)	-0.0002** (0.00004)
$YLDVAR_{it}$	0.7368** (0.1444)	0.1249 (0.0818)	0.0579 (0.0862)	-0.2634 (0.5756)	0.0306 (0.0508)	0.315** (0.1656)	0.1598** (0.0541)	-0.0192 (0.0000)	-0.1339 (0.0899)	0.0015 (0.0264)
PBT_{it}	0.1876** (0.0376)	0.2248** (0.0433)	0.0960** (0.0330)	0.1154 (0.0889)	0.1507** (0.0190)	-0.08358** (0.0281)	-0.0223 (0.0143)	-0.0099 (0.0075)	0.0168 (0.2653)	-0.0135 (0.0072)
$SUBSIDYPERLB_{it-1}$	3.891** (0.5887)	5.474** (0.8147)	2.763** (0.4533)	2.875 (1.795)	3.536 (0.2851)					
$PROR_{it-1}$	0.0006** (0.00023)	0.0006 (0.00064)	0.0033** (0.0012)	0.0014 (0.0050)	0.00063* (0.00025)					
$PICC_{it}$						-0.08352** (0.0109)	-0.0244** (0.0036)	-0.0179** (0.0026)	-0.0036 (0.0049)	-0.0251** (0.0021)
$D1_t$	-18.099** (2.091)	-7.786** (2.730)	2.527 (3.056)	-13.057** (4.863)	-7.173 (1.366)	-18.410** (4.263)	-14.414** (1.352)	-3.557** (0.7148)	-1.666 (1.7567)	-8.602** (0.676)
$D2_t$	-12.958** (2.534)	-6.264** (2.036)	6.591** (2.341)	1.846 (13.381)	-4.219 (1.154)	-3.822 (2.953)	-6.678** (1.415)	1.597* (0.7189)	3.1674 (1.6317)	-1.119** (0.629)
$PCOTACRES_{it}$	1.051** (0.1679)	1.645** (0.4500)	2.491** (0.7621)	-2.778 (3.228)	1.379 (0.243)					
$PINSUR_{it}$						-0.6800** (0.1821)	-0.6191** (0.0581)	-0.2927** (0.0445)	-0.07433 (0.1032)	-0.4302** (0.0341)

Note: Asterisks indicate statistical significance at the 5%(*) and 1%(**) levels. Standard errors are in parentheses.

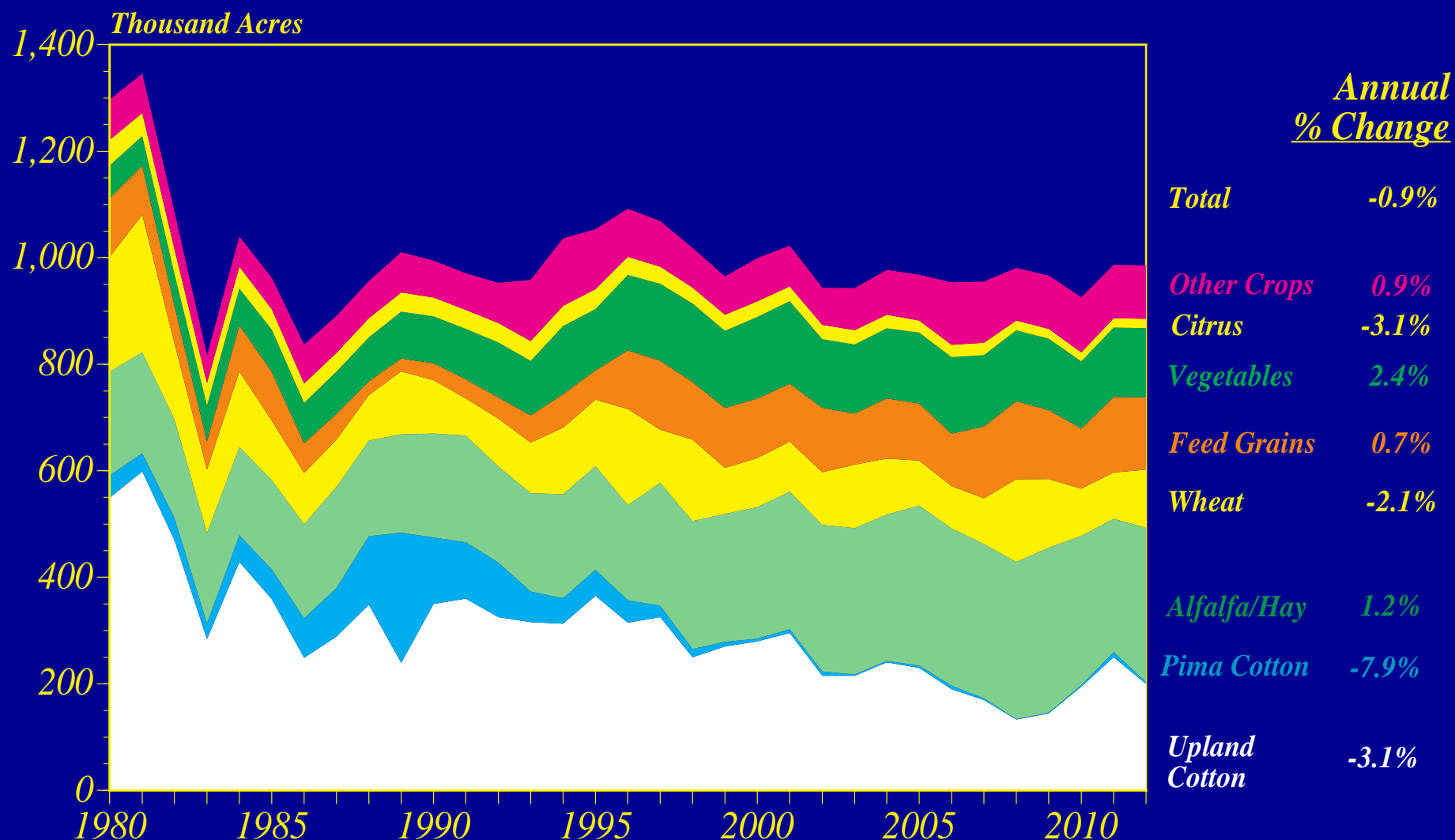
Marginal Effect of Price on Insurance Participation Given Yield



Marginal Effect of Price on Cotton Acreage Given Yield



Arizona Crop Acres, 1980-2012



Source: Arizona Agricultural Statistics, various years

San Carlos Water Allocations

San Carlos Allotments			
Year	Apportionment		
1936	3.50		
1937	4.10		
1938	2.15		
1939	1.62		
1940	2.02		
1941	3.60		
1942	4.20		
1943	4.00		
1944	3.35		
1945	2.05		
1946	1.00		
1947	1.00		
1948	1.00		
1949*	3.30		
1950	1.65		
1951	1.00		
1952*	2.25		
1953	1.00		
1954	1.50		
1955	1.50		
1956	1.30		
1957	1.00		
1958*	2.00		
1959	1.50	20 year span "dry"	
1960*	2.00	only 2 years >	
1961	0.65	2.00 allocation.	
1962	1.55	average = 1.42 ac-ft	
1963	1.30		1.42
1964	0.95		
1965	0.90		
1966	3.00		
1967	2.25		
1968	3.00		
1969	3.00		
1970	1.75	13 year span	
1971	0.70	8 years 2.0 ac-ft	
1972	2.00	or more	
1973	3.00		
1974	3.00	5 years < 2.0 ac-ft	
1975	2.00		
1976	1.20	average = 2.1 ac-ft	
1977	0.69		
1978	1.70		
1979	3.50		
1980	3.50		
1981	3.50		
1982	1.50		
1983	3.00		
1984	3.50	18 year span "wet"	
1985	3.00	only 2 years	
1986	3.50	< 2.0 acre-ft	
1987	4.00	average = 2.85 ac-ft	
1988	3.00		
1989	2.50		
1990	0.69		
1991	2.50		
1992	2.60		
1993	3.00		
1994	2.50		
1995	3.00		
1996	2.50		
1997	1.41		
1998	1.60		
1999	0.79		
2000	0.65		
2001	1.35		
2002	0.64	17 year span "dry"	
2003	0.35	only 1 year at	
2004	0.35	2.0 ac-ft	
2005*	2.00	average = 1.08 ac-ft	
2006	1.55		
2007	1.45		
2008	1.86		
2009	1.28		
2010	1.64		
2011	0.77		
2012	0.40		
2013	0.23		
2014	0.82?		
Avg (1936-2013)	2.00	Median	1.82
50 year (1963-2013)	1.98	50 yr Median	1.93
40 year (1973-2013)	1.96	40 yr Median	1.78
30 year (1983-2013)	1.82	30 yr Median	1.62
25 year (1988-2013)	1.50	25 yr Median	1.45
20 year (1994-2013)	1.32	20 year Median	1.38
10 year (2004-2013)	1.15	10 year Median	1.37

Crop Insurance, AZ-Drought

- **In 2013, AZ cotton accounted for 30% of insured acres**
- **Cotton accounted for over 72% of indemnity claims in 2013.**
- **Over 76% of indemnity claims for cotton were associated with Prevented Planting (PP) (avg. ~\$716/acre in payouts)**

Summary

- Low yields & quality, respond most to insurance participation as price goes up.
- Shifting production from high to low risk regions.
- West – least significant factors
- -subsidy; other factors???



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