A CORN YIELD MODEL INCORPORATING PLANTING PROGRESS AND WEATHER VARIABLES
By Paul Westcott (202) 219-0609

Estimates of 1996 corn yields will be particularly important because of this year's tight market conditions. USDA's initial 1996 corn yield projection of 127 bushels an acre, released in the February 1996 Long-term Agricultural Projections to 2005 report, was based on a composite of a number of different modeling and statistical approaches. This section discusses one of the corn yield models used.

This corn yield model is based on trend, July weather, and mid-May plantings progress (table B). Data used to estimate the model are from 1975-1995. The data for weather and mid-May plantings are for the 5-State Corn Belt (Iowa, Illinois, Indiana, Ohio, and Missouri) which typically accounts for about half of total U.S. corn production. Almost 90 percent of national corn yield variation is explained by the estimated regression equation.

The model is linear in all variables except July Corn Belt precipitation. However, the response of corn yields to different amounts of precipitation is not linear. Reductions in corn yields when rainfall is below its average are larger than gains in corn yields when rainfall is above its average. The model's use of a squared term for July precipitation (JP2) represents this asymmetric effect.

Assuming normal planting progress by the middle of May and average weather in July, the model suggests a 1996 corn yield of about 131 bushels an acre. However, a weighted average of corn yield estimates for alternative levels of planting progress and July weather outcomes results in a lower mean expected corn yield for 1996 of 127.5 bushels per acre, reflecting the asymmetric response of corn yields to different amounts of rainfall. This mean expectation accounts for variation in planting progress and July weather within two standard deviations of their averages, covering 95 percent of the statistical distribution of the those variables.

As the planting and growing season for corn progresses, and actual data for mid-May planting progress and July weather become available, the equation can be used to provide revised model projections of the likely outcome for corn yields. Last year, for example, the model's pre-season mean expected corn yield was 125.8 bushels an acre. Late plantings last year lowered the model's expected corn yield to 117.2 bushels an acre. July 1995 Corn Belt weather that was hotter and drier than average then reduced the model's estimate to 111.3 bushels an acre, compared with 1995's actual corn yield of 113.5.

Table B. Estimated Corn Yield Equation, Based on Trend, July Weather Variables, Mid-May Plantings Progress, 1988 Effects Omitted

Regression equation:

	Intercept	Trend	D88	JP	JP2	JT	CPMIDMAY
Coefficients	210.564	1.645	-30.825	22.050	-2.170	-4.083	0.247
Std Err of Coef.	71.619	0.235	6.661	5.332	0.544	0.891	0.065
t-statistics	2.940	7.007	-4.628	4.135	-3.985	-4.584	3.822

Estimation period	1975-1995
Std Err of Y Est	6.108
R Squared	0.893
Number of Observations	21
Degrees of Freedom	14

Variable definitions:

Dependent variable	National corn yield, bushels per acre
Trend	Linear trend, 1975=75
D88	1988 dummy variable to omit 1988 effects
JP	July precipitation in 5-state Corn Belt, inches
JP2	JP squared
JT	July temperature in 5-state Corn Belt, degrees
CPMIDMAY	Corn plantings progress by mid-May in 5-state Corn Belt, percent

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