



A Look at Minnesota Corn Yields over Time

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Corn yields in Minnesota have been excellent for the past few years and have exceeded the expectations based on weather and growing conditions during the growing seasons. Whole field yields during the past three years have exceeded 200 bushels per acre for many growers in the central to southern regions of the state. As a result, we may begin to wonder if these high yields are now normal and should we expect them in the future or have they been blips on the yield profile? It may not be very accurate to use the past to predict the future, but it is one method to look forward to corn yields of the next few years. That's the objective of this paper.

I used the 1968 to 2004 state average corn yields to determine both a linear trend line and a curvilinear trend line and then used those to predict the 2005-state average corn yield. Both models (linear and curvilinear) had similar fits to the data (the degree of fit is determined by the R^2 value for each model and the R^2 's were not statistically different). But, the curvilinear trend line turns upward for the past few years, which shows a better visible fit to the increasing yields of

the last few years. The linear trend line for the 1968-2004 period predicted a state average yield of 147 bu/a for 2005 and the curvilinear model predicted a state average yield of 158 bu/a for 2005. The last crop report pegged the Minnesota state average corn yield at a whopping 171 bu/a! The curvilinear model better predicted the 2005 corn yield.

What can we expect for 2006; will these high yields continue? I've updated the trend lines including the 171 bu/a state average yield for 2005 and recalculated both the linear and curvilinear models. The linear is graphed in Figure 1 and the curvilinear in Figure 2. The R^2 values are again not different statistically, so the long-term corn yields fit both models equally well. However, the curvilinear model is a better fit for the last few years because it turns upward as I mentioned above. Based on 38 years of Minnesota state average yields, a linear trend line would predict a state average yield of 153 bu/a for 2006 while the curvilinear trend line would raise that prediction to 164 bu/a.

Is a state average yield of 164 bu/a doable? Certainly, the 2005 crop topped that. And yields for the next few years will need to continue to go higher if we stay on either a linear or curvilinear yield trend over time. But, we should caution ourselves that a major factor driving these high yields is the environment, which we can't predict very accurately. How much available stored soil moisture do we have in the root profile going into the growing season? When will the crop get planted? What will the rainfall be –both the amount and distribution during the growing season? What will temperatures be? Will we have extreme temperatures at times when available moisture is short? **These are major environmental variables that can *make or break* corn yields.**

Deviations from the trend line do occur. The greatest deviations (for either the linear or curvilinear model) occurred in 1974 (Labor Day frost), '75, '76, '83 and '88 (dry or dry and hot years), and '93 (late planting, cold and wet year). Corn yields have been on or above the trend line (for both models) for seven of the past nine years, which is one way of suggesting that we may be due for a deviation from trend, and possibly below trend line. The '74, '75, and '76 drops in yield were 20% below trend line and the '83, '88 and '93 low production years were 20% to 50% below the trend line, so major low yields have occurred.

A speaker at the recent Agri-Growth Council meeting was asked if Minnesota corn production could continue to provide grain for both the livestock industry and the expanding ethanol industry in years when corn yields might be low. The speaker's response was "Technology has insulated us from disaster years." I don't believe that to be the case. It's true that corn breeders have provided us with high yielding hybrids that appear to tolerate stress with a minimal effect on grain yields (hybrids is only one of the technologies that has contributed to high corn yields). **We shouldn't be lulled to sleep expecting that high corn yields are the norm. We need to remember that the weather we get is the major yield limiting or non-limiting factor. Let's hope for a good growing season next year to continue this upward yield trend for corn in Minnesota.**

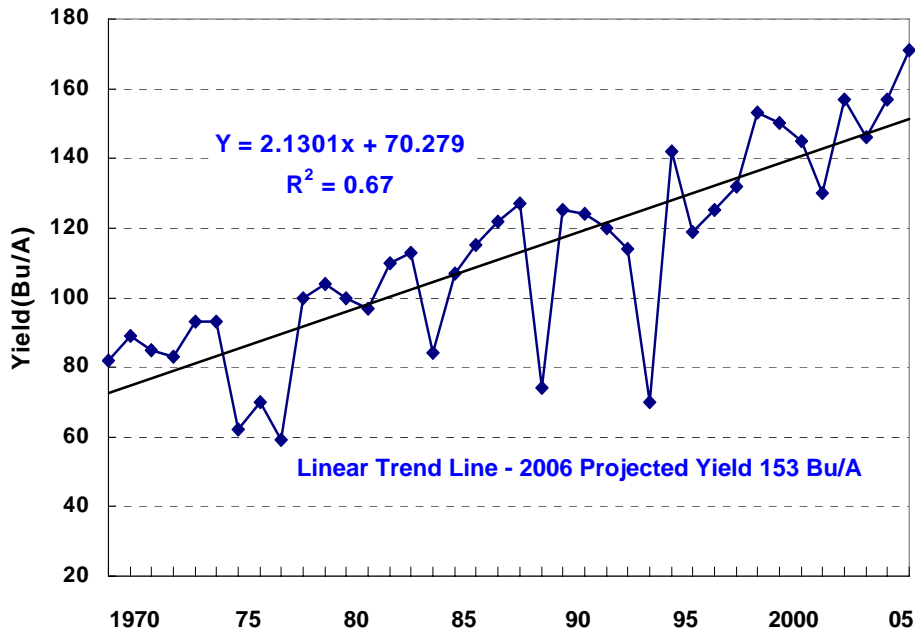


Figure 1. Minnesota State average corn yields for 1968 - 2005 with a linear trend line.

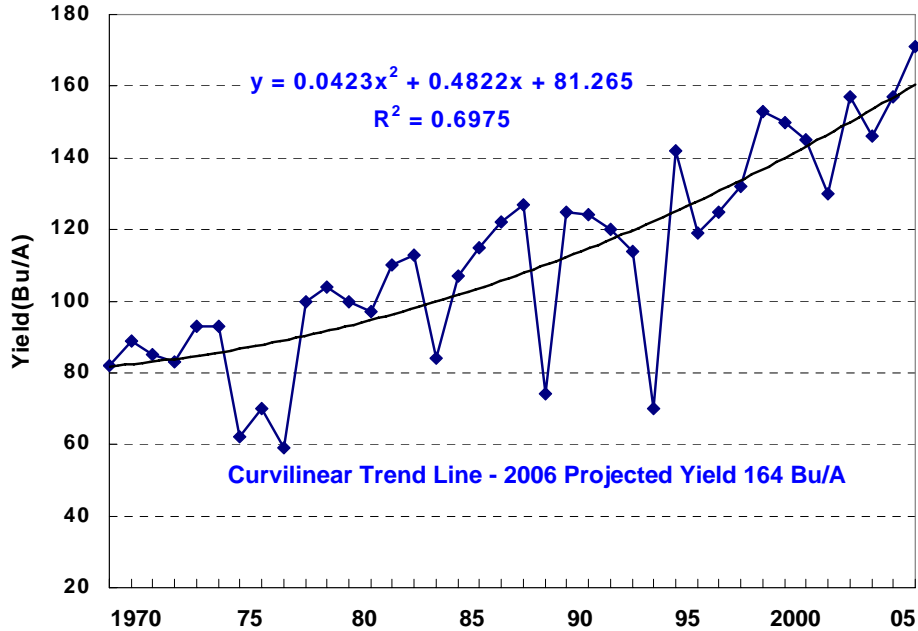


Figure 2. Minnesota State average corn yields 1968 - 2005 with a curvilinear trend line.