

**White Corn Production and Markets
for North Dakota Growers**

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Abstract

U.S. white corn production, consumption, and exports increased from 1980 to 1999/00 and production and area have since declined. White corn is produced largely in Nebraska, Kentucky, and Texas, although production in Texas has declined and has increased in other states (Illinois, Indiana, and Iowa). Major domestic processors of white corn are located in the southern United States, with the closest large domestic processor located in St. Joseph, MO. Comparisons of white and yellow corn varieties suggest yields are similar, but have a wide range of variability. Net returns for white corn are most affected by white corn premiums and yield differences relative to yellow corn in southeastern and south central North Dakota. A 10 percent yield advantage for white corn over yellow corn or increases in the white corn premium from 10 cents/bu to 30 cents/bu would increase net returns to labor by \$10/a in southeastern North Dakota. Effects of increases in yield advantages or white corn premiums have larger impacts in Nebraska than in North Dakota. Estimated net local prices for North Dakota were 22-25 cents/bu higher for shipment to the Pacific Northwest (PNW) export market than for shipment to domestic markets. This dominance of the PNW market for exports of either white or yellow corn from North Dakota and cost disadvantages relative to production from Nebraska makes serving the domestic processing market not so attractive. Results would change if: 1) a local processor or domestic market were to arise which was not at a disadvantage to being supplied from other areas; 2) premiums for white corn over yellow corn were to increase for a sustained period of time; 3) yield advantages of white corn varieties relative to yellow corn varieties increase; or 4) an export market which was not disadvantaged relative to being supplied from other regions were to emerge.

Key Words: white corn, supply/demand, North Dakota, competitiveness, markets, geographic competition

White Corn Production and Markets for North Dakota Growers

Bruce L. Dahl and William W. Wilson*

Introduction and Scope

In recent years, farmers growing corn have experienced lower profitability of traditional yellow corn due to lower prices. Some producers searching for alternatives to gain profitability have chosen production of white corn as an alternative to yellow corn. White corn production in the United States has increased dramatically in recent years. These factors have fostered questions about the potential of white corn production being introduced into northern production regions.

The purpose of this report is to describe the white corn market and assess the prospective agronomic competitiveness of white corn grown in the northern regions. The following sections provide a description of supply and demand and trends in U.S. white corn production. Later sections describe domestic markets, agronomic competitiveness due to differences in prices/yields of white and yellow corn. Finally, geographic competition from markets are examined to identify relative attractiveness or cost disadvantages of supplying markets from North Dakota.

Supply and Demand

U.S. area of white corn increased substantially from 1980 to 2000 (Figure 1). Harvested acres in the late 1990s and early 2000s are two to four times that harvested during the early 1980s. In 1980/01, white corn was harvested on 443,000 acres, while in 2001/02, white corn was harvested on 893,000 acres. U.S. production of white corn has over the same period more than quadrupled (Figure 2). Production of white corn in 1980/81 was 29 million bushels. By 2001/02 production of white corn had increased to 135 million bushels. However, area and production spiked in 1999/00 and have declined since then with projections for 2002/03 harvested acres at just over 800,000 and production down from 155 million bushels for 1990/00 to a projected production of 117 million bushels for 2002/03.

White corn is planted in several states in the United States, but planted area has been concentrated in Nebraska, Kentucky, Texas, and Illinois and has increased in the late 1990s and early 2000s in Indiana and Iowa (Figure 3). Production is concentrated in the same states, although, changes in production in the 1990s and 2000s also reflect yield variability across states and years. In most years in this period, over 50 percent of production is from Nebraska, Kentucky, and Texas (Figure 4). Since 1999/00, production in the states of Illinois, Indiana, and Iowa have increased in importance and Texas has declined. Production increases for white corn have come from increases in production in states where large areas of white corn have been grown (Nebraska and Kentucky), from increases in production in states where white corn had previously not been important (Indiana, Iowa, and others), and from introduction of white corn production into states where white corn had not been grown such as the upper Midwest which includes Minnesota and Wisconsin.

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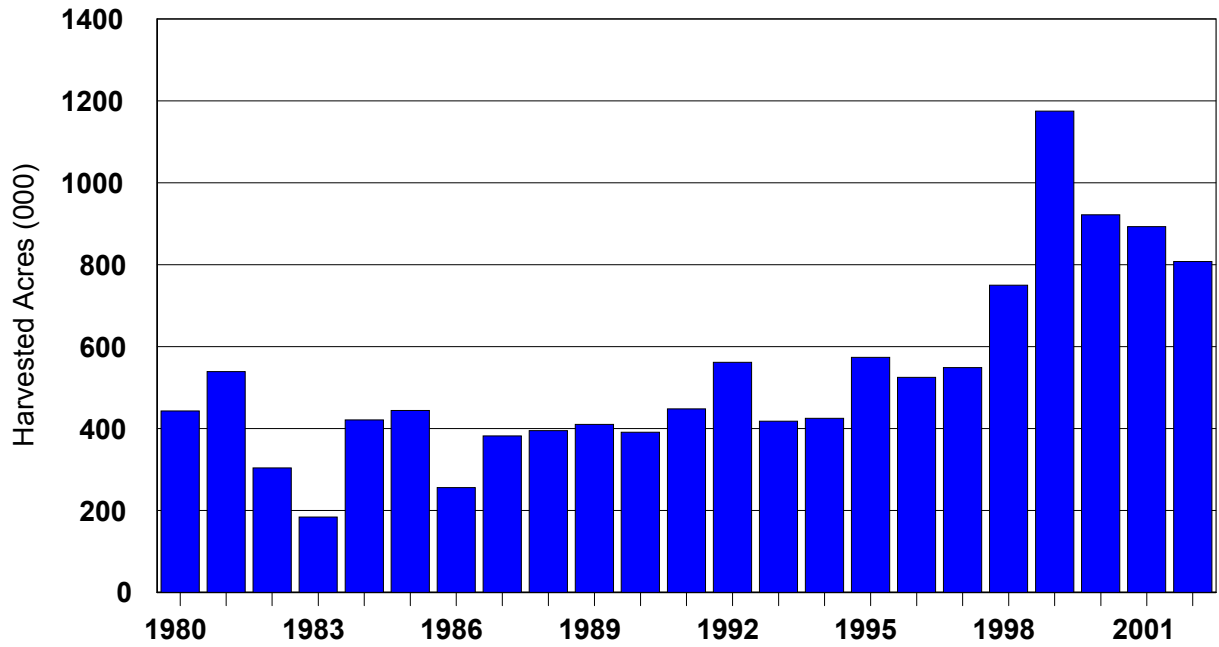


Figure 1. Harvested Acres for U.S. White Corn, 1980/81 to 2002/03.

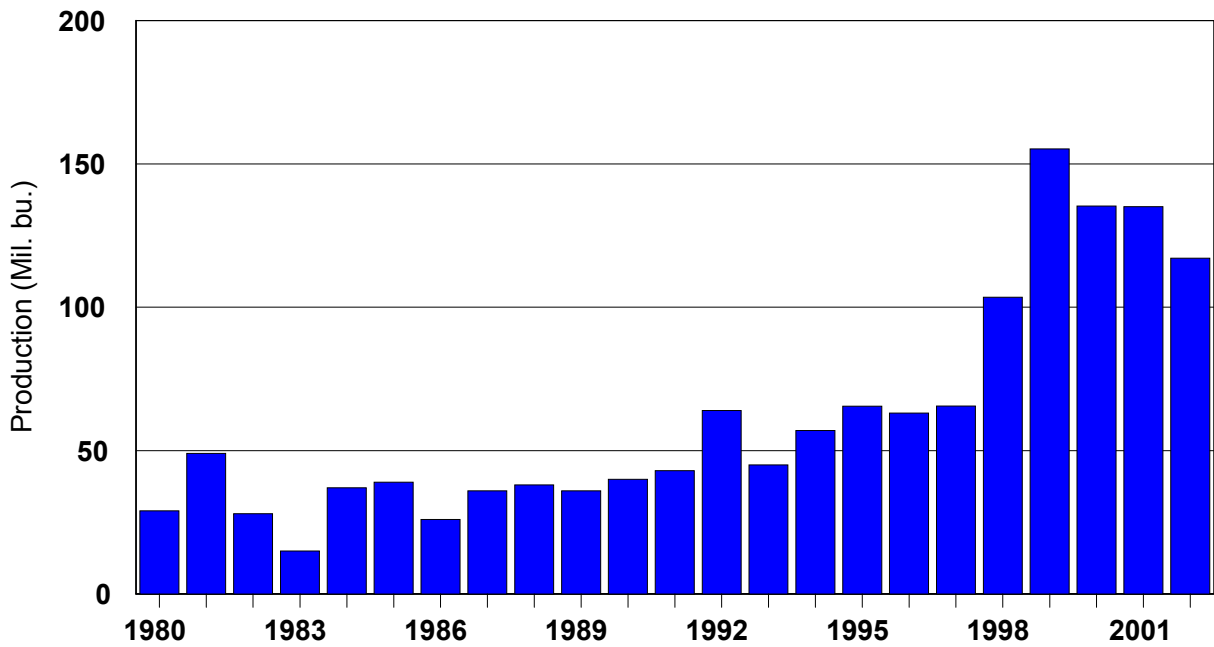


Figure 2. U.S. White Corn Production, 1980/81 to 2002/03.

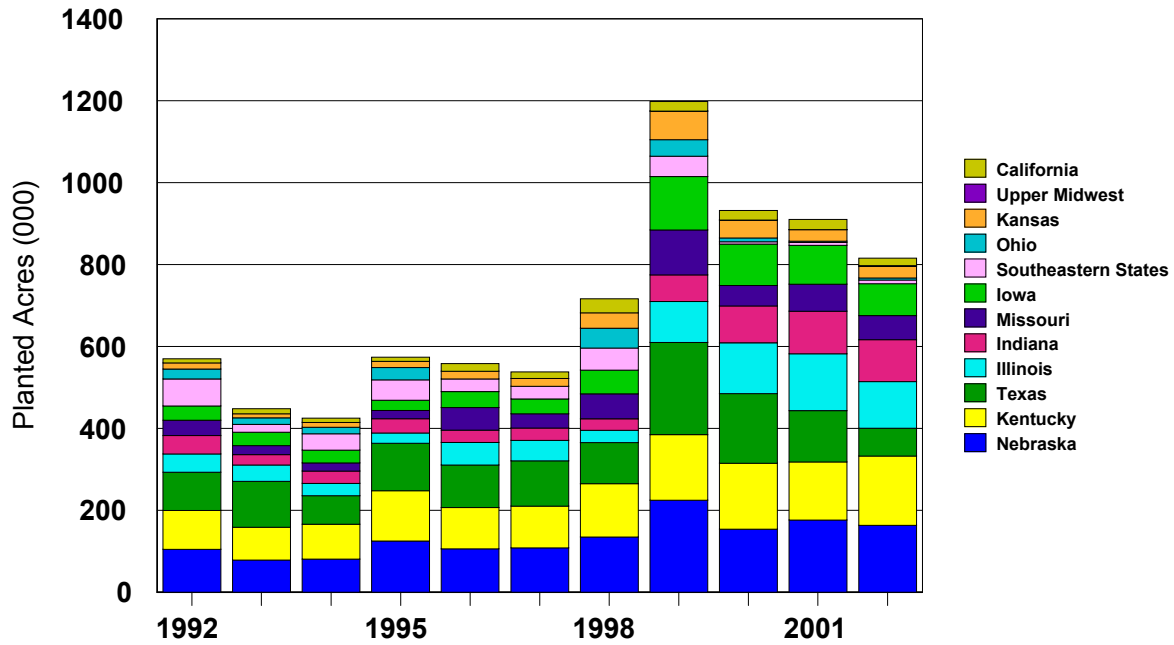


Figure 3. U.S. White Corn Planted Acres, by State, 1992/93 to 2002/03.

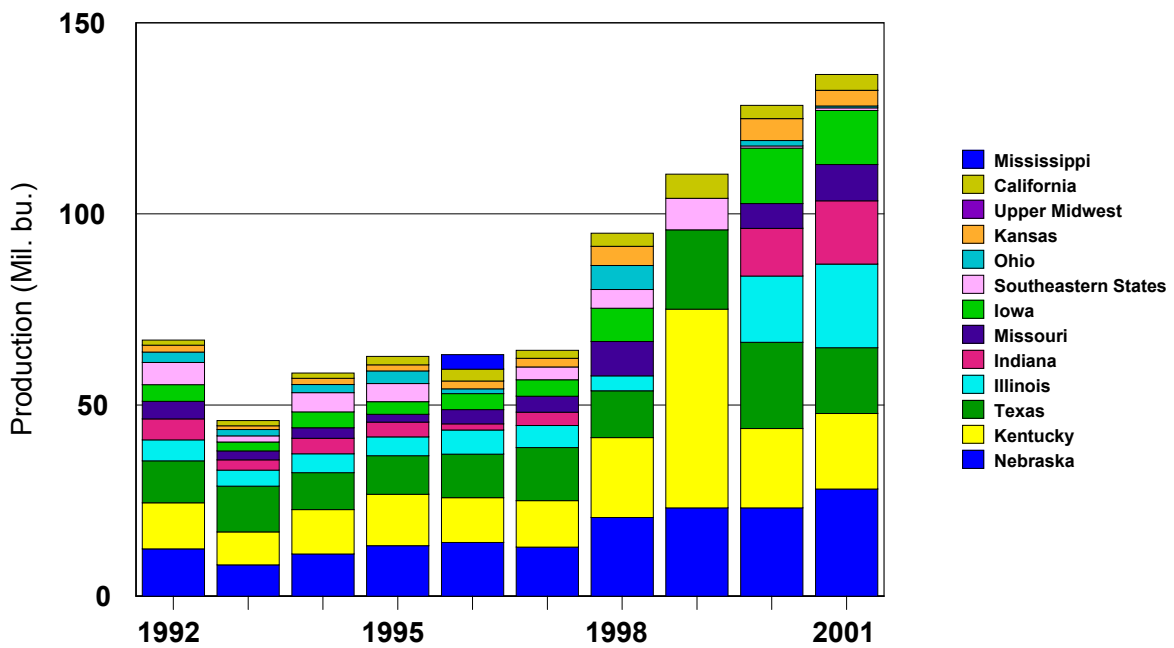


Figure 4. U.S. White Corn Production, by State, 1992/93 to 2001/02.

As production of white corn in the United States has grown, both domestic consumption and exports of U.S. white corn have increased (Figure 5). Domestic consumption of U.S. white corn has more than doubled from 26 million bushels in 1980/81 to 60 million bushels in 2001/02. Growth in exports of U.S. white corn have increased even more dramatically, increasing from 7 million bushels in 1980/81 to 62 million bushels in 2001/02.

Mexico was the largest importer of U.S. white corn in 2000/01 importing 75 percent of U.S. white corn exports in that marketing year (Figure 6). Other major importers of U.S. white corn in that year were Central/South American countries (Colombia, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, and Panama) along with Japan and the Philippines. Exports for 2001/02, although only representing a portion of the crop year, show similar trends and include shipments to Mozambique, South Africa, and Zimbabwe.

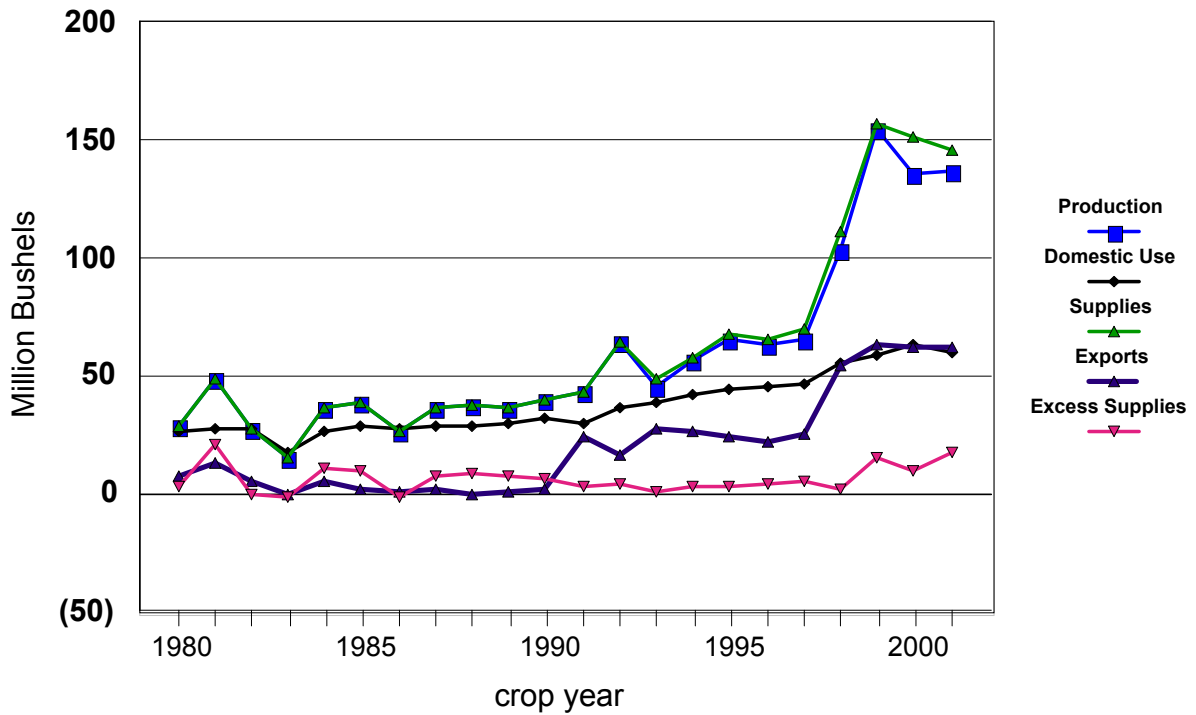
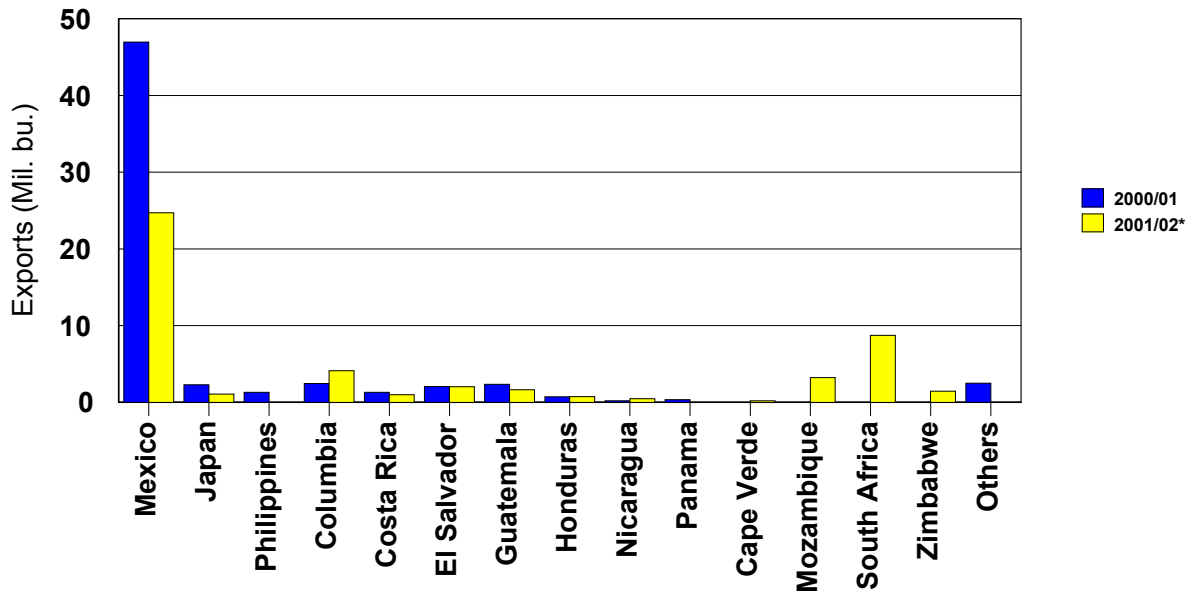


Figure 5. Supply and Demand for U.S. White Corn, 1980/81 to 2001/02.



* Sep - May

Figure 6. Exports of U.S. White Corn, by Country, 2000/01 and Partial for 2001/02.

Domestic Markets

There are several domestic processors of white corn (Table 1). The largest of these are Asteca (Gruma Corp.), Frito-Lay, Quaker Oats (recently sold to Agramarke), and Marta White (White Lily). Many of the plants processing white corn are located in or near states where white corn is produced (NE, KY, and TX). Many of the processors have expanded annual capacity. For example, Asteca increased annual capacity from 11.5 million bushels in 1995 to 14.5 million bushels by 1998, and Frito-Lay has increased from 7 to 9.5 million bushels over the same period.

These domestic plants are generally located away from the northern region and concentrated in the south. The nearest large processor is in St. Joseph, MO, which had been owned by Quaker Oats, but was sold in 2001 to Agramarke Inc., a farmer-owned cooperative.

Table 1. Major Domestic Processors of White Corn

| Firm - Locations | 1995 | 1998 |
|---------------------------------------|-------------------------|------|
| | --- million bushels --- | |
| Asteca (Gruma Corp.) - CA, IN, KY, TX | 11.5 | 14.5 |
| Frito-Lay | 7 | 9.5 |
| Quaker Oats - IO, MO | 5.5 | 5.5 |
| Marta White (White Lily) - TN | 5 | 4.5 |
| ADM- TX, CA, KY, NE | | 2.5 |
| Minsa - TX, IO | | 1.5 |
| Others | 7.2 | 9.5 |
| Total | 36.2 | 47.5 |

Agronomic Competitiveness

Yields

Average yields of corn and white corn were compared to evaluate their competitiveness. U.S. corn (predominately yellow) and white corn yields have increased from 1980-2001 (Figure 7). Yields of U.S. all corn and white corn follow the same general pattern. However, yields for white corn were generally lower than those of all U.S. corn through most of the 1980s and have recently increased above those for all corn in the last few years. This suggests growth in yields for white corn has been at a faster rate than those for yellow corn.

Yields for white and yellow corn varieties adapted to North Dakota have been examined in several variety trials. Results from trials suggest yields from white and yellow corn varieties are comparable, with a high degree of variability. For example, results from a trial in North Dakota in 2001 had a white variety yielding 147 bu/a while the average of all varieties was 137 where the LSD (Least Significant Difference) at 5 percent probability was 27 bu/a (Carena, 2002 and Carena and Berglund, 2001). Most yellow varieties had yields within 27 bu/a of the mean. This suggests yields for most white and yellow corn varieties are similar. Thus, budget analysis below assumes yields are equal and then sensitivities are conducted.

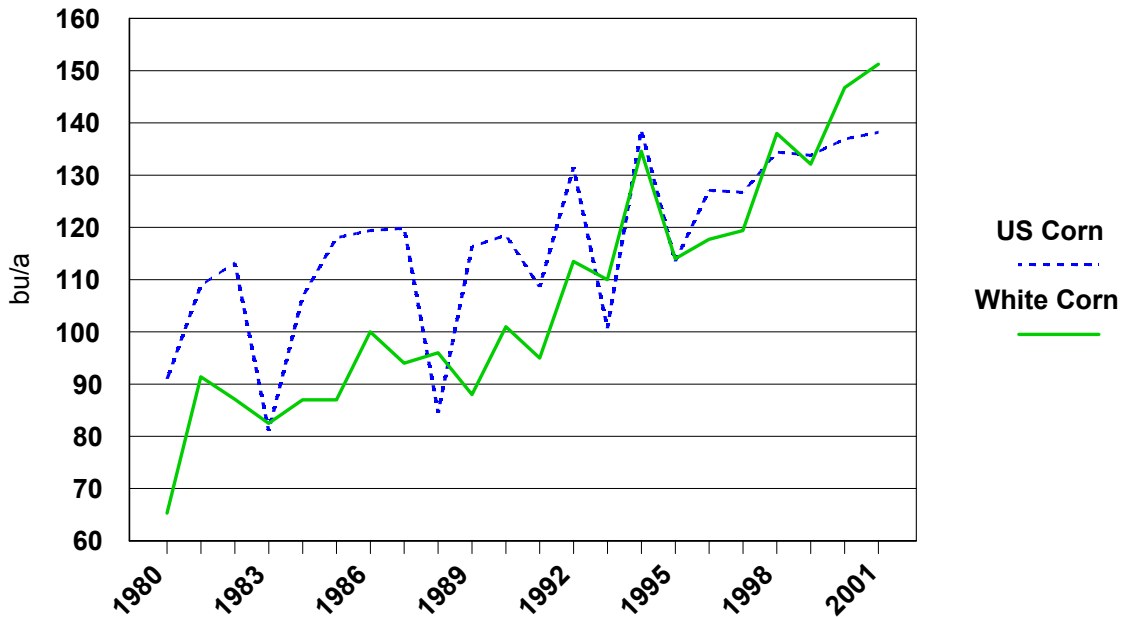


Figure 7. Comparison of U.S. Corn and White Corn Yields, 1980-2001.

Budget Analysis

A budget analysis of production of white or yellow corn was conducted using crop budgets generated for North Dakota and Nebraska. Budgets were obtained from Swenson and Haugen for North Dakota and from the Nebraska Extension Service. These were utilized to compare effects of yield differences and white corn premiums on profitability of white versus yellow corn varieties in selected growing regions of North Dakota and Nebraska. Costs and net returns to labor for yellow corn are shown in Figures 8 and 9 for North Dakota and Nebraska.

Net returns to labor and management were estimated for both yellow and white corn. Yields and costs of producing both white and yellow corn were assumed equivalent. However, a premium of 10 cents/bu was applied to white corn. Net returns were less negative for white corn budgets in North Dakota than for yellow corn. Differences in net returns between white and yellow were highest for southeastern (\$10/a) and south central (\$9/a) North Dakota and lowest for southwestern (\$6/a) North Dakota (Figure 10). For Nebraska, differences in net returns were highest for white corn production grown under irrigation in both southeast and east central Nebraska. White corn increased net returns under irrigation in these areas over yellow by \$15/a (Figure 11).

Sensitivities were conducted on both yields and premiums of white corn. Increasing white corn yields by 10 percent increased the advantage of white over yellow (Figures 12 and 13). These increases were largest in southeastern and south central North Dakota. Increasing yields of white corn by 10 percent increased the advantage of white corn net revenue over yellow in southeastern North Dakota from \$10/a to \$30/a. Decreases in yields by 10 percent affected the same areas the most. A 10 percent decrease in yields resulted in white corn being at a \$9/a cost disadvantage to yellow, where in the base case it had a \$10/a advantage. Increasing yields in Nebraska increased the advantage of white over yellow corn under irrigation from \$15/a to \$45/a.

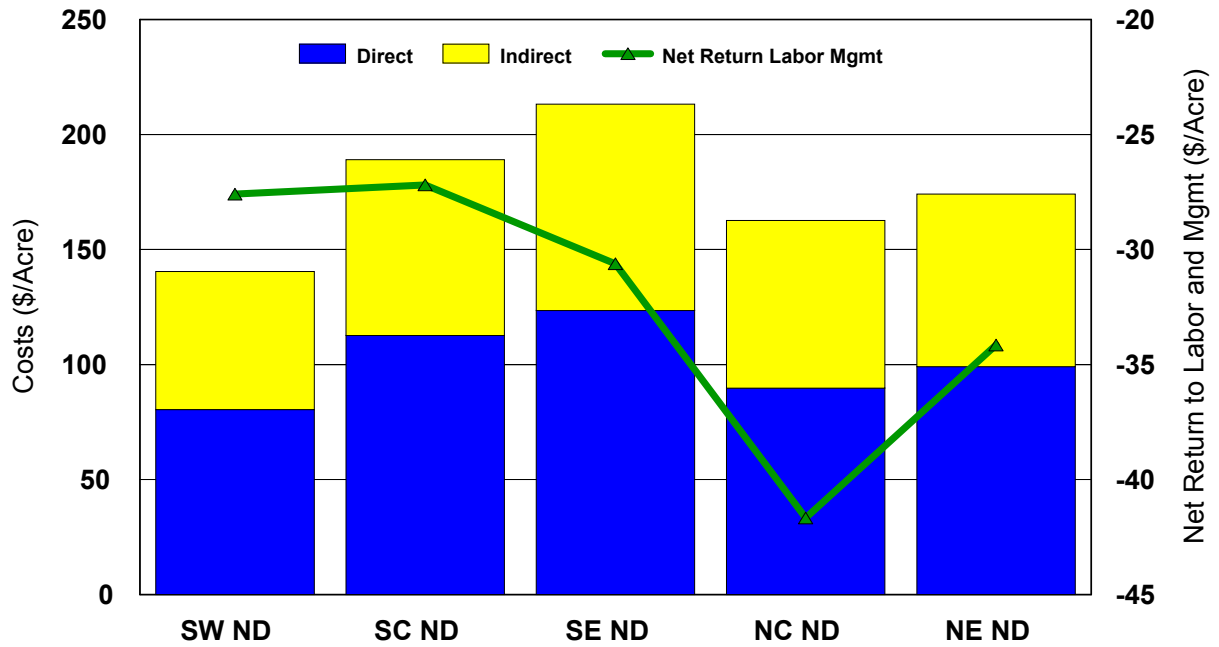


Figure 8. North Dakota Corn Production Costs, 2002.

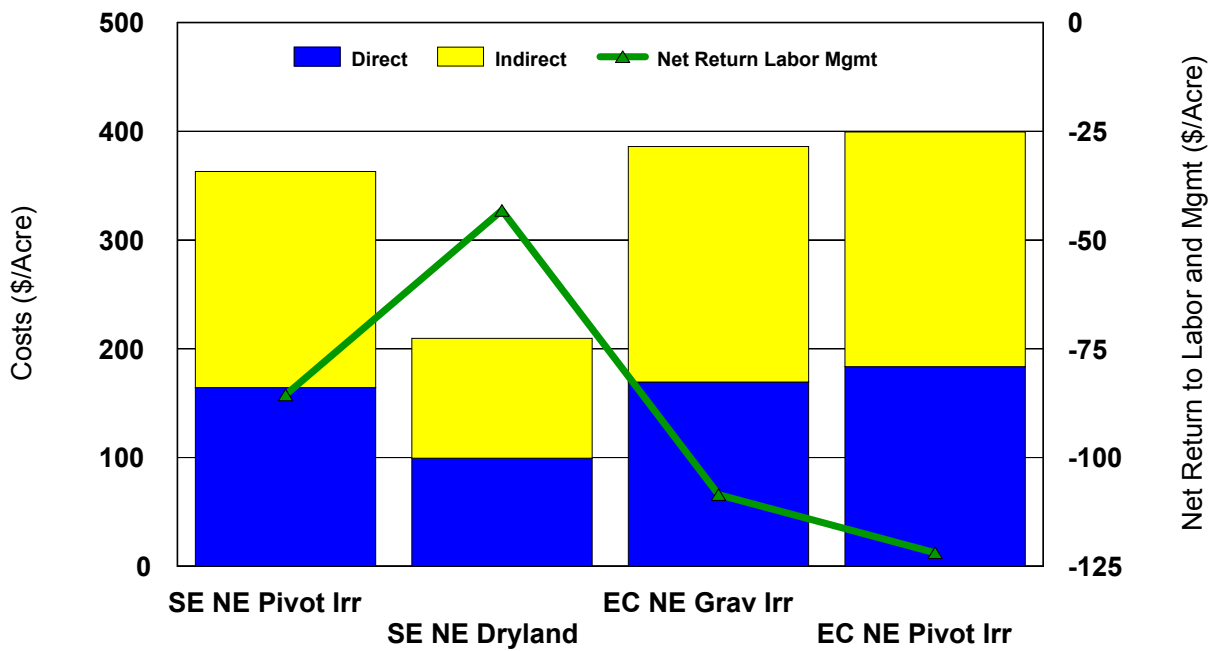


Figure 9. Nebraska Corn Production Costs for Selected Areas and Crop Practices, 1999.

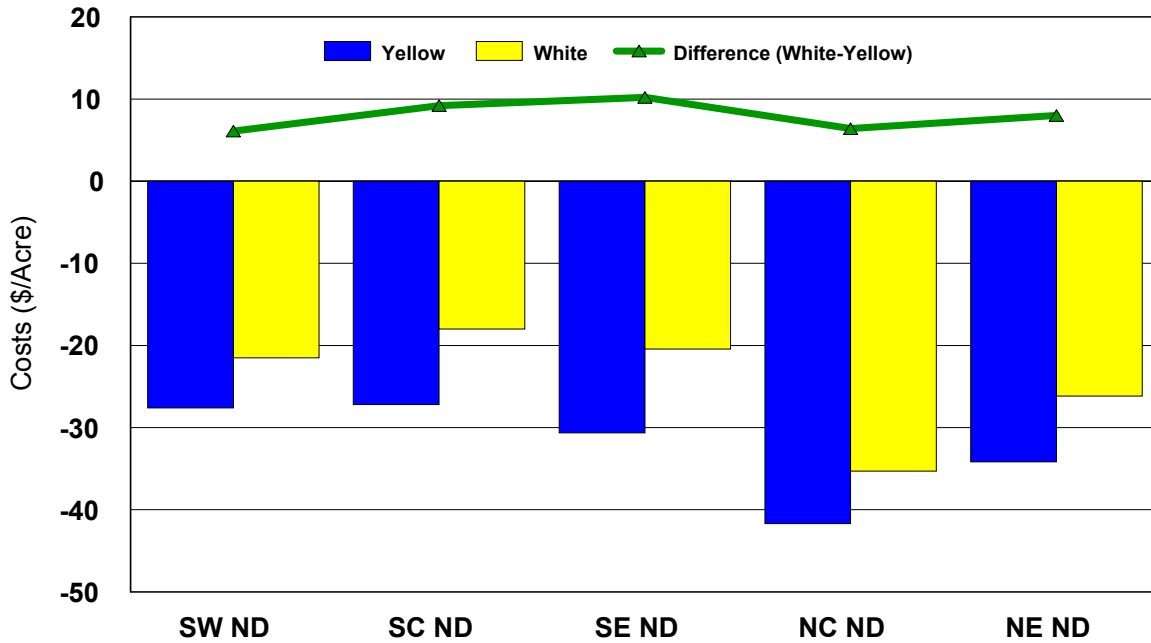


Figure 10. Comparison of Net Returns for Yellow and White Corn and Difference, North Dakota, 2002.

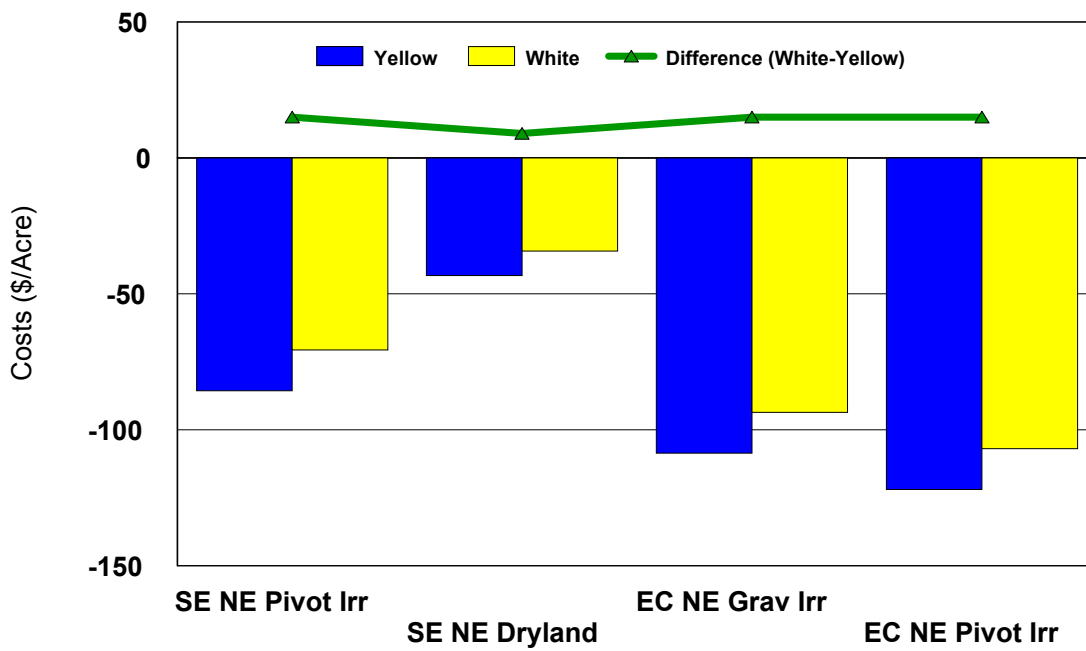


Figure 11. Comparison of Net Returns for Yellow and White Corn and Difference, Nebraska, 1999.

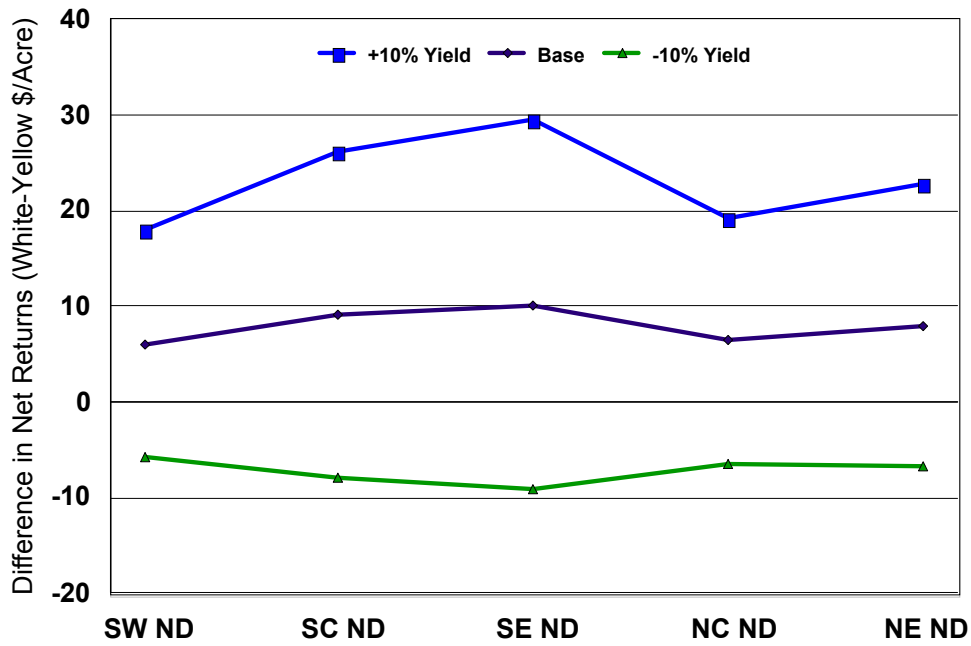


Figure 12. Effect of Yields on Difference in Net Returns Relative to Yellow Corn, North Dakota, 2002.

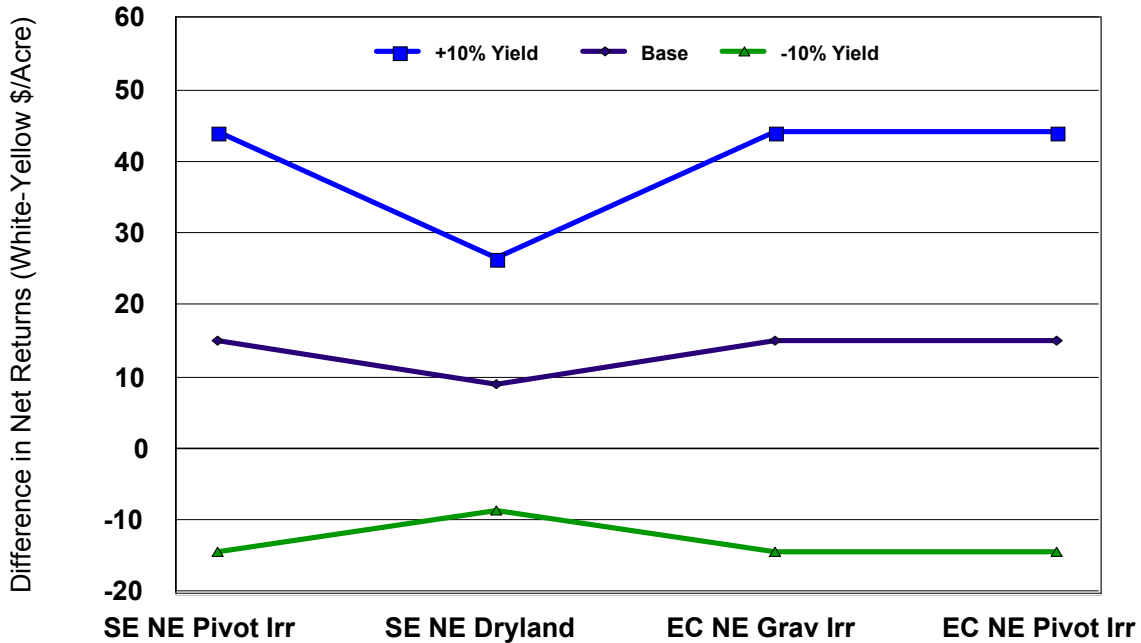


Figure 13. Effect of Yields on Difference in Net Returns Relative to Yellow Corn, Nebraska, 1999.

Changes in premiums for white corn had similar effects. Increasing the premium for white corn from 10 cents/bu to 30 cents/bu increased the advantage of white corn in southeastern North Dakota to \$30/a (Figure 14). Similarly, decreasing the premium for white corn from 10 cents/bu to -10 cents/bu resulted in white corn in southeastern North Dakota being at a \$10/a disadvantage to yellow corn production. Changes in premiums in Nebraska had similar effects to 10 percent changes in yields. Increasing the premium from 10 cents/bu to 30 cents/bu increased net returns under irrigation in southeastern and east central Nebraska from \$15/a to \$45/a (Figure 15).

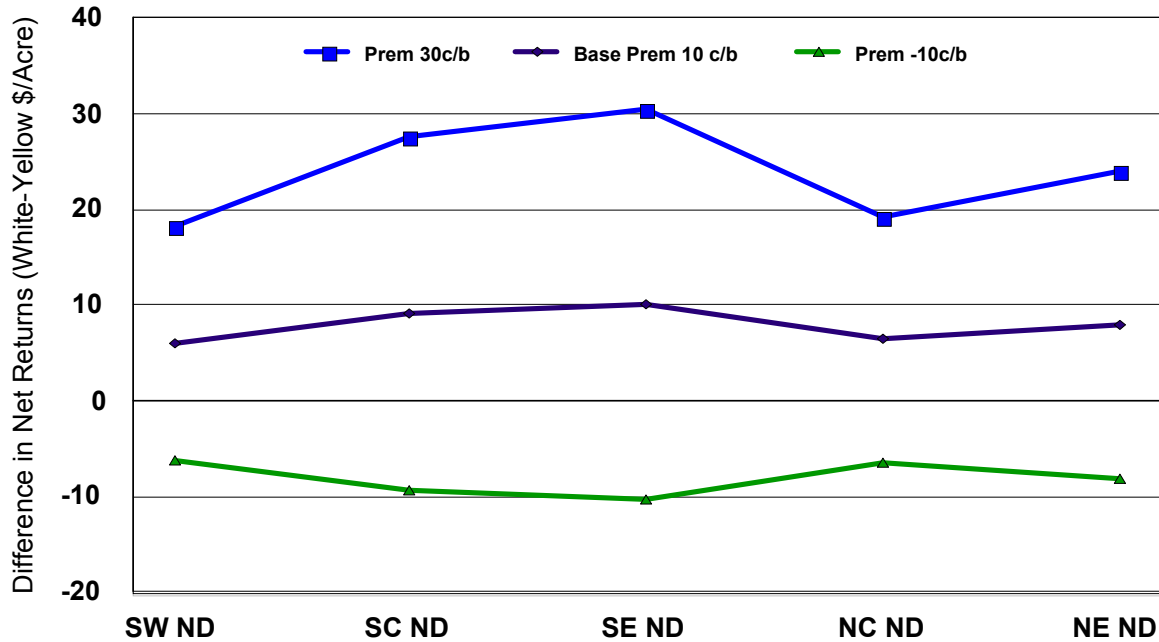


Figure 14. Effect of White Corn Premiums on Difference in Net Returns Relative to Yellow Corn, North Dakota, 2002.

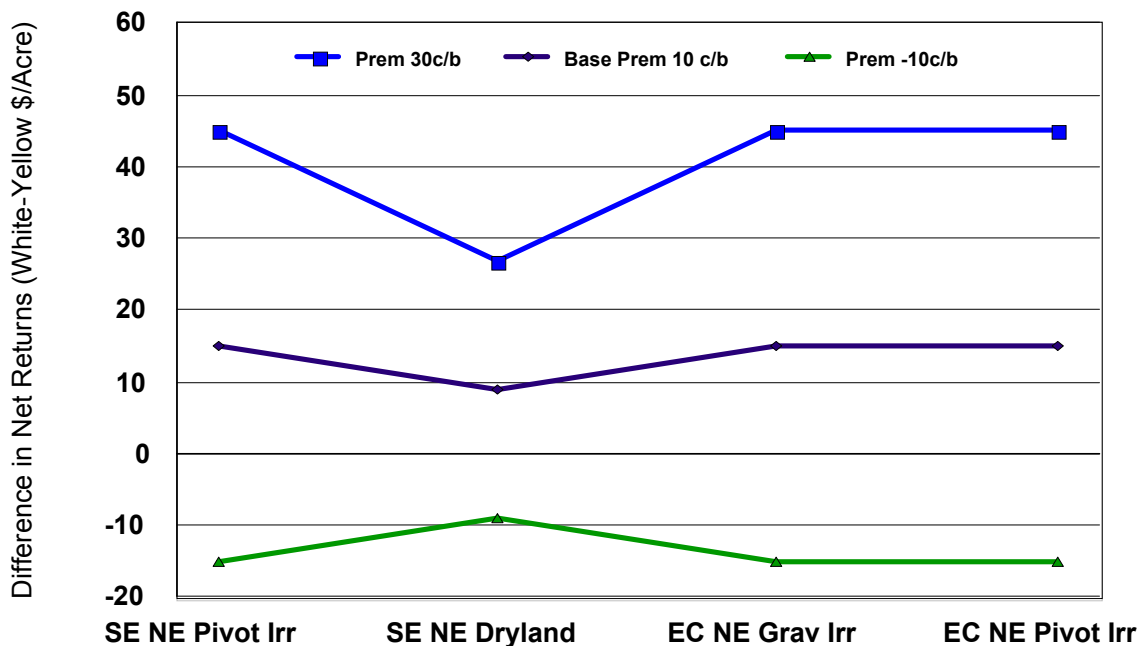


Figure 15. Effect of White Corn Premiums on Difference in Net Returns Relative to Yellow Corn, Nebraska, 1999.

Geographic Competition

Competitiveness of white corn production in North Dakota versus other regions was evaluated by comparing net corn prices to different markets and contrasting these with other prominent white corn producing regions (Nebraska).

Rail shipping rates for corn to several export locations [Pacific Northwest (PNW), St. Louis, Texas Gulf, and to Mexico by rail] were taken from Burlington Northern Santa Fe (BNSF). Rates were obtained for two North Dakota corn shuttle loading facilities, Anton (Hillsboro) and Jamestown, and for six shuttle locations in Nebraska which were chosen to represent crop reporting districts where white corn is produced. Domestic rail shipping rates were compared for one additional North Dakota location (Arvilla) and same locations for export comparisons to St. Joseph, MO (Table 2).

Prices at specific markets were taken from AMS (2002b) for April 2002. Average monthly prices reflect largely No. 2 yellow corn; however, white and yellow corn prices delivered Kansas City provide insight into the spread between white and yellow corn. This spread (10 cents/bu) was added to all No. 2 yellow corn prices to examine geographic competition.

Table 2. Estimated Shipping Costs of White Corn from Selected North Dakota and Nebraska Origins to Export and Domestic Locations.

| Region-State | Origin Station | Destinations | | | | |
|--------------|-------------------|--------------|-----------|------|--------|------------|
| | | PNW | St. Louis | Gulf | Mexico | St. Joseph |
| CE-ND | Alton (Hillsboro) | 0.77 | 0.71 | 0.77 | 1.17 | 0.45 |
| Cen-ND | Jamestown | 0.76 | 0.70 | 0.76 | 1.16 | 0.47 |
| NC-ND | Arvilla | | | | | 0.54 |
| NE-NE | S. Sioux City | 0.71 | 0.63 | 0.71 | 1.05 | 0.36 |
| EC-NE | Fremont | 0.73 | 0.59 | 0.61 | 0.92 | 0.32 |
| SE-NE | Lincoln | 0.73 | 0.59 | 0.61 | 0.92 | 0.30 |
| Cen-NE | Roseland | 0.72 | 0.64 | 0.59 | 0.92 | 0.37 |
| SW-NE | Maywood | 0.72 | 0.64 | 0.59 | 0.92 | 0.36 |
| PH-NE | Gurley* | 0.64 | 0.68 | 0.59 | 0.87 | 0.41 |

* For St. Joseph, Transportation rates to Alliance were utilized as none for Gurley were available.

Estimated net local prices indicate that the PNW is the predominant market determining local prices for North Dakota white corn (Table 3). This is also true in Nebraska, but to a lesser extent. Net local prices for Alton are 22 cents/bu, and Jamestown is 25 cents/bu higher for delivery to the PNW than for shipments to St. Joseph. This suggests that a competitive price for supplies from Alton would be a price at St. Joseph of \$2.24/bu or $\$1.79 + 0.45 = \2.24 . Thus, relative prices (i.e., PNW relative to St. Joseph) and/or shipping costs would have to decline for white corn to move from North Dakota to St. Joseph. In fact, relative prices for shipment of white corn from Alton and Jamestown to St. Joseph would be at a 12 cents/bu to 15 cents/bu disadvantage to yellow corn shipped to the PNW (PNW net local price less 10 cents/bu white corn premium).

Table 3. Estimated Net Local Price of White Corn for Specific Origins (Destination Price Less Transportation).

| | | Destinations | | | |
|---|-------------------|--------------|-----------|------|------------|
| | Origin | PNW | St. Louis | Gulf | St. Joseph |
| Region- State | Price | 2.56 | 2.16 | 2.31 | 2.02 |
| Net Local Price (Destination Price Less Transportation) | | | | | |
| CE-ND | Alton (Hillsboro) | 1.79 | 1.45 | 1.54 | 1.57 |
| Cen-ND | Jamestown | 1.80 | 1.46 | 1.55 | 1.55 |
| NC-ND | Arvilla | | | | 1.48 |
| NE-NE | S. Sioux City | 1.85 | 1.53 | 1.60 | 1.66 |
| EC-NE | Fremont | 1.83 | 1.57 | 1.70 | 1.70 |
| SE-NE | Lincoln | 1.83 | 1.57 | 1.70 | 1.72 |
| Cen-NE | Roseland | 1.84 | 1.52 | 1.72 | 1.65 |
| SW-NE | Maywood | 1.84 | 1.52 | 1.72 | 1.66 |
| PH-NE | Gurley* | 1.92 | 1.48 | 1.72 | 1.61 |

* For St. Joseph, Transportation rates to Alliance were utilized as none for Gurley were available.

Conclusions

U.S. white corn production, consumption and exports have increased dramatically from 1980 to 2000. Production and area have since declined. White corn has been produced largely in Nebraska, Kentucky, and Texas, although production in Texas has declined and production in other states (Illinois, Indiana, and Iowa) have increased. Major domestic processors of white corn are located in the southern United States, with the closest large domestic processor located in St. Joseph, MO. Comparisons of white and yellow corn varieties suggest yields are similar but have a wide range of variability. Net returns for white corn are most affected by white corn premiums and yield differences relative to yellow corn in southeastern and south central North Dakota. A 10 percent yield advantage for white over yellow corn or increases in the white corn premium from 10 cents/bu to 30 cents/bu would increase net returns to labor by \$10/a in southeastern North Dakota. Effects of increases in yield advantages or white corn premiums had a larger impact in Nebraska than in North Dakota. Estimated net local prices for North Dakota were 22-25 cents/bu higher for shipment to the PNW export market than for shipment to domestic

markets. This dominance of the PNW market for exports of either white or yellow corn from North Dakota and cost disadvantages relative to production from Nebraska make serving the domestic processing market not so attractive.

These conclusions depend on the prevailing conditions remaining in place. Results would change if: 1) a local processor or domestic market were to arise which was not at a disadvantage to being supplied from other areas; 2) premiums for white corn over yellow corn were to increase for a sustained period of time; 3) yield advantages of white corn varieties relative to yellow corn varieties increase; or 4) an export market which was not disadvantaged relative to being supplied from other regions were to emerge.

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