

**PROGOLD CORN PLANT ANALYSIS:
Implications for North Dakota Producers
of Alternative Plant Sites**

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- IMPLICATIONS FOR NORTH DAKOTA PRODUCERS OF ALTERNATIVE PLANT SITES -

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Introduction

The purpose of this analysis¹ was to assess the implications of alternative ProGold plant sites for ND producers. The Wahpeton and Milbank sites were included in the comparison. Hankinson, the third proposed site, would be similar to Wahpeton based on the costs and factors used in this analysis. Topics addressed in the analysis are the corn acquisition costs for the plant, centers of gravity for subscribers and subscribed bushels, and producer delivery costs (Graph 1). The analysis does not incorporate benefits associated with a potential increases in local corn price and economic activity.

TransCAD, a transportation modeling program, was used to estimate gathering costs for the alternative plant sites and determine the centers for gravity for subscribers and subscribed bushels.

Assumptions that established model parameters included:

1. Corn production is not homogeneous across the drawing territory, thus each county was divided into quadrants and corn production was distributed based on recommendations from an advisory panel and information from county agents,
2. Price of corn is an exogenous factor that does not influence model results, so implicitly, it is uniform across the drawing territory and alternative sites,
3. Based on competition in the market area, a plant located at Hankinson or Wahpeton attracts 80% of the corn available in the drawing area,
4. Based on competition in the market area, a plant located at Millbank attracts 60% of the corn available in the drawing area,
5. A transportation cost of \$1.80 per loaded mile, and
6. A 5¢ per bushel charge for subscribed bushel requirements fulfilled through the pool.

¹This analysis was conducted at the request of the ND Governor's Task Force.

Acquisition Costs

The acquisition costs of corn for the plant will be an important factor in the competitiveness and thus the profitability of the plant. The acquisition cost of corn for the plant is influenced by competition for local corn and transportation costs. The acquisition cost cannot be estimated with this model, but it is important to understand the supply and demand conditions that define the market, and thus price of corn across each site's drawing area.

The market for the corn grown in the Wapeton drawing area is the Pacific Northwest (PNW) export market. Thus, elevator board prices reflect export demand and transportation rates to the port. Elevator board prices information was based on weekly bids listed in **Agweek**². The major source of demand for the corn grown in the Millbank drawing area is also the PNW export market, but local market demand including livestock feeding and other corn milling plants is more prevalent relative to the ND sites. The presence of a stronger local market in the Millbank area is reflected in the elevator board prices that are an average 6¢ to 7¢ higher than those in the Wapeton drawing area (Graph 2).

Center of Gravity for ProGold Subscribers & Shares

Producer-subscribers have a vested interest in the success of the plant, but must also consider marketing gains that may be associated with being in close proximity to the plant. The center of gravity for ProGold subscribers and shares provides a base for discussing the benefits of a plant located in a producer's local market. The subscriber and share centers are both located in North Dakota, on the center of the Cass-Richland county line (Graph 3). The center of gravity for the subscribers (shares) is defined as the center of the sum of distances to each of the subscriber (shares). These centers of gravity illustrate

²**Agweek**, *Friday Local Cash Grain Prices*. Grand Forks, North Dakota. Julie Copeland, Editor. Various Issues.

that the concentration of interest (subscribers and shares) in the plant is strongest in North Dakota, with fringe support being stronger in Minnesota than South Dakota.

Gathering Costs

The final section of this analysis concentrates on corn gathering costs associated with alternative sites. Gathering costs include delivery costs for (1) subscriber bushels and (2) additional bushels required to satisfy plant demand. Subscribed bushels include delivered and pooled corn that satisfies subscribed bushel commitments. Delivered subscribed bushels are the actual deliveries of corn to the plant by subscribers in the plant drawing area. Alternatively, market conditions may make it more profitable for a subscriber to purchase corn from the pool bushels to satisfy a subscribed bushel commitment.

The drawing area for each plant site was estimated based on corn production and corn gathering costs (Graph 4). The plant drawing area (inner red circle) includes producer-subscriber and producer-non-subscriber bushels. The additional drawing area for subscribed bushels (outer blue ring) reflects the effect of a 5¢ per bushel charge³ assessed when subscribers fulfill bushel commitments through pool purchases.

In comparing the sites based on gathering costs, per bushel delivery costs that will affect corn acquisition of the plant and the pool costs for subscribers, should be considered. The per bushel delivery costs for corn are determined by the size and shape of the drawing areas. Drawing areas are based on transportation costs and corn production patterns. A cost minimizing objective was the base for estimating the radius of the Wahpeton site was 38.2 miles compared to a 36.8 miles for the Milbank site (Graph 4). The transportation cost per bushel for delivery to Wahpeton was 14.4¢ per bushel compared

³The 5¢ per bushel charge is equal to the pool charge at the Marshall, Minnesota corn processing cooperative.

to 13.9¢ per bushel for Milbank. Wahpeton delivery costs that are ½ cent per bushel higher, add \$70,000 to the plants' marketing bill, increasing transportation costs by less than a third of one percent. Thus, gathering costs for the sites are similar.

Pool costs for subscribers are also an important consideration. Pool costs are minimized when the plant is located in the area that is most densely populated with subscribers because market forces will encourage the delivery of more subscribed bushels. The pool costs for a plant sited at Wahpeton total \$360,000, a 46 percent lower cost than Milbank site pool costs of \$662,500 (Graph 7). The Wahpeton site benefits North Dakota subscribers, as their pool costs are reduced 43 percent compared to the \$323,350 it would cost North Dakota subscribers to fulfill subscribed bushel commitments through pool purchases at the Milbank plant site.

A final consideration for subscribers is the cost of the pool corn. The cost of pool corn to subscribers will be the plant acquisition cost of corn plus the 5¢ per bushel pool charge, that has been discussed. The acquisition price of corn at the Wahpeton site is an average 6¢ to 7¢ lower, based on elevator board prices. Assuming this difference in basis prevails, in addition to reducing plant profit margins through higher acquisition costs, the Milbank site would cost subscribers an additional \$927,500 when they 'buy' this higher priced corn through the pool to satisfy bushel commitments. The higher price of corn at Milbank would increase the cost for pool corn nearly \$1.2 million, compared to the Wahpeton site (Graph 8). North Dakota subscribers would pay \$776,040, nearly half of the pool expenditures. Thus, the basis differential between the sites is an important consideration for subscribers.

Conclusion

The goal of the analysis was to assess the implications of alternative ProGold plant sites for ND producers. Corn acquisition costs, centers of gravity for subscribers and subscribed bushels, and producer delivery costs provided the foundation for the analysis.

The acquisition cost of corn is dependent on market supply and demand condition. The acquisition price of corn is important to the profitability of the plant. In addition, subscribers who satisfy bushel commitments through pool purchases are directly affected by the plant's corn acquisition price when they 'buy' pool corn. The presence of a stronger local market in the Milbank area is reflected in the elevator that are 6 to 7 cents higher than in the Wahpeton drawing area. Thus, plant profitability is greater and subscriber pool costs lower for a plant located in Wahpeton or Hankinson.

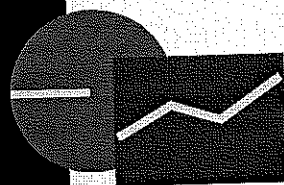
The competitiveness of the plant and benefits realized by subscribers will also be influenced by gathering costs. Based on production patterns and transportation costs, the Milbank site has a half of a cent lower gathering cost per bushel than the Wahpeton site. This difference in gathering costs equals \$70,000. Therefore, this estimate indicates that the gathering costs for the sites are similar.

The difference in subscriber pool expenditures, however, vary substantially for the sites. The centers of gravity for subscribers and shares are both located in North Dakota. As the plant location is moved farther from these centers on the northern Cass-Richland county border, pool delivery costs increase as more subscriber corn bushel commitments are satisfied through pool purchases than through actual delivery of subscribed corn. A 5¢ per bushel charge for pool corn would cost subscribers \$662,500 for a plant site at Milbank, compared to \$323,350 at Wahpeton.

In addition to the pool charges, the basis differential between the plant sites makes corn more expensive across the Milbank drawing area. Subscribers would pay an additional \$927,000 for pool corn because the acquisition price for corn is 6¢ to 7¢ higher for the Milbank site.

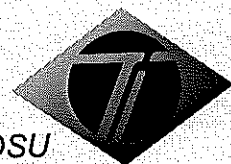
A Milbank site would cost North Dakota subscribers \$776,040. This cost includes a 5¢ per bushel pool fee that would cost North Dakota subscribers \$323,350, and a 7¢ per bushel cost to account for the higher price of corn across the Milbank drawing area, that results in an additional \$452,690 cost for North Dakota subscribers.

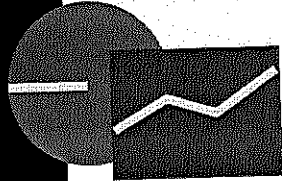
Based on the criteria discussed in this analysis, the Wahpeton or Hankinson sites provides substantial benefits to the plant and the subscribers compared to the Milbank site. Lower corn acquisition costs increase plant profits and reduce the cost of pool corn, and a location closer to the center of gravity for subscribed bushels would reduce subscriber pool expenditures because more subscribed bushels would be delivered. In addition to the costs to North Dakota subscribers that are presented, the benefits associated with a potential increase in the local corn price and economic activity should be considered in assessing the site alternatives for the ProGold corn plant.



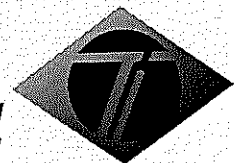
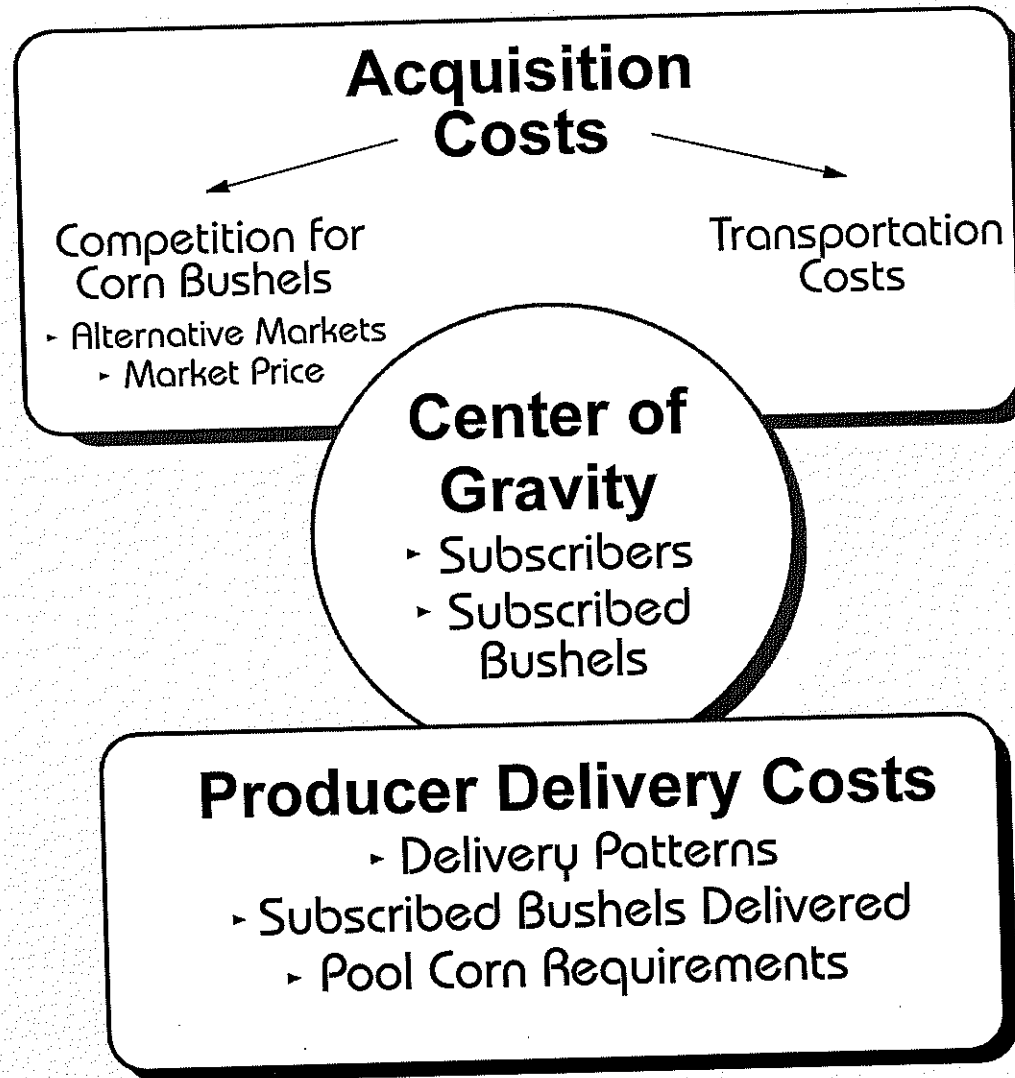
Pro Gold Corn Plant Analysis

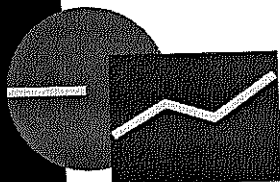
- Analysis does not include benefits resulting from the potential increase in the local price of corn
- Does not account for primary and secondary economic benefits (spin off activity)
- Assumptions
 - Corn production is not homogeneous throughout the drawing territory
 - Price of corn is constant throughout drawing territory
 - Hankinson or Wahpeton can attract 80% of the corn in the drawing territory
 - Milbank can attract 60% of the corn in the drawing territory
 - Transportation costs are \$1.80 a running mile



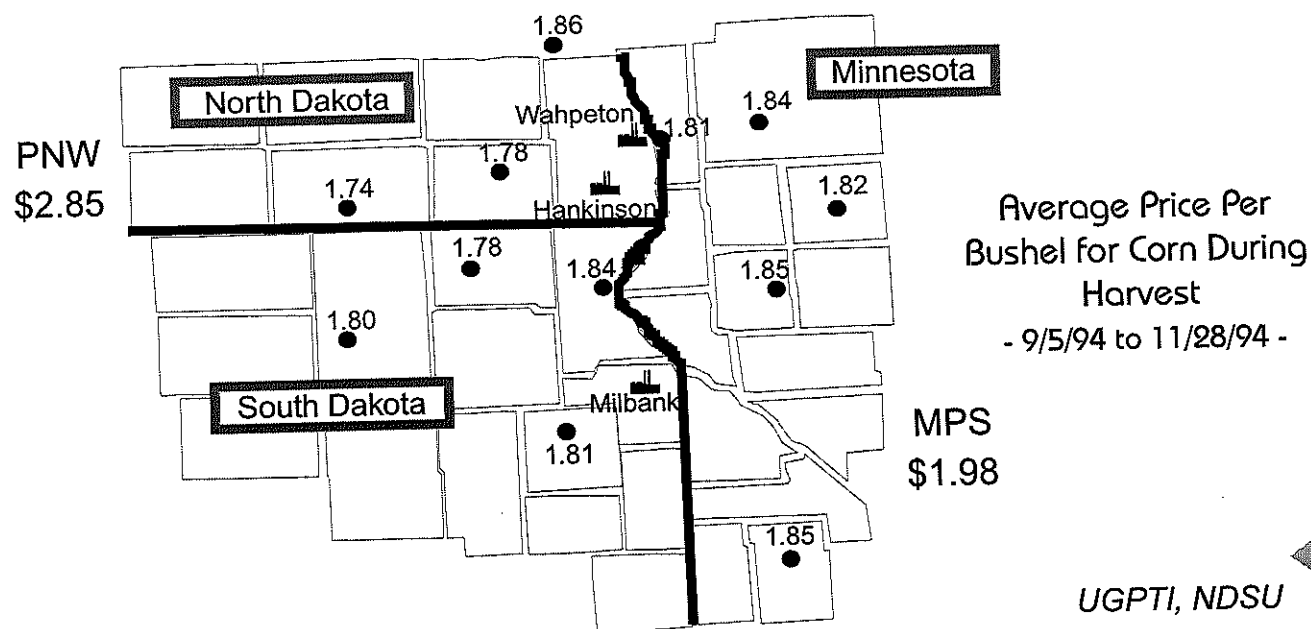
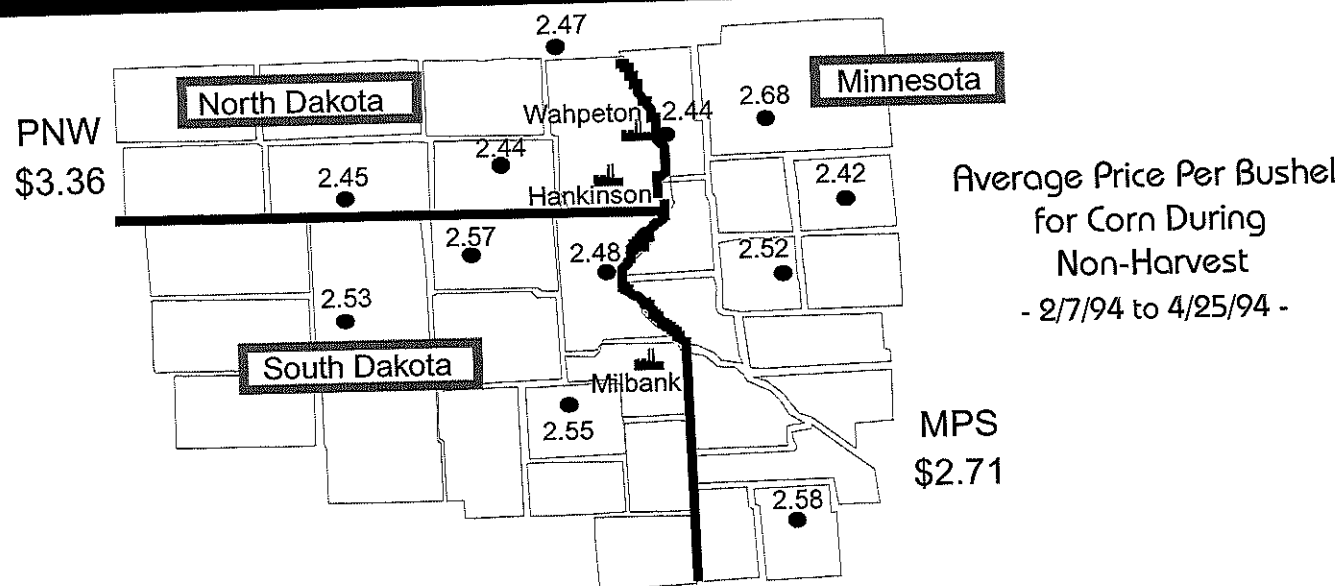


Implications for North Dakota Producers of Alternative Plant Sites



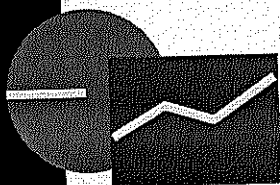


Elevator Board Prices (REVISED)

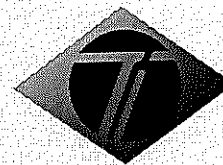
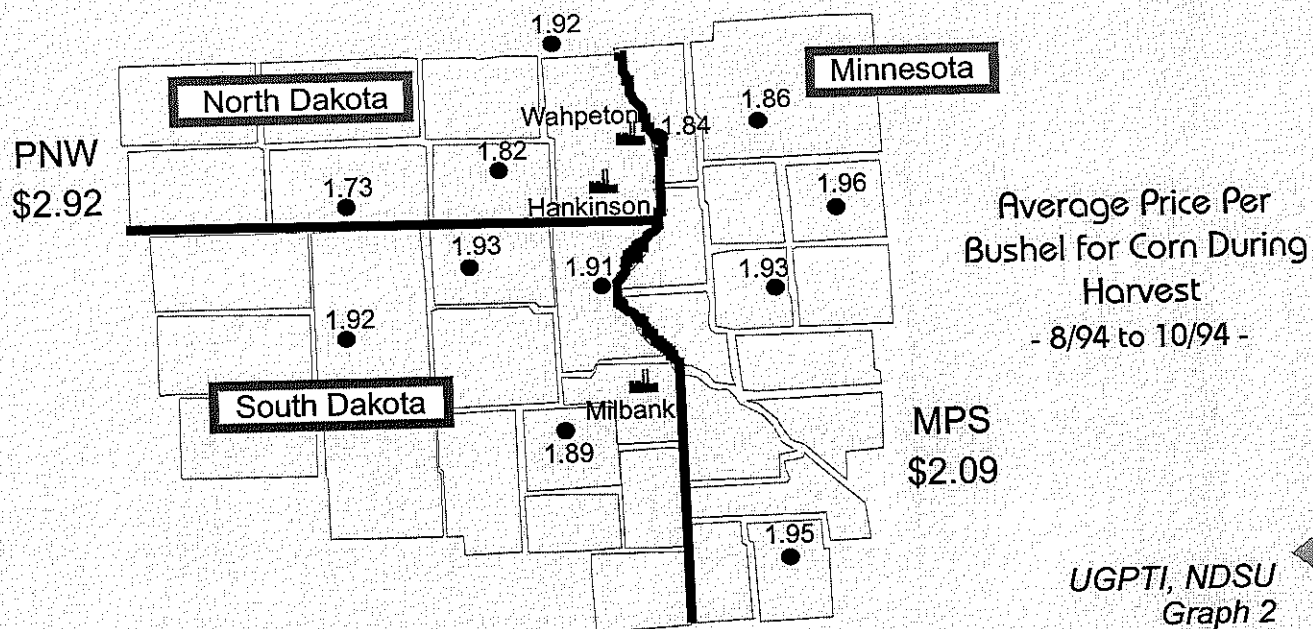
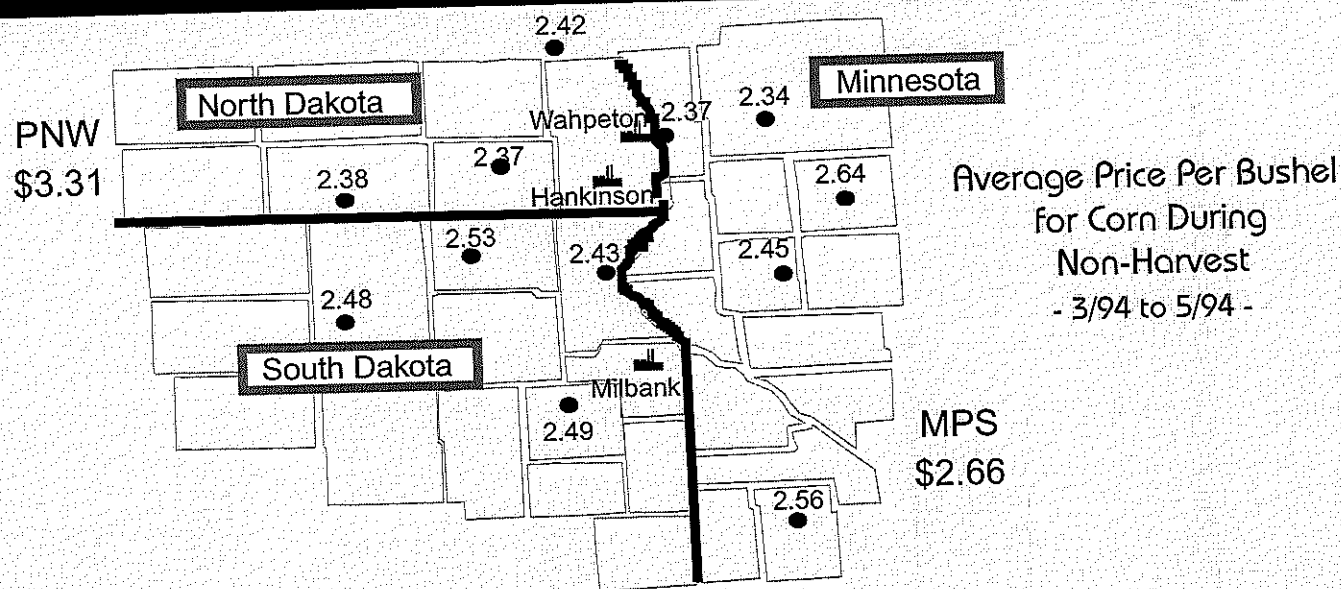


UGPTI, NDSU

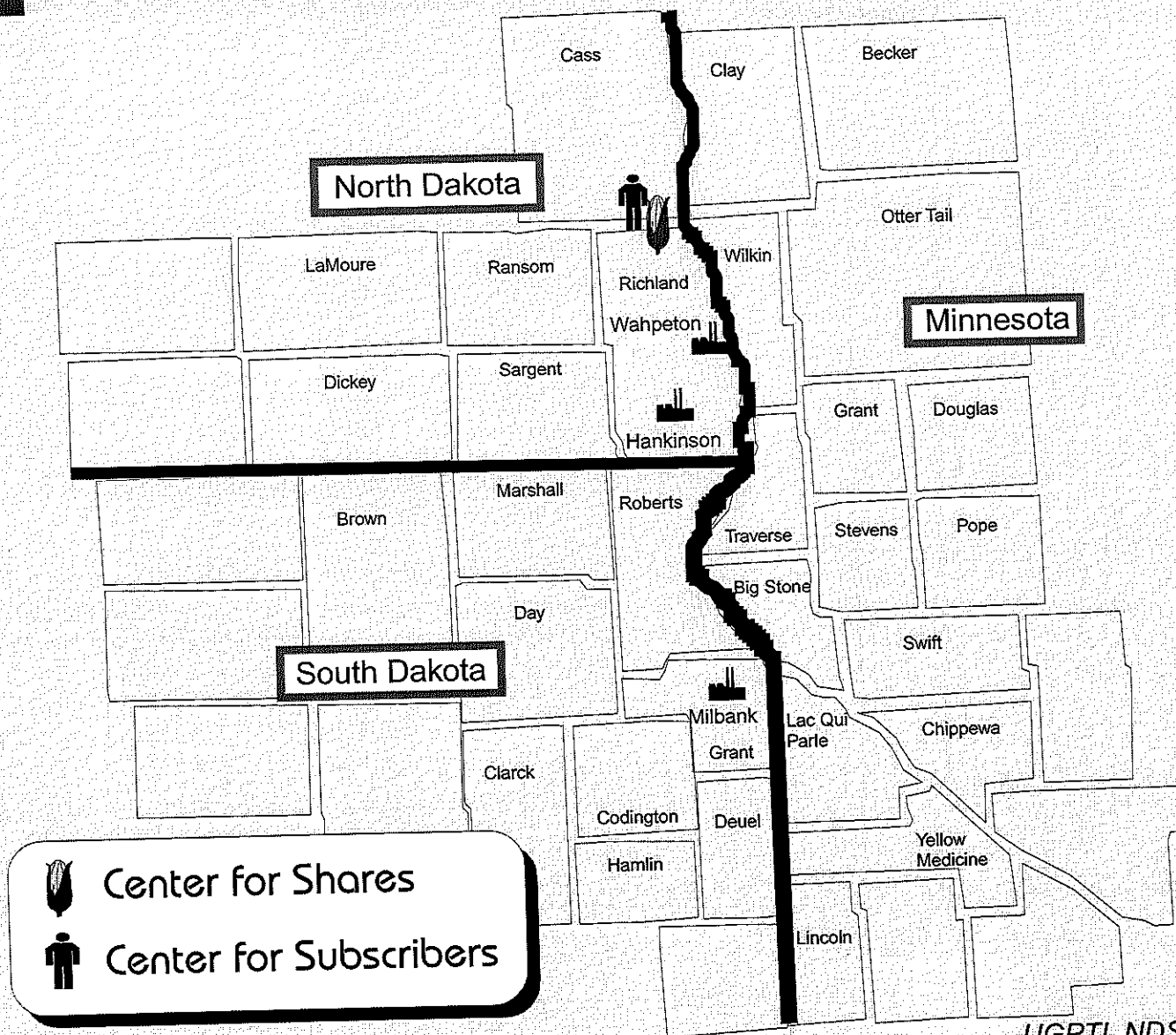
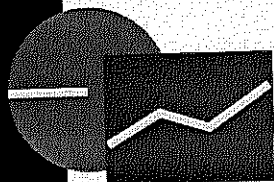




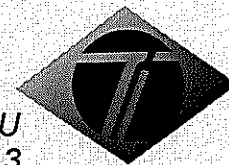
Elevator Board Prices



Center of Gravity for ProGold Subscribers & Shares

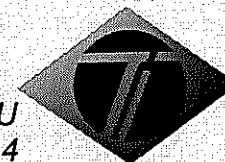
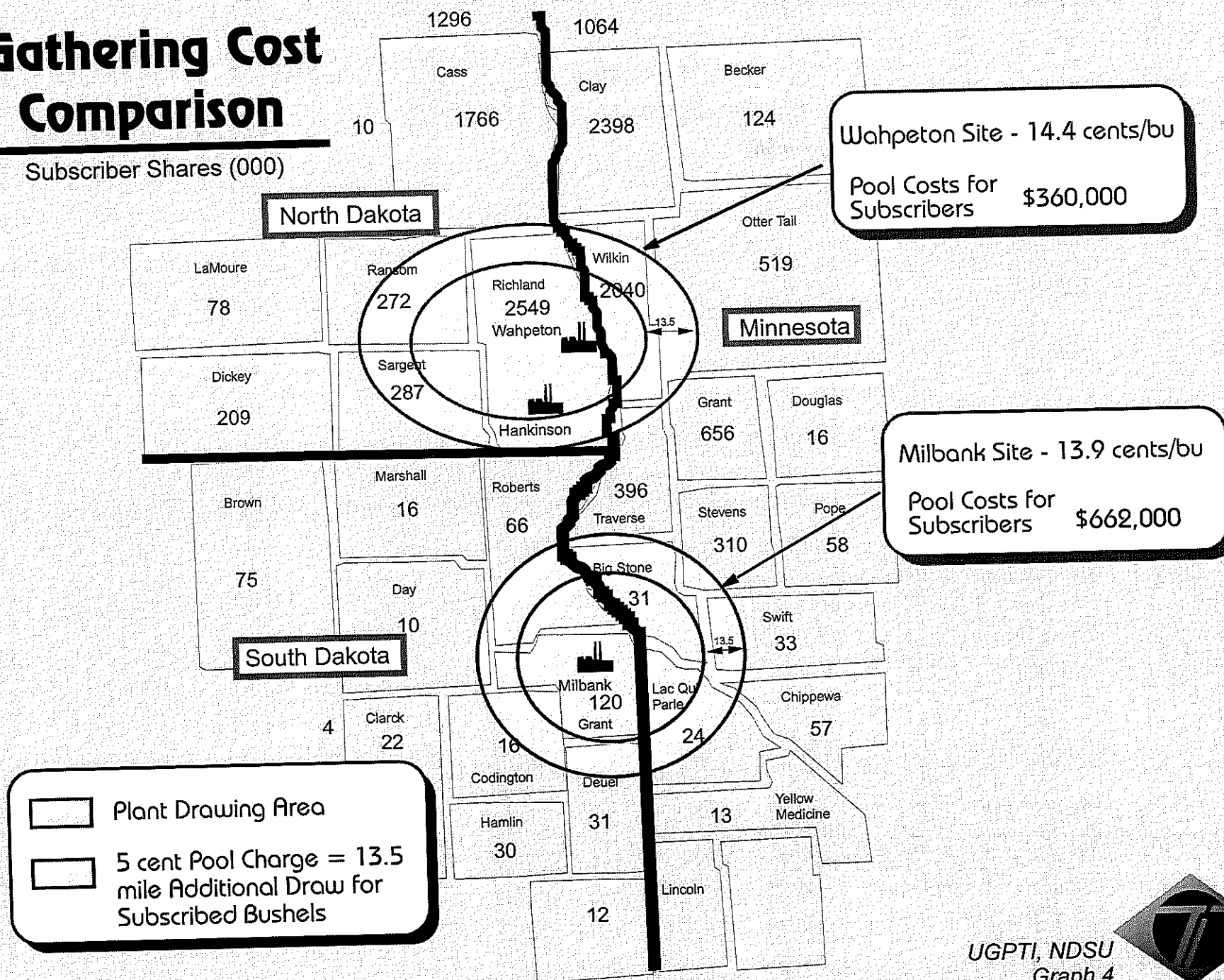


UGPTI, NDSU
Graph 3



Gathering Cost Comparison

Subscriber Shares (000)



Wahpeton Drawing Area

(Reference for Graphics)

| Radius | Corn Delivered From Plant Drawing Area <small>(Inner Circle)</small> | Subscribed Delivered From Additional Drawing Area <small>(Outer Ring)</small> | Total Corn Delivered <small>(Inner Circle + Outer Ring)</small> | Additional Requirement to Satisfy Plant Demand of 25,920,000 |
|---------|--|---|---|---|
| (Miles) | | | (Bushels) | |
| 10/23.5 | 1,134,477 | 2,680,559 | 3,815,036 | |
| 15/28.5 | 2,603,087 | 3,164,792 | 5,767,879 | 20,152,121 |
| 20/33.5 | 5,360,040 | 3,323,885 | 8,683,925 | 17,236,075 |
| 25/38.5 | 9,788,071 | 3,104,136 | 12,892,207 | 13,027,793 |
| 30/43.5 | 15,118,897 | 2,850,360 | 17,969,257 | 7,950,743 |
| 35/48.5 | 20,388,136 | 2,519,263 | 22,907,399 | 3,012,601 |
| 40/53.5 | 24,752,022 | 2,549,025 | 27,301,047 | -1,381,047 |
| 45/58.5 | 29,678,684 | 2,822,500 | 32,501,184 | -6,581,184 |
| 50/63.5 | 35,842,236 | 2,678,110 | 38,520,346 | -12,600,346 |
| 55/68.5 | 48,577,528 | 1,997,741 | 50,575,269 | -24,655,269 |

*Radius is specified as radius of plant drawing area / radius of additional subscriber drawing area

Availability of corn in the Wahpeton area was assumed to be 80% of total production.
The remaining 20% was assumed to be used for feeding purposes.

Graph 5

Milbank Drawing Area

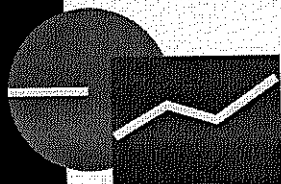
(Reference for Graphics)

| Radius | Corn Delivered From Plant Drawing Area <small>(Inner Circle)</small> | Subscribed Delivered From Additional Drawing Area <small>(Outer Ring)</small> | Total Corn Delivered <small>(Inner Circle + Outer Ring)</small> | Additional Requirement to Satisfy Plant Demand of 25,920,000 |
|---------|--|---|---|---|
| (Miles) | | | (Bushels) | |
| 10/23.5 | 1,574,308 | 187,419 | 1,761,727 | |
| 15/28.5 | 3,684,961 | 340,493 | 4,025,454 | 21,894,546 |
| 20/33.5 | 7,028,842 | 482,336 | 7,511,178 | 18,408,822 |
| 25/38.5 | 11,485,342 | 553,637 | 12,038,979 | 13,881,021 |
| 30/43.5 | 16,827,456 | 586,012 | 17,413,468 | 8,506,532 |
| 35/48.5 | 23,083,772 | 680,472 | 23,764,244 | 2,155,756 |
| 40/53.5 | 30,184,750 | 871,947 | 31,056,697 | -5,136,697 |
| 45/58.5 | 37,826,823 | 1,150,120 | 38,976,943 | -13,056,943 |
| 50/63.5 | 46,751,045 | 1,306,380 | 48,057,425 | -22,137,425 |
| 55/68.5 | 56,442,276 | 1,295,045 | 57,737,321 | -31,817,321 |

* Radius is specified as radius of plant drawing area / radius of additional subscriber drawing area.

Availability of corn in the Big Stone-Milbank area was assumed to be 60% of total production.
The remaining 40% was assumed to be used for feeding or other processing purposes.

Graph 6



Pool Delivery Costs

Pool Charge = 5 cents/bushel (Assumed to be equal to the Marshall, MN Plant)

Wahpeton

ND Subscriber Pool Cost

| |
|----------------------|
| 6,467 Shares(000) |
| (2,815) In Draw Area |
| <hr/> |
| 3,652 |
| x .05 Pool Charge |
| <hr/> |
| \$182,600 |

Total Pool Cost

| |
|----------------------|
| 14,000 Shares(000) |
| (6,800) In Draw Area |
| <hr/> |
| 7,200 |
| x .05 Pool Charge |
| <hr/> |
| \$360,000 |

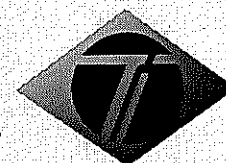
Milbank

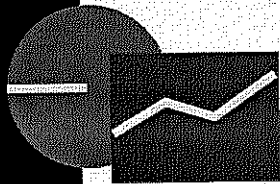
ND Subscriber Pool Cost

| |
|-------------------|
| 6,467 Shares(000) |
| (0) In Draw Area |
| <hr/> |
| 6,467 |
| x .05 Pool Charge |
| <hr/> |
| \$323,350 |

Total Pool Cost

| |
|--------------------|
| 14,000 Shares(000) |
| (750) In Draw Area |
| <hr/> |
| 13,250 |
| x .05 Pool Charge |
| <hr/> |
| \$662,500 |





Pool Delivery Costs

Pool Charge = 5 cents/bushel (Assumed to be equal to the Marshall, MN Plant)

Wahpeton

ND Subscriber Pool Cost

| |
|----------------------|
| 6,467 Shares(000) |
| (2,815) In Draw Area |
| <hr/> |
| 3,652 |
| x .05 Pool Charge |
| <hr/> |
| \$182,600 |

Total Pool Cost

| |
|----------------------|
| 14,000 Shares(000) |
| (6,800) In Draw Area |
| <hr/> |
| 7,200 |
| x .05 Pool Charge |
| <hr/> |
| \$360,000 |

Big Stone

ND Subscriber Pool Cost

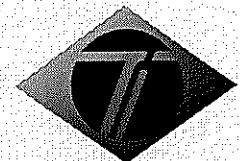
| |
|---------------------|
| 6,467 Shares(000) |
| (0) In Draw Area |
| <hr/> |
| 6,467 |
| x .12 Pool & Basis* |
| <hr/> |
| \$776,040 |

Total Pool Cost

| |
|---------------------|
| 14,000 Shares(000) |
| (750) In Draw Area |
| <hr/> |
| 13,250 |
| x .12 Pool & Basis* |
| <hr/> |
| \$1,590,000 |

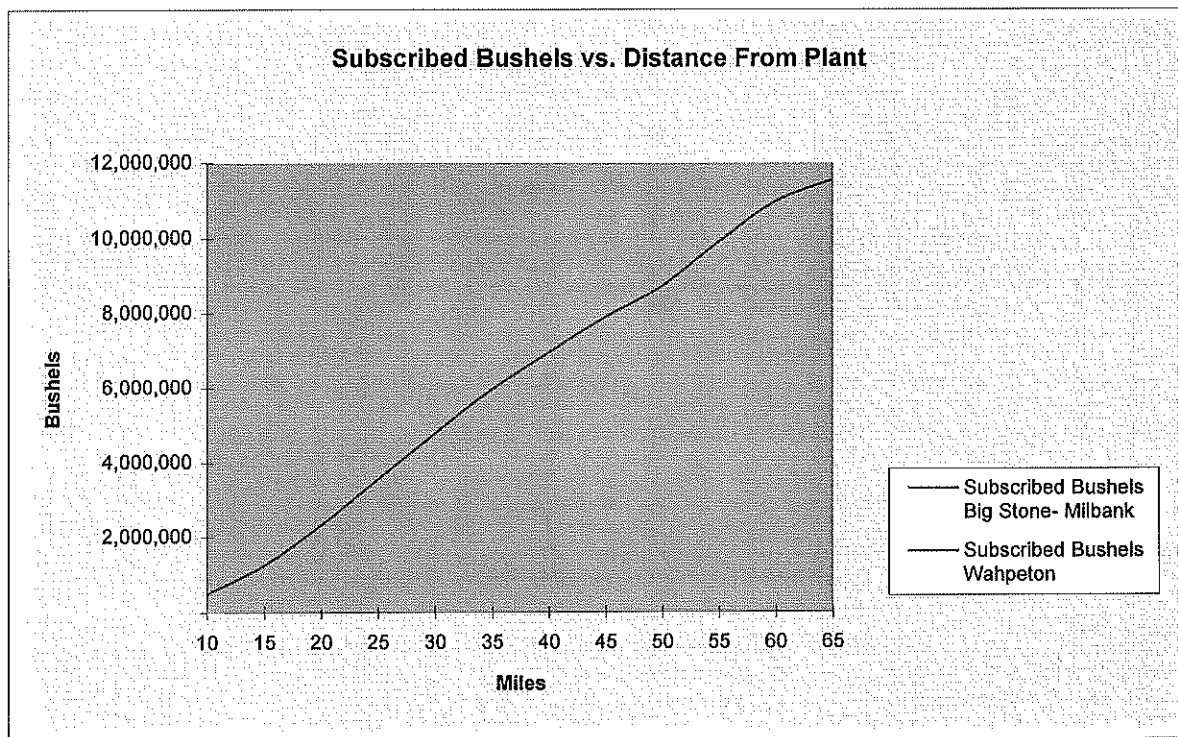
*5 cent pool charge + 7 cent basis differential

UGPTI, NDSU
Graph 8



Subscribed Bushels vs. Distance From Plant

| Miles | Subscribed Bushels | |
|-------|-----------------------|------------|
| | Big Stone- Milbank | Wahpeton |
| 10 | 28,826 | 502,583 |
| 15 | 63,131 | 1,260,721 |
| 20 | 125,545 | 2,327,121 |
| 25 | 267,680 | 3,570,461 |
| 30 | 466,639 | 4,786,826 |
| 35 | 668,763 | 5,982,303 |
| 40 | 887,831 | 6,962,006 |
| 45 | 1,127,523 | 7,919,560 |
| 50 | 1,460,543 | 8,746,260 |
| 55 | 1,905,789 | 9,917,779 |
| 60 | 2,432,451 | 10,992,379 |
| 65 | 2,901,772 | 11,574,435 |



Corn Deficit vs. Distance From Plant

| Miles | Big Stone | Wahpeton |
|-------|-------------|-------------|
| 10 | 24,158,273 | 22,104,964 |
| 15 | 21,894,546 | 20,152,121 |
| 20 | 18,408,822 | 17,236,075 |
| 25 | 13,881,021 | 13,027,793 |
| 30 | 8,506,532 | 7,950,743 |
| 35 | 2,155,756 | 3,012,601 |
| 40 | -5,136,697 | -1,381,047 |
| 45 | -13,056,943 | -6,581,184 |
| 50 | -22,137,425 | -12,600,346 |
| 55 | -31,817,321 | -24,655,269 |

