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Should We Increase Public Investments in Reforestation?

Howard M. Hoganson

Minnesota's forest industry has shown enormous growth. But are harvest levels sustainable? A generic environmental impact statement is being prepared to examine the impact of timber harvesting on Minnesota's forest resource. The Blandin Foundation has also funded a major study to examine the situation surrounding forestry investments in northern Minnesota. Although results of these studies are not yet available, some of the key issues are apparent.

Most public forest management agencies use some type of an allowable cut analysis to help select their harvest level. These analyses involve more than a simple inventory of the forest to identify how timber volumes have changed in recent years. One key assumption is the total land area over which timber production will be practiced in the future. This assumption is very subjective with different interest groups having differing opinions on the most appropriate assumption.

In terms of timber supply in northern Minnesota, aspen is the species of most concern for the short-term. This concern stems from the age imbalance of aspen stands as most aspen stands are either very young or very old making for the potential of a temporary shortfall of harvestable age stands in 20 to 30 years. Recognizing this concern, a substantial portion of the recent Minnesota forest industry expansion has been designed to utilize more northern hardwoods. Minnesota has substantial volumes of mature northern hardwoods as hardwoods have consistently been in low demand. However, northern hardwoods are not likely the answer to Minnesota forest industry's long-term timber needs as northern hardwoods generally grow very slowly. Average annual growth rates for many northern hardwood stands are less than .25 cords per acre per year. Growth rates of over two cords per acre are plausible using hybrid aspen. Hybrid aspen also has appeal in that it can be grown on much shorter rotations (20 to 25 years) and thus it might be used to help overcome problems associated with the aspen age class imbalance. Softwood reforestation alternatives offer the potential to increase growth rates to well over a cord per acre per year. Softwoods are also appealing because of their potential high value to the sawlog industry.

Perhaps reforestation investments can be viewed positively by most all interest groups. For a given acre, many environmentalists may oppose management intensification, but potential indirect impacts also need to be considered. With intensive management, a substantially smaller land base could sustain a fixed harvest level. Assuming harvest levels remained fixed, the savings could potentially be over 8:1 for some reforestation investments; eight fewer acres of timberland needed for every additional acre managed reforested.

Reforestation also offers potential to reduce risks associated with overharvesting. In general, timber production involves very long planning horizons and complex biological processes. There is much we do not know. If confidence intervals could be developed, one would expect wide intervals associated with estimates of long- term timber supply and reforestation needs. The cost of over-investing in reforestation may be very low compared to the potential costs of under-investing.

If increased public investments in reforestation are desirable, questions will arise as to the appropriate level and location of investments, the degree to which harvest levels should increase with increased investments, and the degree to which forest industry should be expected to pay for such investments. These are difficult questions. Based on today's timber prices, financial returns from most intensive reforestation activities look marginal at best. This is a likely major deterrent for reforestation investments by private forest landowners. However, a major shortcoming with these analyses is that impacts on nontimber uses are not recognized. Market forces recognize very few of the benefits from intensifying and shifting timber production to fewer acres. Strong arguments have also been made that simple financial analyses of reforestation investments also miss the benefits associated with the job base that forestry investments support.

Reforestation investments are very long-term investments requiring considerable capital up-front. In tough economic times, reforestation investments are likely first targets for spending cutbacks, especially since future timber prices are very uncertain and net returns are very sensitive to timber prices. For small landowners the risks are even

small landowners the risks are even greater as there is potential that their entire investment could be severely damaged or destroyed by insects, disease or fire.

Uncertainty concerning reforestation policies on public lands also complicates reforestation decisions for private landowners. From an industrial perspective this uncertainty is likely to stimulate some reforestation investments as there is undoubtedly some desire by industry to guarantee the wood supplies necessary to support the large capital investments already made. Furthermore, if timber prices do rise over time, returns on reforestation investments could be quite large. However, uncertainty surrounding public policy also discourages high levels of investment as there is potential that large volumes of timber will be made available from public lands and tend to keep timber prices from rising.

In general, forest industry and communities dependent on a healthy forest industry could benefit enormously from public investments in reforestation, but potential losers are the nonindustrial private forest landowners who would benefit from higher timber prices. Nonindustrial private landowners are the largest single ownership group in Minnesota, owning over 40 percent of the timberland. If large public investments are to be made in reforestation, consideration should also be given to public policies and programs that could stimulate reforestation investments on private lands by reducing or absorbing more of the risks associated with intensive forest management and uncertain future timber prices.

Increased reforestation investments could be very important for northern Minnesota. In developing statewide policies and public reforestation plans caution must be exercised as the situation is very complex. Investments in detailed statewide, multiownership, management plans and policy analysis may be a good investment.

Commercial Sweet Corn Cultivar Evaluations

David K. Wildung, Horticulturist

I don't know how you are this time of year, but I would certainly enjoy eating fresh corn on the cob! That's especially true since the 1992 growing season was so cool resulting in poor sweet corn production in northern Minnesota. In recent years there have been many new cultivars and new types of sweet corn released. If you haven't tried growing these you may have questions concerning their capabilities. Reviewing our North Central evaluations from the last four years provides some insights into how the new cultivars and types perform in our region.

First a review of the major sweet corn types might be useful. There are three major types of sweet corn available through the vegetable catalogs.

1. su or normal sugary types--these are the traditional cultivars most of us are familiar with characterized by not needing isolation for pollination and containing varying degrees of sugar. Cultivars lose sweetness and become starchy and gummy after harvest. Identified by the su in the catalogs.

2. se or sugary enhanced types--a relatively new type of sweet corn that has somewhat greater sweetness and more kernel tenderness than su types. They do not require isolation and the conversion from sugar to starch after harvest is slower than with su types. They are identified in the catalogs by the se, se+, or EH designation.

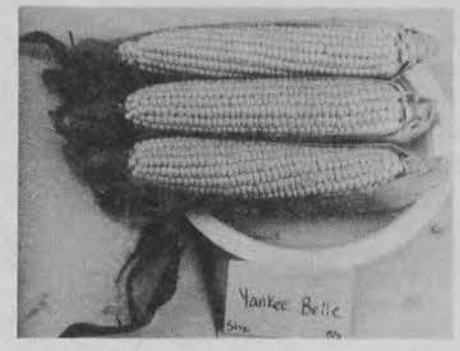
3. sh_2, supersweet or shrunken types--the newest sweet corn type that has "super sweet" flavor, good kernel crispness and slow conversion of sugar to starch resulting in longer than su and se storage life. Shrunken type cultivars require isolation to retain their best sweetness. Because the dry seed contains so little starch, it is more shrunken than the normal seed, sometimes resulting in poor seed germination and plant stands. They are identified by the sh_2 or supersweet designation in the catalogs.

How do these three major sweet corn types compare? Generally, it has been our experience that the su and se types have fairly comparable germination rates, maturity rates and yield potential but se types have slightly sweeter flavor. The comparisons between se and sh_2 types however are somewhat different as Table 1 indicates. Each value in Table 1 represents the average of four seasons results of cultivar evaluations at North Central. For example, with seed germination the average best seed germination rate for all se cultivars over the four-year period was 96% while the average worst seed germination was 22%.

Table 1. Four-year comparisons of sh_2 and se cultivars in northern Minnesota.

	sh_2 types	se types
Seed germination (%)		
Best	86	96
Worst	17	22
Average	60	70
Ripening dates (days)		
Earliest	90	83
Latest	105	101
Yield (dozen/acre)	1134	1288
Quality (1-9 scale) (9=best)	7.2	6.7

As Table 1 indicates se cultivars overall average about 10% better germination and plant stand than the sh_2 types. As mentioned above, sh_2 kernels have very little starch or stored energy for germination so they need ideal soil conditions for germination and early growth. With our typical spring conditions sh_2 plant stands will not be as good as either the se or su type sweet corns. Plant stands for sh_2 type sweet corns can be improved by delaying planting until soil temperatures reach 55 degrees or by increasing the seeding rate. Unfortunately as Table 1 shows, sh_2 types also mature from 4 to 7 days later on average than se types making delayed planting difficult. In selecting any sweet corn cultivar for our area, care should be taken to plant cultivars with no more than 80 to 85-day *catalog* maturity dates. This is especially true with the sh_2 types. In seasons like 1992 even the 80 to 85 day maturity cultivars will not ripen. When comparing yield, we have found that sh_2 types do not produce as well as se types (1,288 dozen/acre for se types compared to 1,134 for sh_2). However, if stands were equal for both types, yield probably would be similar. Finally in comparing quality, the sh_2 types rate somewhat better than the se types. The sh_2 types definitely appear to be sweeter and crisper (more crunchy) than the se types. They also seem to retain their sweetness longer than the se or su types.



Yankee Belle

Tables 2 and 3 list the cultivars evaluated at North Central Experiment Station that have exhibited better qualities. The maturity listed in the tables is the company's catalog maturity. In our experience, you should add from 12 to 16 days to the catalog maturity for northern Minnesota, making cultivars with over 85-day maturities very risky for our area even in warm summers. It should be noted that during the 1992 season all cultivars with over 75-day catalog maturities did not mature in our plots. During the 1990 and 1991 seasons all cultivars listed did very well. Among the sh_2 types, Landmark and Yankee Belle seem to have better cold soil germination than the other cultivars. While the eating quality of all the cultivars listed is good, the later maturing cultivars exhibit larger ears and somewhat better quality.

Table 2. Suggested se cultivars for northern Minnesota.

Cultivar	Source	Maturity	Color
Seneca Dawn	RB	69	Bicolor
Supreme	HM	74	Yellow
Bodacious	CR	75	Yellow
Ambrosia	CR	75	Bicolor
Pristine	CR	76	White
Crystal Bell	SW	78	White
Zest	AS	79	White
Lancelot	ST	83	Bicolor

Table 3. Suggested sh_2 cultivars for northern Minnesota.

Cultivar	Source	Maturity	Color
Mariah	SW	67	Yellow
Landmark	HM	75	Yellow
Yankee Belle	AS	75	Yellow
SS7210Y	AC	78	Yellow
Challenger	AS	78	Yellow
Sweeter Bi-Far	HM	79	Bicolor
Candy Store	HM	81	Bicolor
Sweetie 82	SU	82	Yellow

Table 4 lists the sources of these cultivars. All are commercial sweet corn growers and some may not sell small quantities to home gardeners.

Table 4. Commercial sweet corn cultivar sources.

AC	=	Abbott and Cobb Feasterville, PA 19047
AS	=	Asgrow Seed Co. Kalamazoo, MI 49001
CR	=	Crookham Seed Co. Caldwell, ID 83605
HM	=	Harris-Moran Seed Co. Rochester, NY 14624
RB	=	Robson Seed Co. Hall, NY 14463
ST	=	Stokes Seed Co. Buffalo, NY 14240
SU	=	Sun Seed Co. Nampa, ID 83657
SW	=	Seedway Seed Co. Syracuse, NY 13201

Results of all our 1992 vegetable cultivar trials are published in the **Midwestern Vegetable Variety Trial Report for 1992** available upon request for $10. Likewise, small fruit and annual flower trial results are also available for $2 each.

Aspen Improvement Potential

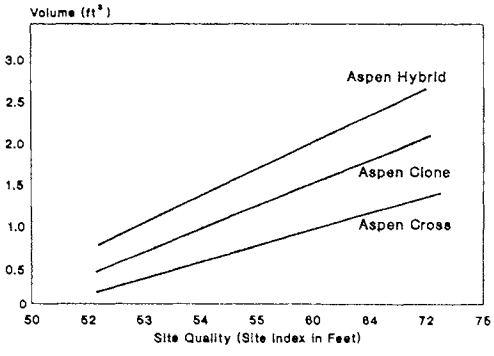
Bailian Li and Gary Wyckoff

The aspen breeding work at the North Central Experiment Station focuses on hybridization to improve aspen growth and wood quality. Frequently, questions are raised: Why hybridization? Why not improve pure native species? What is the aspen improvement potential? We would like to provide a brief discussion for these questions and then use long-term field trial data to demonstrate hybrid aspen's potential.

The underlying basis of tree improvement is natural variation. A tree improvement program utilizes genetic variation by selecting for desired characteristics, and then packages them into individuals for large-scale planting. Field selection based on phenotypic performance (i.e., physical appearance) is the first step for any tree improvement work. After selection the simplest ways for improvement are to 1) use wind-pollinated seeds from selected trees, 2) make crosses among selected trees, and 3) clonally propagate selected trees for planting. The improvement progress for using wind-pollinated seeds is limited because only female parents are selected (pollen is from unselected trees in the stand). Making controlled crosses among selected individuals should provide greater gains because both male and female parent trees are selected. Clonal propagation of highly selected trees should provide the greatest improvement potential among the three methods because the best trees are duplicated. The underlying assumption for these methods, of course, is that the selected traits are under a degree of genetic control.

Hybridization of two different species is another means to achieve genetic improvement by combining favorable characteristics of the parent species or by capturing heterotic genetic effects (hybrid vigor or heterosis) not available by other methods. Hybrid vigor, i.e., superior hybrid performance over the parent species, has often been observed in poplars. Aspen is one of the poplar species. Because of easy crossing and clonal propagation, poplar hybrids have been used successfully to increase wood production throughout the world.

Over the past 30 years of our aspen breeding program, many field trials were established to demonstrate the growth difference between native aspen and hybrids. The chart below summarizes the 15-year individual tree volume growth difference between native quaking aspen and hybrid aspen on a range of northern hardwood sites in the Lake States (site index ranging from 50 feet to 70 feet). Hybrid aspen is compared to pure quaking aspen (controlled crosses among selected trees) and to aspen clones (vegetative propagation of highly selected trees). Quaking aspen clones show greater volume growth than progeny from controlled crosses of selected trees (for the reason discussed before). Aspen hybrids, however, show additional



volume improvement over the best quaking aspen clones, and hybrid clones are expected to give an improvement over the hybrid crosses. Hybrid superiority in volume growth is clearly demonstrated across site quality (over the 16 field trials), increasing as site quality increases. The growth rate for

hybrids is more than double that for native aspen, and the rotation length can be reduced to 20 years compared to 40 years for native aspen. In addition to fast-growing, aspen hybrids also show better wood and fiber quality than native quaking aspen. So far, no insect or disease problems different from those of native aspen have been observed on the hybrids. Similar improvement potential has been demonstrated in other breeding programs in Europe and Asia. Such strong hybrid vigor clearly indicates that hybridization is more effective than breeding within pure quaking aspen species.

The forest industry is the second largest manufacturing industry in Minnesota, employing over 54,000 people. Aspen is by far the predominant species used in that industry, comprising more than half of the statewide harvest. As aspen harvests increase in Minnesota and the Lake States region in general, imbalances in age classes are occurring. Additionally, increases in forest land use for other than timber production, and environmental pressure for more set aside areas contribute to this imbalance. Hybrid aspen's rapid growth and improved wood quality will contribute to overcoming the expected shortfall of wood due to this imbalance.

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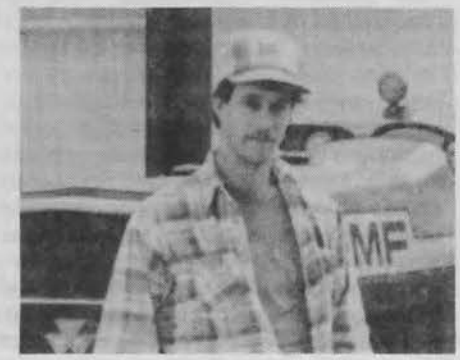

Todd Lovdahl, pictured, and Rodney Erickson were honored by North Central employees at a coffee party recently. Todd had been employed at NCES since 1984 and Rodney during 1992.

News from North Central

David L. Rabas, Superintendent

A late January thaw has provided an early warning that spring is not too far away. Seed catalogs, increased producer information meetings and farm seed and chemical sales representative visits are sure signs of an approaching spring.

This issue of our *Quarterly* and the past year's issues provide evidence of an increasing growth in the depth, diversity and direction of the research and outreach activities at our station. In addition to excellent research reports in our traditional agriculture, horticulture and forestry research programs, the *Quarterly* has contained reports on wild rice, tourism, aspen/larch breeding, sustainable agriculture, biological weed control and cooperative work with industry in areas important to the economic development of rural Minnesota.

Restructuring and redirection of our research program at NCES has not been without some loss. The sale of our dairy herd in November and the shift to an increased emphasis on beef cow-calf research has resulted in the reduction of two support staff positions in the animal science area. Todd Lovdahl, farm animal attendant and Rodney Erickson, assistant farm animal attendant were important members of our swine and dairy research staff. We wish them success in their future career opportunities.

I have been interested in getting together with some of the "old timers" from the station and the school of agriculture. "Old timers" would include those who lived or worked on the station in the 1930s, '40s and '50s. The purpose of the meeting would be to record part of some of the early history of the station before some of us get to an age where we tend to forget many of the stories, events or people who were important to the early success of research and agriculture in northern Minnesota. We have set 10:00 a.m., March 23,1993, as a date to get together at our station and talk about old times. Anyone who would like to share something about the early days of our station and school or who might want to come and listen is invited to attend. Please let us know if you will join us on the 23rd.

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Memorial Services were held on Monday, January 11, 1993 in Alamo, Texas, for Walter 0. Carlson, an English and Social Studies teacher at the North Central School of Agriculture during 1959 and the early 1960s. He had been living in Texas for 13 years. Mr. Carlson is survived by his wife Palma, a daughter, three sons and six grandchildren. The alumni fondly remember Mr. Carlson and extend sympathy to his family.

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An Hu recently joined our staff as a junior laboratory technician in Dr. Bob Nyvall's plant pathology lab. An and Bob are investigating biological methods to control purple loosestrife, a serious weed pest in Minnesota waters and wetlands. The research for mycoherbicides or naturally occurring fungi to replace chemical herbicides for control of weeds is part of a larger University of Minnesota effort to preserve and protect the environment.

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