CONF-960958--4

Energy Division and Environmental Sciences Division

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Mark Downing
Energy Division and Environmental Sciences Division
Oak Ridge National Laboratory

Dan Langseth
WesMinn Resource Conservation and Development District

Ron Stoffel
Minnesota Department of Natural Resources

and

Tom Kroll
Minnesota Department of Natural Resources

Prepared for
7th National Bioenergy Conference
Nashville, Tennessee
September 15-20, 1996

Prepared by
Oak Ridge National Laboratory
Oak Ridge, TN 37831-6205
managed by
LOCKHEED MARTIN ENERGY RESEARCH CORP.
for the
U.S. DEPARTMENT OF ENERGY
under contract number DE-AC05-96OR22464

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LARGE-SCALE HYBRID POPLAR PRODUCTION ECONOMICS: 1995 ALEXANDRIA, MINNESOTA ESTABLISHMENT COST AND MANAGEMENT

Mark Downing, Dan Langseth, Ron Stoffel, and Tom Kroll[1]

ABSTRACT

The Minnesota Wood Energy Scale-up Project planning began in late 1993. Cooperators include the WesMin Resource Conservation and Development Council, US Department of Energy's Biofuels Feedstock Development Program at Oak Ridge National Laboratory, the Electric Power Research Institute, the US Forest Service at Rhinelander, WI, the Minnesota Department of Natural Resources - Forestry, and others. In spring 1994, Phase I of the project established 1000 acres of trees. Phase II, documented here, includes plantings established on 870 acres by June 1995. The purpose of the entire project is to track and monitor economic costs of planting, maintaining and monitoring larger scale commercial plantings. In addition, accurate descriptive mapping of the soil classes and specific soil types, combined with specific site maps of hybrid poplar clones, and subsequent annual growth measurements during the first rotation will assist researchers in developing reliable site productivity functions. These site productivity functions will provide valuable information to support continued basic research on genetic enhancement and species screening to help assure producers reliable yields across representative soils in a production region. Major findings are the per-farm costs of establishment and maintenance for establishment year, machinery complements used, and methods of management. In addition, an average cost of establishment across 1000 and 2000 acres is profiled. These costs assist potential growers and purchasers of this resource to determine the ways in which supply and demand may be secured through developing markets. For these proceedings, average production costs are documented, and the management scenario is presented for establishment for Phase II planting completed in June 1995. For documentation of 1994 Phase I establishment, please refer to Downing, et al., 1996.

Keywords: hybrid poplar, production economics, wood energy

BACKGROUND

For 15 years, only smaller scale research and experimental plantings of hybrid poplar have been utilized to screen for promising high-yielding candidate species. Currently,

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[1] Downing, Oak Ridge National Laboratory, PO Box 2008, Oak Ridge, TN 37831-6422, Langseth, WesMin RC&D, 910 Hwy 29 North, #103, Alexandria, MN 56308, Stoffel, MN DNR, 2605 Aga Drive, Unit 6, Alexandria, MN 56308, Kroll, MN DNR, Forestry Division, 500 Lafayette Rd., St. Paul MN 55155-4044.

1870 acres of hybrid poplar trees have been planted on Conservation Reserve Program (CRP) land within a 50-mile radius of Alexandria, MN. Phase I of the project involved planting 1000 acres in 1994. Phase II began in 1995 and nearly 870 acres were planted. The project is beginning a third phase in 1996. At the end of 1995, nineteen landowners had obtained a 5-year extensions of their CRP contracts by planting hardwood trees. The CRP contracts will expire in 2001 when the plantings are 7 years old.

The purpose of this project is to track and document the economic costs of planting, maintaining, monitoring, and harvesting large scale commercial agricultural plantings of hybrid poplar. The project will also educate the public about short rotation woody crops and serve as an important source of information for vendors, technical advisors, and others to learn more about the cultural practices that involve hybrid poplar or woody biomass production. The plantings also serve as an invaluable research facility for studying clonal performance, plantation growth and production, soil relations, wildlife use and climatic effects, all at the larger scale.

SITE ESTABLISHMENT

Fall site preparation continued to be the number one concern for proper establishment of hybrid poplar cuttings. There are two methods for beginning fall site preparation. Ideally, operations should begin in June; however, late August should suffice. These can still ensure establishment success. First, producers may choose to cut the Conservation Reserve Program cover by mowing. After some regrowth, Round-Up is applied at the 1 to 1.5 quarts per acre rate. A second method simply involves spraying the fields with the same rate of Round-up without mowing.

One to two weeks following the herbicide application, moldboard plowing or either offset or plowing disks are used to break up the sod. Two or three days later, fields are worked very intensively with a tandem disk. Usually, based on weather or other operational delays, tandem disking operations could continue into early or mid September.

By mid October the following operations should take place to complete proper fall site preparation. The field must be smoothed and groomed before marking the field for spring planting. This will ensure demonstrative markings to last through snow cover, and spring thawing. Using a field cultivator or a smoothing harrow will ready the field for marking operations. After marking, and preferably before the ground freezes, a fall Oust application is desirable. In addition, if erosion is considered to be a problem, producers can sow 0.5 bu of oats per acre to prevent erosion. Oats are not winter-hardy in this location. Rye is not considered a desirable cover crop because it will begin to grow again in the spring.

In spring, those fields treated with Oust in the fall may simply be planted. Sites not sprayed with Oust may need field cultivation and harrowing. Following cultivation and harvesting, fields need to be marked for planting so trees can be planted accurately. An

Oust application is then necessary followed by a 10 to 14 day waiting period before planting.

Table 1 outlines 1994 establishment average cost per acre (Downing, et al., 1996). Table 2 contains the 1995 establishment costs. The 1996 report on Phase III (commencing late 1995) of the project will document the cost of labor and time spent performing different establishment and maintenance functions. A more comprehensive and detailed machinery complement documentation will be forthcoming.

PLANTING OPERATION

During the 1994 establishment period, many trees were machine planted. As a result, some placement of cuttings was not accurate. Either cuttings were too deep, too shallow, or not "firmed" into the soil. Air spaces, for example, cause desiccation of cuttings as a result.

Fields that were alternatively planted by crews by hand, using a planting hook, were planted accurately, and this accuracy afforded cross-cultivation for better weed control. To ensure proper planting, several supervisory personnel count cuttings planted, randomly check depth of planting and spot check cutting planting direction. Although cuttings are commonly painted on the "up" end, additional quality control checks proved invaluable. Overall survivability increases as a result of hand planting, and the cost of planting only increases marginally.

ON-SITE MONITORING

After planting, 2 field supervisors are assigned each of the 18 planted sites or a total of 1870 acres. They cruise every field once each week to check for general condition, extent and type of weed growth, obvious existing pest problems, disease, and moisture levels. In this way, fields can be monitored to prevent problems from getting ahead of the landowner, cultivator or herbicide applicators. A Forest Service advisor also makes a monthly tour through all the fields. Fields notes taken assist all decision-makers in delegation of tasks to be performed. These field notes will also assist in determining the reasons why relative yields differ across different soils with different clones 2 or 3 years after establishment.

WEATHER VARIABLES

Rainfall in 1995, proved to be variable within fields and across fields. Although fall and spring site preparation were completed, early initial after-planting site maintenance was difficult. Some maintenance was delayed in the western and southern areas of the region as a result.

PLAN FOR PHASE III

Some interplanting was completed on a few Phase II sites in the spring of 1996. One site will be replanted because the landowner used inappropriate tillage equipment for

Table 1.
1994 Hybrid Poplar Average Per-Acre Establishment Cost (13 sites, 1000 acres total)

Operation	1994 $/acre
offset disk and plow	15.00
tandem disk	8.00
disk/chisel	15.00
Round-up application	19.00
tandem disk cultivate/harrow	8.00
burn down and herbicide as needed	10.00
apply Linuron/Lorox	34.00
tree stock/ship/store	73.00
planting cost (8X8) spacing	49.00
first cultivation	10.00
second cultivation	10.00
third cultivation	10.00
herbicide application	15.00
AVERAGE COST PER ACRE	**276.00**

Table 2.
1995 Hybrid Poplar Average Per-Acre Establishment Cost (5 sites, 870 acres total)

Operation	1995 $/acre
fall site preparation complete	35.00
Round-up application	18.00
tandem disk cultivate/harrow	10.00
apply herbicide	20.00
tree stock/ship/store/soak	82.00
planting cost (8X8)	38.00
4 cultivations	40.00
AVERAGE COST PER ACRE	**243.00**

cultivation. Oust was applied successfully across all sites prior to trees breaking dormancy. This application will assist weed control throughout the growing season.

Continued research on weed control is critical to the success of planting establishment. Research on a plastic mulch test will provide economic and production data about the benefits and costs of non-chemical weed control. Herbicide trials continue across a wide range of clones and chemicals. Many herbicides are not labeled for use on hybrid poplar. Resistance to herbicide damage as a result of breeding efforts continues. For example, the Oust label was re-issued based on work completed on the sites in 1994 and 1995.

Plantings established during the 1996 planting season on Conservation Reserve Program land along the Minnesota River Basin southeast of Alexandria will provide initial data about economic and environmental effects as a result of growing larger scale agricultural plots.

RESULTS AND DISCUSSION

The average cost of establishment in 1995 was $243 per acre. This is a reduction of $33 over 1994 establishment costs of $276. There are several reasons for this. The cost of tree planting was reduced in 1995 over 1994 costs saving $11. This was a result of hiring different tree planting crews and a change of oversight management during planting operations. There were no fields burned in 1995 which saved an additional $10. No Linuron was applied in 1995 which saved an additional $35.

Several per acre average costs did increase. The average number of cultivations in the first year increased to four from three. This resulted in an increase of $10 per acre average cost. Additional herbicide application increased across all sites by an average of $5 per acre. This was true even with a reduction in purchase price of Oust to producers due to re-labeling. Cost of handling trees increased $10 because the soaking operation was included in a category called tree stock, ship, store and soak rather than including soaking in the cost of planting. Overall, the net reduction was $33 per acre average.

Four major accomplishments highlight 1995 over 1994 production. Much better site preparation was completed across all sites. All of the sites were hand planted instead of machine planted. Planting was much more uniform as a result of hand planting, and coordination of crews and soaking of cuttings was better organized. Finally, written specification of planting material was provided to all nursery stock suppliers. Additional gains in understanding are expected to made as the project continues.

REFERENCES

1. Downing, Mark, Rick Pierce, and Thomas Kroll. 1996. *Minnesota Wood Energy Scale-up Project 1994 Establishment Cost Data.* ORNL/TM-12914. Oak Ridge National Laboratory, Oak Ridge, TN 37831-6422.