

LCMR Work Program

I. Project Title: E-41 Tree and Grass Production for Ethanol

Program Manager: Edward G. Wene
Agency Affiliation: Agricultural Utilization Research Institute
Address: P.O. Box 599, Crookston, Minnesota 56716
Phone: (218) 281-7600

A. Legal Citation: M.L 93, Chpt 172, Sect. 14, Subd. 4 (e). (\$380,000)

This appropriation is from the oil overcharge money to the commissioner of administration for a contract with the agricultural utilization research institute to implement a program to supply biomass feedstock derived from trees and grass to a national renewable energy laboratory (NREL), U.S. department of energy engineering development facility for converting biomass to ethanol and/or thermochemical fuels. This appropriation is contingent on an agreement to purchase biomass.

The Project is extended to December 31, 1996; on that date the appropriations cancel and no further payment is authorized, Minnesota Laws 1995, Chap. 220, Sec. 19, Subd. 19.

Amount Budgeted: \$380,000
Balance: \$0

B. LMIC Compatible data Language: Not Applicable

C. Status of Match Requirement: Not Applicable

II. Narrative (Project Summary)

Implementation of a program to supply 3,000 acres of biomass feedstock to an engineering development facility for converting biomass to ethanol and/or thermochemical fuels. The U.S. DOE has solicited letters of interest from groups which will be able to supply 40-100 tons per day of biomass feedstock to Energy Demonstration Units (EDU). This group of cooperators has responded to the DOE by providing details of our plan to plant 3,000 acres of biomass crops. The DOE will work with private companies to site these EDU in areas which have available biomass feedstock. There is a great deal of interest in the Upper Midwest as a site for this demonstration project because of the availability of suitable land for growing biomass feedstocks. This project will be instrumental in securing further support for Minnesota as a site for production and conversion of renewable fuels. Minnesota Power Company has agreed to purchase the biomass and to work to attract a renewable energy facility to Minnesota.

III. Statement of Objectives

- A. Recruit growers and select suitable sites for tree and grass production
B. Training in best management practices for growers, custom farmers and farm consultants
C. Productivity analysis and development of low-input techniques
D. Implementation of tree establishment plan

IV. Objectives:

A. Title of Objective: Recruit growers and select suitable sites.

A.1. Narrative: AURI and UMC are presently funding Geographic Information Systems (GIS) analysis studies to identify up to three locations within Minnesota which have the most suitable areas for growing hybrid poplars. The studies include analysis of statewide soil surveys and information on soil type, pH, slope, bulk density, organic matter, texture, available water and location of CRP acres. Previous work by members of this group have defined parameters using these criteria which maximize potential yields. The regional location of the tree plantations was identified in 1992 utilizing GIS analysis. The DNR Forestry Division and AURI will work with each selected grower to determine if each individual site is suitable. The MN DNR Forestry will also develop specific work plans with each grower.

A.2. Procedures: Growers will be recruited within the area identified by the GIS mapping. The DNR Forestry Division will work with selected growers to insure suitability of land and develop work plans with growers. The GIS mapping will determine general areas of suitable land, but each site needs to be evaluated for soil characteristics, slope and cropping history to determine site suitability and to develop individual work plans.

A.3. Budget:

- a. Amount budgeted: \$27,000 \$41,177.11
b. Balance: \$ -0-

A.4. Timeline: Table with columns for dates 6/94, 1/95, 7/95, 1/96 and rows for 'Develop grower contract criteria' and 'Recruit growers/evaluate sites'.

A.5. Status: The regional location for the 3000 acres of hybrid poplars will be an area within a 20 mile radius from the city of Oklee, in Red Lake County. This part of the project is being called the Oklee Tree Project to clearly distinguish these activities from future activities. CRP acres have been identified in this area and informational meetings were held in three locations, Oklee, Goodridge, and McIntosh on June 29 and 30. Interested growers land was soil sampled by a private company to evaluate individual sites. Minnesota Power is offering 30 year contracts to

growers which include yearly payments and agreements to purchase the wood. Eighteen growers have signed contracts for a total of nearly 2,500 acres. Over 10,000 acres of land was soil sampled in the site selection process. Twenty growers have now signed contracts for 3,000 acres and 15,000 acres have been soil sampled. Recruiting has continued through the summer of 1995 and 23 growers have now signed contracts to plant 3,000+ acres of trees. Over 17,000 acres of land has been soil sampled to select suitable sites. This phase of the project is now complete.

A.6. **Benefits:** Plantations will be located on suitable sites for tree establishment.

B. Title of Objective: Training in best management practices.

B.1. **Narrative:** Technology transfer of best management practices to growers, custom farmers & farm service consultants (ie. CENTROL). This work will be carried out by the U of M, Crookston (UMC), The US Forest Service (USFS), Natural Resources Research Institute (NRRI) and DNR, Forestry Division. Growing hybrid poplars requires techniques and management practices which are different from other row crops, and with ten-year rotations, it is beneficial to insure that specific procedures for site preparation and planting are put into practice.

B.2. **Procedures:** Group and individual training sessions and demonstrations will be organized to insure that growers, custom farmers and farm service consultants follow established techniques for site preparation and planting.

B.3. Budget:

a. Amount budgeted: ~~\$38,000~~ ~~\$33,822.89~~ \$22,308.36
 b. Balance: \$0

B.4. Timeline:

	<u>4/94</u>	<u>7/94</u>	<u>4/95</u>	<u>7/95</u>	<u>4/96</u>
#1) Training sessions	*****	*****	*****	*****	***

B.5. **Status:** Control began work in May to train their farm service consultants in proper site preparation, weed control, planting and maintenance practices. This work is being conducted on a 70 acre site planted in May 1994 with assistance from AURI and the University of Mn-Crookston. Tree planting vendors were trained at this planting site in May 1994. Custom vendors for 1994 summer site preparation were trained on several selected sites. Work has begun on building prototype marking equipment to aid hand planters in cross-checking fields. Three row markers were built and used to mark fields for 500 acres of tree planting in the Spring of 1995. Two hand planting crews were trained in proper planting techniques and successfully planted 500 acres. Control monitored spring site preparation, planting and follow-up weed control practices. Training meeting was conducted for growers and vendors prior to spring planting and site preparation. Two additional three-row markers and three more cultivators will be constructed for training growers in site preparation and weed control. Second year weed control practices have been implemented for the 1995 plantings and training has been conducted for the 1700 acres planted in 1996. Training has been concluded and the balance of the money transferred to grower payments.

B.6. **Benefits:** Growers and consultants with skill to successfully establish and maintain plantations that maximize potential yields and minimize environmental impacts.

C. Title of Objective: Productivity Analysis & Development of Low-Input Techniques

C1. **Narrative:** NRRI and UMC are presently conducting yield analysis on established hybrid poplar plantings. These studies are being used to develop models to predict yield of different clones planted on various soil types utilizing several management techniques, including plantings with reduced herbicide applications. These results are being implemented in the ongoing GIS site location mapping. Further yield studies are necessary to further determine how clonal variations and soil characteristics effect potential yield. These studies will be applicable to many different soil types and locations throughout the state.

C.2. **Procedures:** Established hybrid poplar and switchgrass plantings will be analyzed for yield to refine a soils and climate-based growth model. This study will be used to compare low-input techniques and to eliminate less suitable planting sites within regions located by GIS mapping. This information will be also be used for future plantings in the state.

C.3. Budget:

a. Amount Budgeted: \$32,275
 b. Balance: \$0

C.4. Timeline:

	<u>7/94</u>	<u>1/95</u>	<u>7/95</u>	<u>1/96</u>	<u>7/96</u>
#2) Data collection	*****	****	*****		
#1) Productivity analysis		*****	****	*****	
#2) Productivity estimation model		****	****		****

C.5. **Status:** Data collection continued throughout this growing season and low-input technique fields will be planted in the spring of 1996. Land in Clearwater County, recently transferred to Clearwater County Soil and Water Conservation District, will be the site for the low-input technique demonstrations. One additional low-input site was selected in Red Lake County and is being prepared for spring 1996 planting. Low-input plots were established in 1996 in Clearwater and Red Lake Counties and are being evaluated for weed control and growth. Previously established plantings continue to be evaluated for growth to refine the growth model. Budget is complete but low-input areas will continue to be evaluated in subsequent years to determine effects of first year low-input techniques.

C.6. **Benefits:** Development of a soils and climate-based growth model comparing low-input techniques for tree growing and the elimination of less suitable sites within the

region selected. The growth model will be available for future plantings outside the scope of this work.

D. Title of Objective: Implement Tree Plantation Establishment

D.1. Narrative: Implementation of procedures to establish plantations including: nursery stock production program, grower assistance, CRP work plans, and payment plans for growers. AURI and UMC have funded Lee Nursery to insure that sufficient, quality cuttings of selected hybrid poplar clones will be available for planting. Cost estimates for establishing hybrid poplars are @ \$270/acre. CRP will pay up to \$135/acre to establish trees for newly enrolled CRP contracts. 5 year CRP contract extensions are available for converting from grasses to trees. For this program original establishment costs would be deducted from the \$135/acre payment. The LCMR program will assist growers by providing \$91/acre to supplement the CRP establishment costs. The payments will be linked to specific tasks accomplished under individual work programs. That is, the work program will include tasks, accompanied by a dollar amount, and growers would not receive payments until the tasks are completed. This is to insure that recommended management techniques are followed.

D.2. Procedures: Initiate nursery stock program and implementation plan for 3000 acres of trees and/or grasses by 1996. Trees and grasses will be grown on CRP lands. DNR will assist growers and contract consultants to plant crops. CRP payments of @ \$135/acre in addition to @ \$91/acre LCMR funds will cover the majority of the estimated \$270/acre anticipated site preparation and maintenance.

D.3. Budget:
 a. Amount budgeted: ~~\$272,725~~ \$284,239.53 from LCMR, Amount from other sources \$1,200,000
 b. Balance: \$0

D.4. Timeline:

	<u>3/94</u>	<u>7/94</u>	<u>5/95</u>	<u>7/95</u>	<u>5/96</u>	<u>7/96</u>
#1) Cooperate with nurseries to increase planting stock	****	****	****	****	****	
#2) Site preparation/purchase cuttings		*****	****	****	****	
#3) Plantation establishment			****		****	

D.5. Status: Have initiated planting stock increase program with Lee Nursery in Fertile, Minnesota. Site preparation for Spring 1995 plantings began in mid-July 1994. Due to a late start in recruiting growers in 1994, about 500 acres was prepared for planting in the Spring of 1995. Growers received cost-sharing payments from ASCS to cover fall preparation activities. 500 acres were planted between May 28 and June 11, 1995, all fields were sprayed with a pre-emergent herbicide, and cultivation of planted fields began on June 26th. Site preparation work has begun on the remaining 2,500 acres which will be planted in 1996. Due to an exceptionally wet 1995 growing season not all 2,500 acres were prepared for spring 1996 planting. 1,700 acres will be ready for spring 1996 planting and the remaining 800 acres will be planted in the spring of 1997. Ten fields were planted in the spring of 1995 and all were completed successfully and tree survival was exceptional on all fields.

Seventeen growers planted 1,700 acres of trees between June 5 and July 6, 1996. The remaining 800 acres have been prepared for planting in 1997. Due to expected shortages of planting stock for the Spring of 1997, trees were ordered in advance. Grower payment money was allocated to insure availability of planting stock for growers who have already spent money to prepare fields for spring planting. Grower payment money was also allocated to pay for the preemergent herbicide Lorox. The label has expired for Lorox and purchase was required in 1996 to insure this labelled herbicide will be available for the 800 acres of planting in the Spring of 1997. Growers who plant in the Spring of 1997 will still receive their \$91/acre program funds and AURI and UMC will continue to assist growers throughout the 1997 growing season.

D.6. Benefits: This program will demonstrate, on a larger scale than has been accomplished to date in the Upper Midwest, the ability to produce cellulosic feedstock. This large-scale demonstration will provide valuable yield data, cost analysis, and provide information on planting techniques, clonal variations, and grower recruitment techniques and incentive programs.

V. Evaluation: The goal of the project is to establish 3,000 acres of hybrid poplar and/or switchgrass on specific sites in Minnesota, to train growers and custom-farmers in best-management practices, determine yield potential, and to attract a Department of Energy Demonstration Unit for biomass energy conversion. Results will be evaluated by the ability to interest landowners, to successfully produce commercial acreage, and to demonstrate the economic potential of growing biomass for alternative energy use.

VI. Context:

A. Current and previous work has demonstrated the small-scale feasibility of growing hybrid poplars. There is a lack of critical mass of specially-grown biomass crops to develop an energy demonstration facility utilizing crops grown for energy conversion.

B. This proposed work will result in the development of a process to select areas in Minnesota to demonstrate the feasibility of producing energy crops.

C. Members of the consortium have determined the most desirable hybrid poplar clones, developed best-management practices utilized throughout the U.S., and initiated soil suitability models for the selected clones. Efforts by consortium members have resulted in over 800 acres of hybrid poplar plantings throughout the state of Minnesota, which have led to the development of preliminary climate/soil suitability models.

VII. Qualifications:

- 1. Program Manager:** Edward G. Wene, Ph.D.
 - a. Dr. Wene has been active in basic research in biological conversion of biomass to liquid fuels.
 - b. Agricultural Utilization Research Institute/Microbiology-Forestry
- 2. Cooperator:** Professor Wendell Johnson
 - a. Professor Johnson is active in hybrid poplar research in the areas of production practices, technology transfer, clone selection, soils/climate modeling.
 - b. University of Minnesota, Crookston/Biology

3. **Cooperator:** Edward Hansen
- a. Mr. Hansen has been involved in hybrid poplar production, selection, soils and climate based modeling, yield determination in programs with the U.S. Forest Service
 - b. U.S. Forest Service/Forestry

4. **Cooperator:** Bill Berguson
- a. Mr. Berguson has been responsible for soils modeling studies to determine soil characteristics effecting hybrid poplar growth.
 - b. Natural Resources Research Institute/Soils

5. **Cooperator:** William Hauserman, Ph.D.
- a. Dr. Hauserman is active in research in gasification of wood as an alternative energy source.
 - b. University of North Dakota-Energy and Environmental Research Center/Engineering

6. **Cooperator:** Orville Lee
- a. Mr. Orville Lee has established hybrid poplar nursery stock at Lee Nursery. Hybrid poplar cuttings in large numbers will be required for this project
 - b. Lee Nursery/Hybrid Poplar cuttings

VII. Reporting requirements: Semiannual status reports will be submitted not later than July1, 1994, Jan 1, 1995, July 1, 1996 and a final status report by Jan. 30, 1997.