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# MINNESOTA AGRI-POWER PROJECT

Quarterly Report for the Period:

April to June, 1999

## Minnesota Valley Alfalfa Producers

David Wilbur

Project Director

PREPARED FOR THE UNITED STATES

DEPARTMENT OF ENERGY

Under Cooperative Agreement

DE-FC36-96GO10147

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# MINNESOTA AGRI-POWER PROJECT

Instrument No.: DE-FC36-96GO10147

## PROGRAM STATUS AND ACCOMPLISHMENTS

THIRD QUARTER-1999 REPORT

FOR PERIOD

01 APRIL 1999 THROUGH 30 JUNE 1999

### Task 1 Design Package

#### Subtask 1.1 Feedstock Testing

##### *1.1.1 Feedstock Processing, Densification Analyses and Design*

Feedstock processing and system improvements continue. Work continues on the design and cost estimate for the first new alfalfa processing plant. Accurate operating cost estimates have been developed into a financial model for analysis of various operating practices..

The simultaneous production of alfalfa leaf meal and other products has continued to operate as allowed by market conditions.

Work continued in an effort to reduce the tramp particulate emissions at the Priam facility to fully meet the MPCA requirements. Emissions' monitoring as required by the MPCA was completed. Results indicate emission levels below alfalfa industry norms.

Work also continued to improve the Standard Operating Procedures. Monitoring of the physical quality of all products continued. This work is being done without DOE support.

##### *1.1.2 Alternative Design and Technology Options*

No funding for this task has been authorized.

##### *1.1.3 Gasification Testing & Design*

Gasification testing was completed in April. The quick reports were completed on schedule and the final report has now been issued. See Attachment 1.

##### *1.1.5 Alfalfa Leaf Meal Product Testing*

University of Minnesota feeding tests continue, with Gary Robinson (MnVAP') nutritionist coordinating these efforts. The tests have been completed for Creep Feeding, Dairy cow

lactation, Calf starter rations, and feedlot beef trials. MnVAP continues to fund some research with the University.

#### Feedlot Study - Crookston, MN

The feedlot study began December 15, 1998 with 214 head. Pens were randomly assigned to one of four treatments with four pens per treatment; 1) ALM + Rumensin + Tylan; 2) ALM + Catalyst (control); 3) Rumensin + Tylan + Soybean meal (SBM); and 4) Catalyst + SBM. Animals are currently gaining better than expected for all treatments.

Continuous measurements include individual body weight and daily feed intake by pen. At slaughter, carcass data will be collected (kidney-pelvic-heart, hot carcass weight, marbling, yield grade, quality grade, backfat, etc.) to determine treatment differences. Liver abscesses will also be recorded.

#### Cow/Calf Study - Joint w/ NDSU at Streeter, ND

In cooperation with North Dakota State University, approximately 100 Angus and Angus-cross cows were assigned randomly to one of two treatments. Cows were fed a forage and corn based diet top dressed with a range cube formulated for 30 % protein using either ALM or SBM as the primary protein source.

Measurements taken during the study include weekly diet samples and monthly ingredient samples. The initial and final cow weights were taken on two consecutive days and one interim weight at 28 d after initiation of trial. Fecal samples were collected mid-March and will be used to determine diet digestibility. Calving will be monitored to determine calving ease, calf vigor, and birth weights.

#### Response Curve with Early Lactation Dairy Cows - Morris, MN

The primary goal of the study is to provide information leading to the optimum feeding amount and economic value of ALM based on several response variables at varying levels of ALM. The secondary goals were based on what ALM replaced in diets that either maintained forage fiber levels or decreased forage fiber at a constant rate.

The 46 cows and heifers were to be on trial from 0-110 days of lactation with an expected trial completion date of June 20, 1999. Cows were evaluated for chewing times the beginning of April. This will provide another response variable to evaluate all 13 dietary treatments.

#### ALM Calf Starter Trial - St. Paul, Waseca, Crookston, MN

The calf starter trial at St. Paul is completed. Diet analysis, data compilation, and statistical analysis are continuing.

## Alfalfa Leaf Meal Value Added Product Research (Turkeys)

Gross energy determinations were rerun on the ALM excreta samples from previous TME assays. TME calculations for the ALM samples are being calculated. Samples from the TME studies were processed and prepared for shipment to the University of Missouri for amino acid determination and subsequent determination of amino acid availability. However due to the early termination of the grant, a hold was placed on the analyses at Missouri.

A feeding trial to examine the effect of feeding 3% ALM in normal and reduced protein diets of turkey poults was examined in combination with with other protein supplements such as meat/bone meal and distillers dried grains. Data is being summarized and analyzed.

### *1.1.6 Alfalfa Feedstock Variability Analyses*

Continued NIR analysis was completed with most effort placed on stem analysis, including mineral analysis. The database for stem fuel pellets has been improved with the addition of the analysis run on the stem fuel shipments.

Investigated sources of color charts for evaluation of hay color. Determined the Munsell color Chart for plant tissue analysis would be most appropriate.

Compared four ALM pellet samples for % CP using U of MN microkjeldahl, U of MN NIRS and MnVAP NIRS with Midwest labs. NIRS values were less than chemistry values, which indicated that NIRS equation for % CP needed additional samples. Samples were added. MnVAP NIRS shows a bias compared to U of MN NIRS. This was corrected by restandardizing the system.

ADF, NDF, and CP have been run on approximately 40 pellet samples for monitoring and equation development for ALM and hay pellets.

Compared microwave dried and non-microwave dried pellets and found that approximately 1% moisture is lost when grinding the non-microwave dried pellets. Developed a protocol for DM determination of pellets using the microwave.

The University of Minnesota and MnVAP will continue this work on a limited basis. This work is being done without DOE support.

### Subtask 1.2 Integrated Plant Design and Cost Estimate

Enron has withdrawn as co-developer. Efforts to find a new co-developer continue.

## Task 2 Feedstock Supply System

### Subtask 2.1 Scale-Up of Feedstock Supply System

Engineering and environmental preliminary work are underway for the alfalfa plant at Wendell. Site development issues are being worked out and progress is occurring on the infrastructure to be supplied by the community. MPCA permit development is underway. The emissions monitoring required at the Priam plant in support of this application has been completed. The EAW is being prepared. This will continue through the summer. This work is being done without DOE support.

### Subtask 2.2 Development of Biomass -Type Alfalfa Varieties

University researchers are continuing breeding programs to develop high yielding biomass-type alfalfa varieties specifically adapted to processing in the MAP system. They are evaluating stem and leaf yield, stem fuel properties, leaf quality, and persistence of alfalfa entries (commercial varieties and experimental biomass populations) at several locations. This work will continue short term, while the University considers alternate sources of funding for the long term effort. This work is being done without DOE support.

### Subtask 2.3 Best Management Practices

Cooperator farms have been secured near Wendell MN, Spicer MN, and Brookings SD. The following demonstrations are being held at cooperator farms this year: Seeding Rates, Establishment Methods, and Potato Leafhopper Varieties. The same treatments for each trial will be used on the demonstration farms. MnVAP is also obtaining suggestions and background information for the best management practices guide.

Conducted "Alfalfa Production and Management" education programs in Tyler, Cottonwood, Morris, and Wheaton, MN. Conducted "Large Square Bale Package" meeting at Morris, MN. Planted a seeding equipment comparison demonstration on the Minnesota Forage and Grassland Council's Forage Expo 2000 site, near Morris, MN.

## Task 4 Sales and Supply Contracts

### Subtask 4.1 Power Purchase Agreement (PPA)

Negotiations continued with NSP to obtain language changes needed to accommodate the delays caused by the PUC and EQB. The PUC filing was supported as necessary.

The PUC met on March 25<sup>th</sup> and approved the Power Purchase Agreement between MnVAP and NSP, subject to a series of modifications. The Order has been received with the modifications.

The PUC met again in June to consider MEC's petition for reconsideration. This petition was denied.

#### **Subtask 4.2 Biomass Fuel Supply Agreement**

No significant progress was made on this task during the period.

#### **Subtask 4.3 Supplemental Fuel Supply System**

#### **Subtask 4.4 Alfalfa Leaf Meal Market Development**

##### ***4.4.1 Domestic Marketing of ALM Products***

Discussions with several significant feed and animal operations continued in an effort to develop alliances where further commercial scale testing of ALM can be conducted, in potential customers feeding operations. An agreement has been reached with a Minnesota dairy to further test ALM's performance in an operating dairy. Initial results are positive.

Small quantities of ALM have been sold on a simple commercial basis and additional quantities have been produced for use in commercial scale trials. The product continues to create interest among users, in spite of an extremely soft market.

The market for all feed ingredients remain soft, securing new sales that represent significant volume continues to be a struggle. This work is being done without DOE support.

##### ***4.4.2 International Marketing of ALM Products***

International markets also remain soft. To date our sales into the export market have been limited, yet, we continue to make in-roads. We have had several discussions with potential importers to Israel, Croatia, Venezuela, North Africa, Puerto Rico, Chile, and United Arab Emirates. While these discussions represent different levels of seriousness, the effort continues. This work is being done without DOE support.

#### **Subtask 4.5 Inert Gas Supply System**

#### **Task 5 Environmental Permits**

##### **Subtask 5.1 Prepare Critical Path Permit Applications**

Efforts in this area have been suspended.

##### **Subtask 5.2 Alternative Power Plant Siting Study**

Efforts in this area have been suspended.



### **Subtask 5.3 Alfalfa Processing Facilities Siting Study**

The Wendell site is being evaluated to confirm that the infrastructure requirements can be met. Discussions continue with local officials. Financing for this facility is being developed and the environmental permitting process has started. This work is being done without DOE support.

### **Subtask 5.4 Studies to Support Project Design and Permit Applications**

Efforts in this area have been suspended.

#### ***5.4.2 Alternative Ash Disposal Method***

Alfalfa was harvested for the fourth and final time and dry weight measurements were taken. The experiment was terminated and soil and plant samples were analyzed for nutrients and metals. The Sugar beet experiment was continued through the end of the May.

### **Task 6 Education, Environment, Economy**

#### **Subtask 6.1 Enhanced Community Education Program**

Opportunities in agriculture from incorporating biomass energy crops into the rotation was the theme of two presentations one at the Office of Environmental Assistance's Sustainable Development Conference and the other to the Minnesota Milk Producers Association.

Developed and distributed "Power of Alfalfa" community education publication.

#### **Subtask 6.2 Environment: Land Use Demonstrations**

University of Minnesota personnel and collaborating organizations are continuing community education programs which highlight the benefits of resource-conserving energy crops.

Minnesota River Adventures is a pilot program being developed to challenge youth in grades 8-10 in western Minnesota to learn how cropping systems and other land-use practices impact water quality in the watershed they live in. Minnesota River Adventures is a cooperative effort between University of Minnesota Extension, the Center for 4-H Youth Development and the Center for Alternative Plant and Animal Products.

Minnesota River Adventures is a participatory learning experience to develop demonstration projects that highlight the value of resource-conserving crops for improving water quality.

Demonstration plantings of a resource conserving energy crop(s) will be established in the Minnesota River Basin under a Legislative Commission on Minnesota Resources funded project with the Minnesota River Basin Joint Powers Board.

Demonstration plantings of resource conserving energy crops (including: alfalfa, hybrid poplar, willow, and native grasses) will serve as the focal point for environmental education and to demonstrate viable land-use alternatives for farmers in the basin.

### **Task 7 Final Report – Phase II Application**

Efforts in this area have been suspended.

### **Task 8 Project Administration**

#### **Task 8.1 Coordination and Control**

Management of the work under this project and the accounting associated with it continues. Coordination has continued with the PUC, EQB, Citizen's Task Force, Granite Falls Task Force, University of Minnesota, Wendell Economic Development Committee, the Carbona gasification tests, Engineering firms and others.

Financing discussions and development of updated documents, such as the Business Plan continue.

At the request of DOE, a complete review of the project status has been completed. Quarterly reports and monthly invoices have been completed.

Work has begun on demobilization , including the cross-training of personnel and the final report.

#### **Task 8.2 Project Business Entity**

We have approached a total of eight potential development partners and several potential equity partners.

Attachments

1. Carbonna Reports – quick reports April 28, 1999 and June 11, 1999.

# CARBONA

June 11, 1999

Carbena Corporation  
4501 Circle 75 Parkway, Suite E-5300  
Atlanta, GA 30339, USA

## WORK REPORT

for "Second Pilot Plant Gasification Test" MAP-Project (MAP/DOE-220)

period: May 1, 1999 – June 15, 1999

### Subtask 1.1 Variability Test

#### 1.1.1 Preparation and Fuel Selection

- Completed

#### 1.1.2 Fuel Laboratory Analysis

- Completed

#### 1.1.3 Bench Scale Gasification Tests

- Completed

#### 1.1.4 Bench Scale Testing and Additives

- Completed.

#### 1.1.5 Data Analysis and Reporting

- Completed

### Subtask 1.2 Pilot Plant Modifications

#### 1.2.1 Preparation and Status Survey

- Completed

#### 1.2.2 Engineering

- Completed

#### 1.2.3 Procurement of Equipment

- Completed

#### 1.2.4 Modification Work and Maintenance

- Completed.

#### 1.2.5 Commissioning of Equipment

- Completed.

### Subtask 1.3 Pilot Plant Testing

#### 1.3.1/ Fuel Analysis

- Completed

#### 1.3.2/ Test Planing

- Completed

#### 1.3.3/ Test Preparation

- Completed

#### 1.3.4/ Gasification Tests

- Post-test inspections and plant cleaning completed

- Documentation of plant modifications completed

- Final disposal of remainder fuel under preparation

CARBONA INC.  
Kaupintie 11  
FIN-00440 Helsinki  
Tel. +358-(9)0-5407 150  
Fax +358-(9)0-5407 1540  
E-mail: cb.hki@carbena.fi

CARBONA INC.  
P.O.Box 610  
FIN-33101 Tampere  
Tel. +358-(9)31-358 0300  
Fax +358-(9)31-358 0325  
E-mail: cb.tre@carbena.fi

CARBONA CORPORATION  
4501 Circle 74 Parkway, Suite E-5300  
Atlanta, GA 30339, USA  
Tel. +1-770-956 0601  
Fax +1-770-956 0063  
E-mail: carbona\_atl@ibm.net

# CARBONA

June 11, 1999

## 1.3.5/ Test Data Analysis

- Final report of VTT-Energy submitted on May 7
- Data analysis completed on May 24

## 1.3.6/ Test Results and Reporting

- Final report preparation started on May 3
- Final report submitted to Carbona Corporation on June 10

## Subtask 1.4 Project Management

- MAP-Project follow-up.
- CBI internal MAP project meetings on May 3, 10, 17 and June 7

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CARBONA INC.  
Kaupintie 11  
FIN-00440 Helsinki  
Tel. +358-(9)0-5407 150  
Fax +358-(9)0-5407 1540  
E-mail: [cbi@carbona.fi](mailto:cbi@carbona.fi)

CARBONA INC.  
P.O.Box 810  
FIN-33101 Tampere  
Tel. +358-(0)31-358 0300  
Fax +358-(0)31-358 0325  
E-mail: [cbi@carbona.fi](mailto:cbi@carbona.fi)

CARBONA CORPORATION  
4501 Circle 74 Parkway, Suite E-5300  
Atlanta, GA 30339, USA  
Tel. +1-770-956 0601  
Fax +1-770-956 0663  
E-mail: [carbona\\_atl@um.net](mailto:carbona_atl@um.net)

# CARBONA

April 28, 1999

Carbena Corporation  
4501 Circle 75 Parkway, Suite E-5300  
Atlanta, GA 30339, USA

## WORK REPORT

for "Second Pilot Plant Gasification Test" MAP-Project (MAP/DOE-220)

period: April 1, 1999 - April 30, 1999

### Subtask 1.1 Variability Test

- 1.1.1 Preparation and Fuel Selection
  - Completed
- 1.1.2 Fuel Laboratory Analysis
  - Completed
- 1.1.3 Bench Scale Gasification Tests
  - Completed
- 1.1.4 Bench Scale Testing and Additives
  - Completed
- 1.1.5 Data Analysis and Reporting
  - Final report received from VTT-Energy

### Subtask 1.2 Pilot Plant Modifications

- 1.2.1 Preparation and Status Survey
  - No activity in this area.
- 1.2.2 Engineering
  - No activity in this area.
- 1.2.3 Procurement of Equipment
  - No activity in this area.
- 1.2.4 Modification Work and Maintenance
  - Completed.
- 1.2.5 Commissioning of Equipment
  - Completed.

### Subtask 1.3 Pilot Plant Testing

- 1.3.1/ Fuel Analysis
  - Completed.
- 1.3.2/ Test Planning
  - Test planning for third test period completed.
- 1.3.3/ Test Preparation
  - Test preparation meeting for third test period on April 12.
  - Pressure test for third test period on April 17.
- 1.3.4/ Gasification Tests
  - Third test period on week of April 19.
  - Gasified wood for 5 hours, alfalfa for 37 hours

CARBONA INC.  
Kauchole 11  
FIN-00440 Helsinki  
Tel. +358-(0)9-5407 150  
Fax +358-(0)9-5407 1540  
E-mail [cb.hw@carbona.fi](mailto:cb.hw@carbona.fi)

CARBONA INC.  
P.O. Box 810  
FIN-33101 Tampere  
Tel. +358-(0)31-358 0300  
Fax +358-(0)31-358 0325  
E-mail [cb.ire@carbona.fi](mailto:cb.ire@carbona.fi)

CARBONA CORPORATION  
4501 Circle 74 Parkway, Suite E-5300  
Atlanta, GA 30339, USA  
Tel. +1-770-956 0601  
Fax +1-770-956 0063  
E-mail [carbونا\\_atl@ibm.net](mailto:carbونا_atl@ibm.net)

# CARBONA

April 28, 1999

- Consumption: wood 8.2 tons, alfalfa 90 tons, dolomite +kaolin 3.2 tons
- Set point 3A and 3B at 12-10 bars and 700 °C
- Using kaolin additive.

### 1.3.5/ Test Data Analysis

- Data analysis started on March 29 and continued over third test period

### 1.3.6/ Test Results and Reporting

- Quick report of first and second period submitted on April 9
- Updated quick report including third test period submitted on April 29.

### Subtask 1.4 Project Management

- MAP-Project follow-up.
- CBI internal MAP project meetings on April 12, 26.

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CARBONA INC.  
Kaupintie 11  
FIN-00440 Helsinki  
Tel. +358-(9)0- 5407 150  
Fax +358-(9)0- 5407 1540  
E-mail cb.hki@carbona.fi

CARBONA INC.  
P.O.Box 610  
FIN-33101 Tampere  
Tel. +358-(9)31- 358 0300  
Fax +358-(9)31- 358 0325  
E-mail cb.tre@carbona.fi

CARBONA CORPORATION  
4501 Circle 74 Parkway, Suite E-5300  
Atlanta, GA 30339, USA  
Tel. +1- 770- 956 0601  
Fax +1- 770- 956 0053  
E-mail carbona\_atl@ibm.net