MISSISSIPPI BIODIESEL FEASIBILITY STUDY

Alcorn State University
Mississippi Small Farm Development Center
Alcorn State, Mississippi

Magid Dagher, Ph.D. P.I.
Rani Panicker, M.S. Research Associate
Elizabeth Myles, M.S. Research Associate
Nicole Bell, B.S. Research Associate

Prepared for:

MISSISSIPPI BIOMASS COUNCIL

MISSISSIPPI BIODIESEL FEASIBILITY STUDY

Prepared for

The Mississippi Biomass Council

By

Magid Dagher, Ph.D.
Rani Panicker, M.S.
Elizabeth Myles, M.S.
Nicole Bell, B.S.
Mississippi Small Farm Development Center
Alcorn State University

Magid Dagher, Director, Mississippi Small Farm Development Center, received a Ph.D. degree from University of Kentucky in Agricultural Economics. He was the principal investigator for the Mississippi Biodiesel Feasibility Study.

Rani Panicker, Research Associate, received a M.S. degree from Alcorn State University in Guidance Counseling. She assisted with the implementation of the study, compilation of the data, and preparing the final report.

Elizabeth Myles, Research Associate, received a M.S. degree from Alcorn State University in Guidance Counseling. She assisted with the implementation of the study, compilation of the data, creating the directories, and preparing the final report.

Nicole Bell, Research Associate, received a B.S. from Alcorn State University in Computer Science. She assisted in the implementation of the study, compilation of the data, creating the directory and preparing the final report.

TABLE OF CONTENTS

ACKNOWLEDGMENTS

This report was prepared by Dr. Magid Dagher, Elizabeth Myles, Rani K. Panicker and Nicole Bell with assistance from the staff of the Mississippi Small Farm Development Center (SFDC) at Alcorn State University (ASU). The authors are grateful to the following organizations for providing data and assistance to the authors: the Mississippi Department of Health, Mississippi Association of Restaurants, Griffin Industries, Inc., Gold Coast Commodities, Inc., Protein Products, Tyson Foods and the fast food restaurants in Mississippi. The authors also thank: Mississippi Development Authority-Energy Division (MDA-ED), Mississippi Technology Alliance-Mississippi Alternative Energy Enterprise (MTA-MAEE), and the Mississippi Biomass Council (MBC) for coordinating the project and for allowing ASU-SFDC the opportunity to participate.

Moreover, the authors recognize the following individuals for their timely recommendations and contributions to the study: Girish K. Panicker, Ph.D., Director USDA Conservation Research Project and Wes Miller, Marketing Specialist, Alcorn State University-Small Farms Development Center (ASU-SFDC).

For further information regarding this report, contact the Alcorn State University, Mississippi Small Farm Development Center, 1000 ASU Dr. # 1080, Alcorn State, MS 39096, phone (601) 877-3947, fax (601) 877-3931.

MISSISSIPPI BIODIESEL FEASIBILITY STUDY

Executive Summary

United States farmers have been impacted by slow economic conditions during the past few years. Falling commodity prices, higher production costs, and increasing regulatory pressures have not been offset by yield increases sufficient to produce a profit on many farms.

The majority of Americans live in areas that do not meet at least one federal air quality standard. In 1990, Congress passed Clear Air Act Amendments designed to combat high emission levels of carbon monoxide and the creation of ozone caused by petroleum-based transportation fuels. Oxygen-containing renewable fuel alternatives such as biodiesel (fatty-acid methyl ester made from vegetable oil or animal fat) can dramatically reduce noxious emissions from petroleum-fueled diesel engines. Biodiesel used as a 100% fuel or in a typical 20% blend with petroleum diesel reduces visible smoke, odor and other emissions.

Biodiesel is similar to vegetable oil; it contains no sulfur and has excellent lubricity. It is biodegradable in water and can be produced from animal fats and recycled cooking greases. Diesel's roots are organic. Rudolph Diesel, the German engineer whose engine concept (published in 1893) eventually bore his name, fueled his prototype with peanut oil. Biodiesel is the fastest growing alternative fuel in the country according to the National Biodiesel Board (NBB). NBB touts biodiesel's ability to extend engine life, improve fuel economy, decrease air pollution and reduce reliance on foreign fuel. According to President George W. Bush, "Biofuels are gentle on the environment. They are fuels that can be renewed year after year, and fuels that can expand our farm economy. These fuels are made right here in America, so they can't be

threatened by any foreign power. Biofuels are fuels of the future for this country."(Renewable Fuels Association, 2002)

Many farmers and companies involved in agriculture are now looking for alternative crops in an effort to add value to commodities and gain additional income from the market place. The United States imports 57 percent of its petroleum needs. The production of biodiesel as a substitute can decrease our heating, transportation, and industrial requirements for petroleum products. Waste grease from restaurants or from industrial food processors can be recycled and used to produce biodiesel fuels. Biodiesel improves engine efficiency and has similar power characteristics as petroleum based fuel. Federal financial incentives also exist for biodiesel. Notably, a $ 1.00 per gallon blender's credit and commodity reimbursements through Commodity Credit Corporation (included in the 2002 Farm Bill).

The principal biomass waste streams in Mississippi are generated by agriculture, wood products manufacturing, waste oil producers, and municipal solid waste. Mississippi oil seed producers are seeking opportunities to add value to their soybeans and other oilseeds because low commodity prices adversely impact profits. Converting oilseed to a biodiesel fuel product that can be blended with petroleum based diesel fuel allows producers to enter the rapidly growing market for renewable liquid fuels. Energy crops can be grown on most of the state cropland. Energy crops offer economic advantages when produced on erosive lands or lands that are otherwise limited for conventional crop production.

Biodiesel fuel requires no engine modification for use in conventional diesel engines. Soybean growers in Mississippi could benefit from the growth of a biodiesel market in Mississippi. Biodiesel is also safer to store, handle and use than petroleum. With a flash point of 300 degrees

Fahrenheit (versus 125 degrees Fahrenheit for petroleum diesel), biodiesel is considered nonflammable and is not required to carry a Hazardous Material label. When made from recycled oil, it offers savings in landfill or other disposal costs. Compared to petroleum based diesel, biodiesel reduces carbon dioxide emissions by 78% and lowers cancer causing compounds at least 50%. Biodiesel has a future in Mississippi, just as it has in the nation. According to Dr. Lester Spell, Mississippi Commissioner for Agriculture and Commerce, "Biodiesel burns cleanly, it provides an alternative use for our crops and it provides a good means of disposing of food waste." (*Tupelo Daily Journal*, 2003). Biodiesel has the potential for positive energy, environment, and economic impacts. Studies indicate that it is feasible to use animal fat and restaurant grease to produce biodiesel. This fuel can be produced domestically and blended with traditional diesel to boost energy security while creating new crops and markets for farmers. Biodiesel is registered as a fuel and fuel additive with the Environmental Protection Agency (EPA) and meets the clean diesel standards. Neat (100%) biodiesel has been designated as an alternative fuel by the Department of Energy (DOE) and the US Department of Transportation.

MISSISSIPPI BIODIESEL FEASIBILITY STUDY

Chapter I: Introduction

The Mississippi State Legislature established the Mississippi Small Farm Development Center (SFDC) at Alcorn State University (ASU) in 1988. The mission of the SFDC is to promote, enhance, and facilitate the development of small farms and alternative agricultural enterprises, including international marketing, and thereby improve the economic condition of small farmers throughout Mississippi.

The Center was funded with $250,000 in 1993 and began offering interest free loans through its agricultural loan program in 1995. The loan program was expanded in 1996 when the Center received $1 million to support emerging crop and livestock enterprises, to promote the development of value-added products and to establish effective marketing systems.

Mississippi SFDC collected data on animal fats and recycled restaurant and related institutional food service fats from primary and secondary sources as part of its contribution to the study. The data collected by the center is extensive. However, some of the data will require further validation in a later study. Because of the difficulty in contacting the large number of waste stream sources, some conclusions were based on averages and random verification.

Project Background

The Mississippi Development Authority Energy Division (MDA-ED) and the Mississippi Technology Alliance-Mississippi Alternative Energy Enterprise (MTA-MAEE) awarded a grant to Mississippi Biomass Council (MBC) to determine the feasibility of a biodiesel industry in

Mississippi. The Mississippi Biomass Council was responsible for coordinating the study with four contractors. ASU-SFDC coordinated a resource study to develop a database, which will aid in determining the feasibility of starting a biodiesel industry in the state.

The goal of the study is to:

- identify and quantify locally available biodiesel feed stocks;
- identify and quantify local and regional biodiesel markets;
- identify current and propose future government incentives for biodiesel production and consumption;
- organize the data in a user-friendly form which is accessible to business developers; and
- create an internet site containing spreadsheet data with geographical information systems (GIS) capabilities, and with the capability to allow users to retrieve data on command.

Statement of Work

Alcorn State University's Small Farm Development Center developed a project management team to complete the following tasks for the Mississippi Biodiesel Feasibility Study.

A. Quantify the amounts of rendered fats, including spent or recycled restaurant fat (animal and vegetable), which can be transesterified to produce bio-diesel. Survey animal processing facilities in the state and document the amounts fat derived from swine, cattle, poultry and fish operations.

B. Document current methods of disposal of animal fats and the costs associated with disposal.

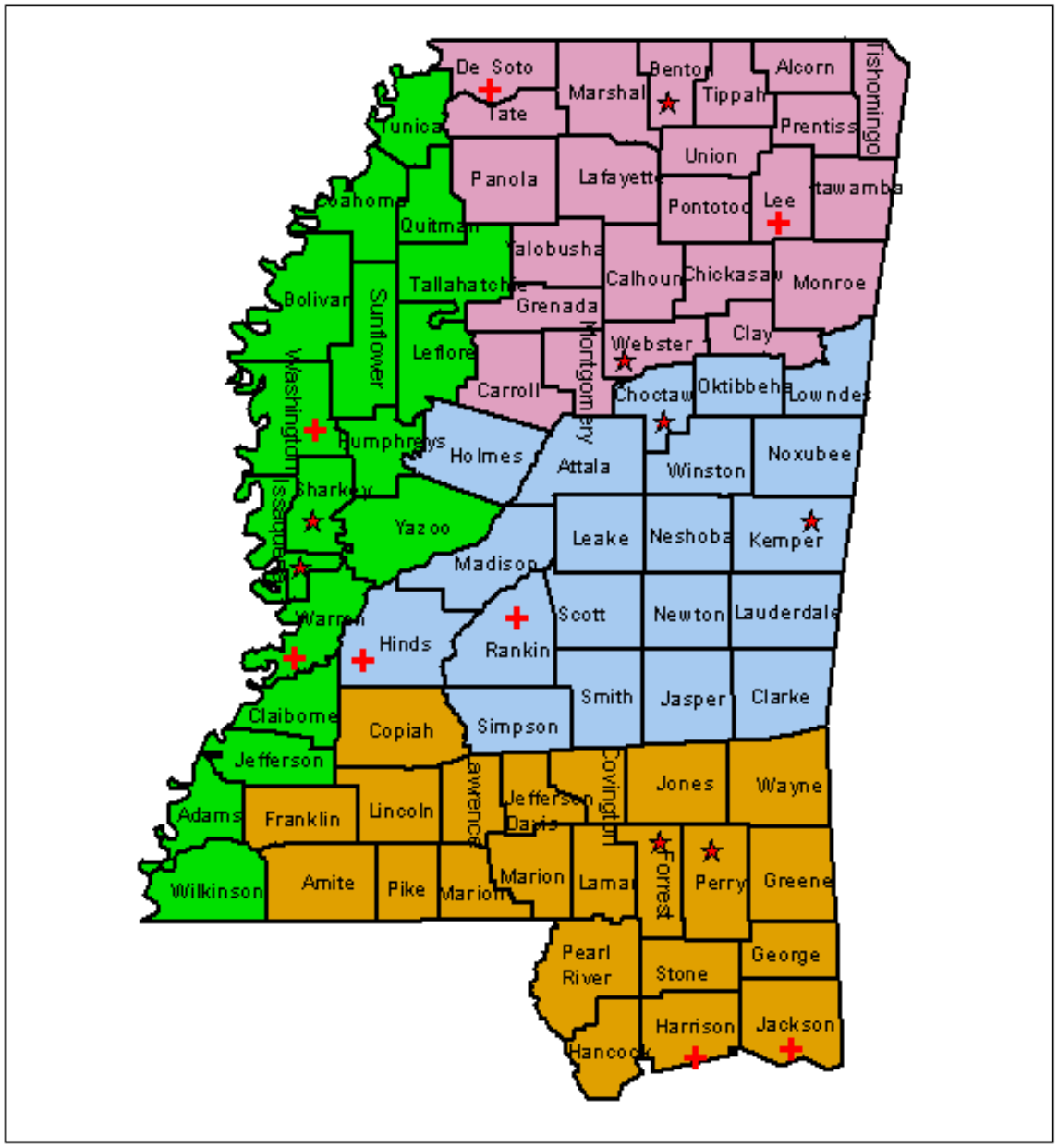
C. Identify and locate the county co-operatives and the Mississippi County Extension offices with their physical addresses, mailing addresses, mail stops and contact information from the Agricultural Census.

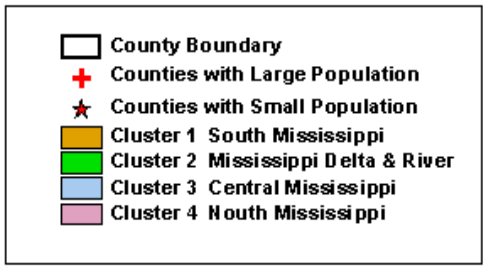
Chapter II: Methodology

The Alcorn State University, Mississippi Small Farm Development Center secured an extensive database from the Mississippi Department of Health. Mr. Rick Griffin provided a list of 12,253 restaurants in Mississippi that fall under the following categories: fast food or delicatessen, full service restaurant, full service bar, food processor, hospital/nursing home, educational institution, bakery/donuts/coffee shop, correctional facility, seafood market, bar with prepackaged food, food repacker, and mobile food unit.

Time and funds did not allow the ASU-SFDC to contact the 12,253 restaurants to obtain waste oil data. An approximation method was used by creating a cluster map (see page 11) to divide the state into four geographic regions: North, South, Central, and Delta River. ASU-SFDC used the 2001 Agriculture Census to determine the population of each county. In each region two counties with the highest population and two counties with the lowest population were selected to conduct a restaurant survey using mail questionnaires. In the North region the highest populated counties are Desoto and Lee; the smallest populated counties are Benton and Webster. In the South region the highest populated counties are Harrison and Jackson; the smallest populated counties are Forrest and Perry. In the Central region the highest populated counties are Hinds and Rankin; the smallest populated counties are Choctaw and Kemper. In the Delta River region the highest populated counties are Washington and Warren; the smallest populated counties are Issaquena and Sharkey. Sixty-four surveys were mailed to randomly selected restaurants in the above counties. The survey questionnaires asked for the amount of restaurant grease being used on a daily, weekly, or monthly basis and for the disposal method and cost. However, this method was not successful since only two surveys were returned to the ASU-SFDC.

CLUSTER MAP OF MISSISSIPPI RESTAURANTS





The second method ASU-SFDC used for data collection was through the Mississippi Restaurant Association. Information was collected on five of the leading recycling plants in the state, Griffin Industries, Inc. (Jackson, MS), and Gold Coast Commodities, Inc. (Brandon, MS), Ferguson Gravel (Greenwood, MS) Birmingham Hide and Tallow Inc. (Birmingham, AL) and W.B. Riggins Tallow (Trussville, AL). Field and phone surveys were conducted with the Recycling Specialist at four corporations. Collectively we estimate that these companies provide grease disposal service for over 7,000 restaurants in Mississippi. Daily trade value of grease was obtained using the Jacobsen Publishing Company report.

Jacobsen reports that $.10/lb is the current average price of waste grease. Prices range from .10 to .14 cents per pound. All licensed grease handlers offer collection systems to meet the needs of various types of clients and provide heavy-duty metal storage containers in a variety of sizes. Although grease collection receptacles vary in size, the most common container has a capacity of 300 gallons or 1,000 pounds. Environmental Protection Agency Guidelines for the "Assessment, Classification and Management of Liquid and non-Liquid Waste, 1999" prohibits the disposal of commercial kitchen waste other than through using a licensed commercial handler. The National Renderers Association estimates that there are three billion tons of yellow grease produced per year and 46 billion tons of animal fats produced annually. In the absence of recycling programs to produce animal food and fertilizer, our landfills would soon exceed their capacity. ASU-SFDC research indicates that a small portion of the waste grease generated is not accounted for because some smaller restaurants dispose of grease by pouring it down the sink drain. It eventually reaches the municipal sewage or rural wastewater disposal system. It has been reported that some restaurants sell directly to haulers who may not be licensed to handle or dispose of cooking oil. Many of the restaurants in the database, such as deli's or pizza parlors do

not use grease. [1]The majority of grease collected in Mississippi is from fast food and full-service restaurants (including casinos). It is estimated that Mississippi may generate enough restaurant and animal fat to produce biodiesel at a competitive price in a small plant that is site specific to area of demand. However, the market demand must be evaluated on a site-by-site basis.

Phone surveys were conducted and questionnaires were mailed to two animal processing facilities in Mississippi, Tyson Foods and Protein Products. ASU-SFDC research indicates that Tyson Foods has two shifts daily and each shift collects 900 lbs. of animal fat (1800 lbs. per day). This amount varies depending on the number of birds slaughtered. The disposal cost was not made available due to confidentiality agreements. After processing, the fat goes to Central By-products Rendering Plant in Mississippi where protein is recovered and used in the production of dog food (Calcan). Protein Products produces 660,000 lbs of catfish oil weekly. The catfish oil is rendered and the oil sold for $.10 to $.20/lb.

Chapter III: Animal Processing Facilities and Recycling Company Profiles

Griffin Industries, Inc. is recognized as one of the largest privately held rendering companies in the United States with over 30 U.S. locations. Griffin Industries produces biodiesel at their Corporate Headquarters in Cold Spring, Kentucky, using recycled vegetable oil and soybean oil feed stocks. Griffin Industries operates a multimillion-dollar central laboratory as well as satellite labs at each manufacturing plant. Griffin is positioned as a leader in the research and development of rendered products. By-products are recycled into quality products such as feed ingredients, tires, plastics, paints, varnishes, cleaners, polishes, soaps, water repellents and cosmetics. Services provided by Griffin include animal by-products removal, waste oil removal, trap grease

[1]The Mississippi Department of Health database does not list casino data but, the ASU-SFDC research efforts were able to obtain this information.

removal etc. Griffin Industries is a partner of Audubon International.

Gold Coast Commodities, Inc. was founded in 1983 and has grown into a widely known industrial plant. Gold Coast has two areas of focus including the production of feed fat for the poultry industry and the manufacture of 100% soya-acidulated soapstock. Gold Coast services over 1,400 restaurants in Mississippi and is fast becoming one of the South's largest acidulators. They are also a custom formulator of blended feed fats. Gold Coast's blended animal-vegetable fat includes blends of different types and amounts of animal fats, vegetable oils and processed restaurant grease. Gold Coast is a leading formulator of fats and oils in the U. S. using both soya fatty acids and yellow grease.

J. C. Bryan, Sr. opened as a small meat market in West Point, MS in 1909. Bryan Foods processing Plant was built in 1936 by his two sons John H.S. and W.B. The company expanded outside of Mississippi and the Bryan brand developed a reputation for high quality smoked meats.

Today, Bryan Foods is a major food company with state of the art processing plants in West Point and Tupelo, Mississippi; and Athens, Alabama. Employing over 2,500 people, it is the largest single employer in Northeast Mississippi. Today, third-generation descendants of the company's founders are still involved in the management of Bryan Foods.

Tyson Foods' Mississippi headquarters is located in Forest, Mississippi. It operates chicken processing plants throughout central Mississippi. Tyson is the world's largest integrated poultry producer in the U. S. The company operates slaughterhouses or processing plants in 15 states.

Feedstock Quality

Free Fatty Acids (FFA) are undesirable in food grade oils and fats and they reduce the value of feedstocks for biodiesel. Modern biodiesel technology can handle up to 10 percent FFA, while

state-of-the-art biodiesel can accommodate up to 20 percent FFA. With the appropriate technology, most feedstocks can be made into biodiesel that meets ASTM PS.

Feedstocks	FFA %	Cents/lb
Seed Oils	<2	17-60
High grade tallow	<2	15-20
High grade lard	<2	15-20
Low grade tallow	Up to 10	13-18
High grade yellow grease	<5	8-15
Low grade yellow grease	<10	4-10
Brown Grease	<20	<5
Trap and Sewage Grease	>20	-5

National Biodiesel Board

Feedstock Conversion Ratio:

The National Biodiesel Council and the Southern Biodiesel Corporation provided the standard formulae for conversion shown below. Conversion figures for each county were conservatively estimated using the calculation for dirty grease. Glycerin production was estimated at 6.6 percent when using dirty grease feedstock.

1 bushel of soybean	=	1.4 gallons of biodiesel
7.5 lbs. of culled grease	=	1 gallon of biodiesel
10 lbs. of dirty grease	=	1 gallon of biodiesel

Using hard data collected at seven counties through phone surveys and from licensed grease handlers and through site visits to 30 facilities, models were developed to establish averages for the amount of grease collected in the various types of restaurants. One of each of the 15 types of restaurants listed in the data tables was called on for data verification. We were not surprised to find that the larger organizations such as South Mississippi Regional Center in Long Beach or nursing facilities in Peal River County were close in our estimations. The problem category for verification was small restaurants whose grease was not picked up by a licensed hauler. Additional time was devoted to verifying amounts estimated in this category characterized as Other in the data tables. Twenty (20) small restaurants were directly contacted through site visits in selected counties throughout the state. Restaurants were chosen in Jackson, Forrest, Hancock, Harrison, Hinds, Sharkey and Stone Counties to aid in developing a standard of deviation for projected figures of grease collection. The restaurant database gave the specific number and type of restaurant in each county. The model created with averages from the grease handlers was used to develop county assessments. The category of **Grease picked-up** is a compilation of several companies. The category represented as **Other** are restaurants not picked up by the major grease handlers in each county. The study takes into account: some of these restaurants may produce grease in quantities too small to be considered for pick-up by licensed grease handlers; some of the restaurants, such as delis, use limited amounts of grease; and, some restaurants use unlicensed grease handlers or simply pour the grease down the drain. It should be reiterated that grease collection and trading is a highly competitive and instances of disposal using unlicensed handlers is low. Estimations for the **Other** category are conservative.

Chapter IV: Data Analysis on Animal Processing Facilities in Mississippi

Agriculture in Mississippi is a 4.5 billion-dollar industry employing 30 percent of the state workforce either directly or indirectly. Animal husbandry accounted for $1.9 billion in 2002 with contributions from the following sectors: poultry/eggs-$1.37 billion, catfish-$241 million, cattle and calves-$194 million, and dairy-$65 million. Hogs, ratite and sheep contributed the remaining $30 million. Mississippi has 80 meat processing facilities, all facilities dispose of waste grease through arrangements with one of the grease handlers or by direct processing into animal feed.

Chapter V: Cooperative Locations in Mississippi (Source: Agricultural Census)

Addresses	Counties
Beat IV Cooperative Route 1, Box 77. Shuqualak, MS 39361	**Noxubee**
Family Farmers Cooperatives, Inc. 1760 Highway 310 Waterford, MS 38685	**Waterford**
Indian Springs Farmers Association 9014 Old River Road Petal, MS 39465	**Forrest**
Marion County Self-Help Org. Inc. P.O. Box 361 Columbia, MS 39249	**Marion**
Mileston Cooperative Association 2632 Epps Road Tchula, MS 36169	**Holmes**
Mississippi Natural Products P.O. Box 30 Monticello, MS 39654	**Lawrence**
Mississippi Potato Producers 2763 Rosebank Road Mt. Olive Lexington, MS 39095	**Holmes**
North Bolivar Farmers Association P.O. Box 144 Mound Bayou, MS 38762	**Bolivar**

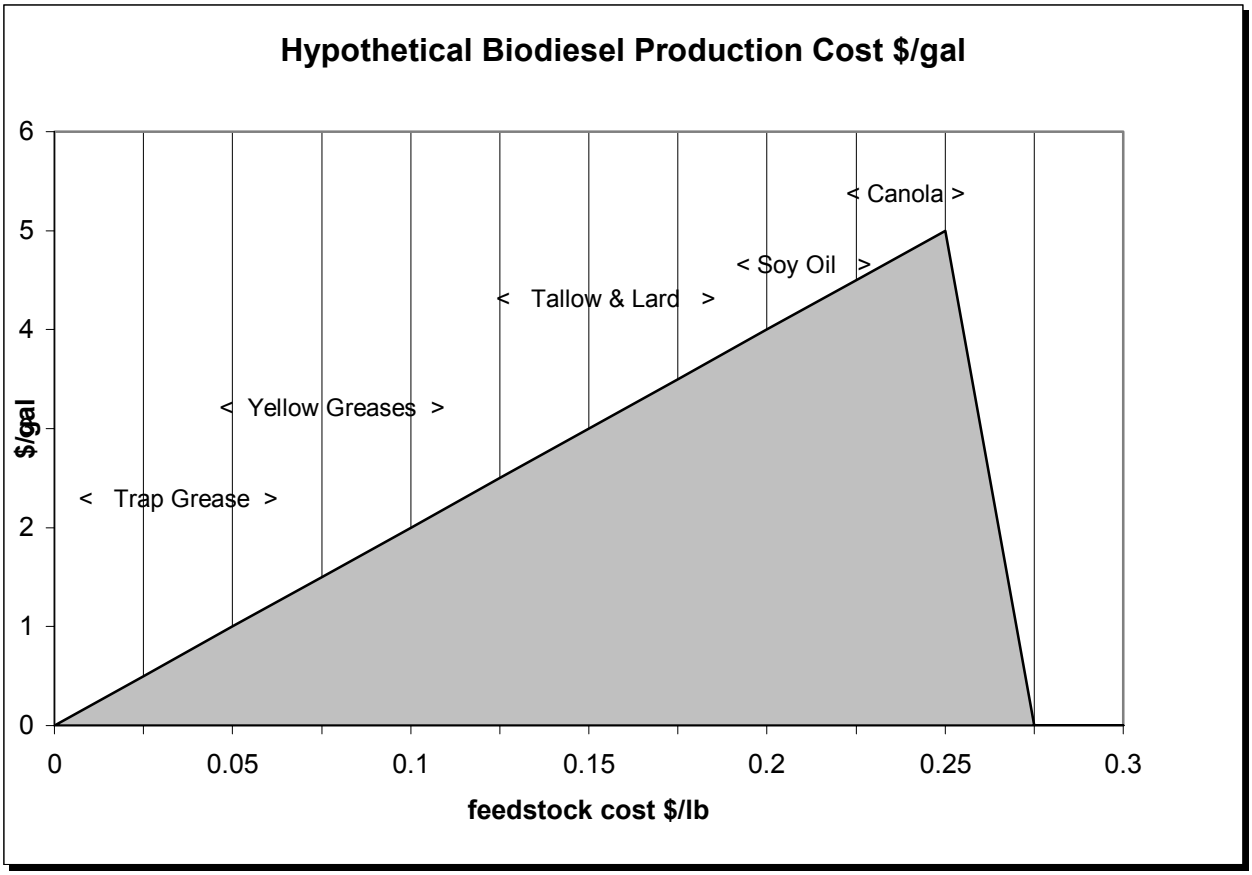
Prime Swine P.O. Box 1237 Hazlehurst, MS 39083	**Copiah**
Quitman County Improve. Association P.O. Box 386-202, Humphrey Marks, MS 38649	**Quitman**
Sweet Potato Growers Association Cooperative P.O. Box 832 Mound Bayou, MS 38762	**Bolivar**
Winston County Self-Help Livestock Asso. Route 1, Box 370 Louisville, MS 39339	**Louisville**

Chapter VI: Conclusion

Transesterification of vegetable oils (and animal fats) with methanol produces an oil/fat molecule comparable to that of diesel; the resulting esters have been given the generic name "biodiesel". Its use and potential as a renewable source of liquid fuel is prominent in the field of biofuels today. Biodiesel has multiple byproducts, which have market value in Mississippi as well. Because of its improved lubricity, biodiesel can add to the life of diesel engines even in fairly low percentage blends. Through the production and use of biodiesel, Mississippi can realize immediate environmental benefits and the potential to create additional economic opportunities for farmers and rural communities as well. Biodiesel production in Mississippi is expected to reduce the buildup of green house gases, support rural economies, improve energy independence and help balance trade.

The estimated potential Mississippi biodiesel production of 5.7 million gallons includes grease from restaurants that are currently serviced by four licensed grease handlers. Handlers have indicated that they are willing to make their grease available if it can be sold at a price that is higher than the current value for animal food commodities. Cost would have to fluctuate to stay

above the commodity trading price which generally ranges between $.10 to $.14 cents per pound. This price range remains slightly lower than the costs of soybean oil, tallow, canola or other feedstocks used to produce biodiesel (see chart).



This study accounts for the approximate 7,000 institutions that have grease collection and provides estimates on the amount of grease that cannot be accounted for. Although we had reports on Ferguson Gravel based in Greenwood being a hauler, they did not wish to participate in the study. Attempts were made to contact firms with processing facilities and transfer stations in Arkansas and Louisiana, however no data was available showing that operations are present in Mississippi. The amount of grease represented by the category **Other** (not picked up by a licensed handler) would not support a commercial biodiesel facility. Although the amount of potential biodiesel that can be produced from this waste is about 308,580 gallons, the facilities a spread apart and would

require a separate collection and transportation network. There is a higher probability of biodiesel being produced through negotiation with existing licensed haulers. Biodiesel production from animal fats and grease is feasible if plant size is small and located with in a 50 mile radius of the feedstock. Small in this instance would mean a plant with a capacity of 10,000 to 100,000 gallons per year. The amount of grease available in any four counties is not sufficient to sustain a high volume production facility plant which typically makes 100,000 to 1,000,000 gallons per year. A high production plant in Mississippi would necessitate the use of vegetable matter as a feedstock in addition to waste grease.

The great benefit of biodiesel is that it is a renewable source of energy. There are a number of reasons for our country to use biofuels. The most important is that the world's petroleum resources will not last forever. Since biofuels are made from renewable sources, they provide the assurance against the uncertainty surrounding the petroleum resource. Our agricultural community in Mississippi stands to benefit, providing options for new valuable crops and new uses for existing crops and residues, plus creating jobs.

Benefits of Biodiesel

Biodiesel made from animal fats or vegetable oils has many benefits. Some are included below:

- creates new production jobs and new industries,
- insurance against oil embargos,
- it is biodegradable and non- toxic- no danger from oil spills; safer to handle,
- reduces life cycle C02 by 78%,
- reduces dependency on foreign oil,
- it is a renewable energy source,
- reduces hydrocarbon and carbon monoxide emissions,
- reduces particulate emissions and smoke,

- has higher cetane value than conventional diesel,
- has higher flashpoint than diesel (safer),
- longer shell life and more stable-study by U. S. Navy,
- has no sulfur and contains 11% oxygen by weight (diesel has 0% oxygen), and
- existing diesel engines and equipment do not need to be altered in order to use it.

References

1. Bailey, Brent; " Agriculture and America need Renewable Fuels," article in Mississippi Farm Country, www.msfb.com, February 7, 2003.

2. Biofuels for Sustainable Transportation- U.S. Department of Energy; article Biofuels and the Environment"; "What is Renewable Diesel?" www.ott.doe.gov/biofuels, February 11, 2003

3. "Biodiesel Benefits," article in The Soy Daily, www.thesoydailyclub.com. February 7, 2003

4. Biocycle Magazine article; "Used Cooking Oil Turned into Diesel Fuel," prepared by Elizabeth Pierson and interview with Peter Arnold. May, 2002.

5. Biodiesel News article, "Why Use Biofuels for Home Heating Oil blend stocks?" www.biodiesel.org, July 23, 2003.

6. Biocost article, "What are Energy Crops?"www.bioenergy.ornl.gov/papers. July 23, 2003.

7. Biodiesel Newsletters, www.biodiesel.org/news. February 11, 2003.

8. "Can biodiesel fuel work in Mid-South?" Article on line www.rermag.com July 22, 2003.

9. Davidson, Gary. "Biofuels More Into New York With First Deliveries Initiatives," Alternative Fuels Advisor; October, 2002.

10. Federation of Southern Co-operatives Land Association Fund: Membership List-on line.

11. Globalideasbank article, "Biodiesel made from recycled cooking oil." www.globalideasbank.org March 12, 2003.

12. Gainesvilletimes. com article: "Biofuels could help Ag Markets." www.gainesvilletimes.com. July 3, 2003.

13. Gold Coast Commodities Inc., www.goldcoastcommodities.com.

14. Griffin Industries, Inc., www.griffind.com

15. Mississippi Agricultural Statistics Service, www.mississippi.gov/state

16. Mississippi Alternative Energy Enterprise article, "Biodiesel," www.msenergy.ms/biodiesel. February 7, 2003.

17. Mississippi Cooperative Extensive Service, www.mississippi.gov/state

18. Miller, Wes: Biomass Resources in Mississippi," article from the official site of the Mississippi Development Authority, www.mississippi.org/ Feb 3, 2003.

19. Mississippi Department of Agriculture and Commerce article, Home Page- "Alternative Energy Opportunities."www.mdac.statems.us/ January 16, 2003.

20. Mississippi State University; on line.

21. North Dakota Soybean Council article on Biodiesel. www. ndsoybean.org./biodiesel, July 7, 2003.

22. Renewable Fuels Association article; "Growing Heartland Security Today." www.ethanol.fa.org, October 9, 2003.

23. The Institute for Sustainable Energy at Eastern Connecticut State University on line article: "Biodiesel in New England 2003."

24. Tupelo Daily Journal article; "Biodiesel venture selects Nettleton. The $16 million refinery could boast area soybean prices," June 10, 2003.

25. Tyson, K. Shaine; "Biodiesel costs and Economics," National Renewable Energy Laboratory.