

AN ABSTRACT OF THE THESIS OF

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Biodiesel is a renewable, non-toxic, and biodegradable diesel fuel made from agricultural feedstocks. With a vibrant agricultural industry, Oregon is positioned to play an important role in the future of this energy source. Limiting factors to widespread biodiesel production include low value of biodiesel feedstock crops, lack of infrastructure, lagging consumer demand, and high production costs. These factors are slowing the growth of the biodiesel industry in Oregon.

This project identified opportunities and limitations for a partnership between agriculture and biodiesel in the Willamette Valley and the state of Oregon more broadly. In-depth interviews and a survey of farmer attitudes toward, familiarity with, and experience with biodiesel were conducted. Findings from this survey indicate that a majority of farmers are aware of the role agriculture can play in the future of biodiesel, agree that they have an opportunity to help reduce our nation's dependence on foreign oil, believe that biodiesel will be an important national market for Oregon agricultural products in the

next ten years, and are interested in the ability of biodiesel to provide a profitable crop.

The opportunities are obvious; farmers are positively predisposed to biodiesel and wait for openings to become full participants in Oregon's biodiesel future.

Key Words: biodiesel, agriculture, Oregon, farmers, survey

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Biodiesel in Oregon: An Agricultural Perspective

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I understand that my project will become part of the permanent collection of Oregon
State University, University Honors College. My signature below authorizes release of
my project to any reader upon request.

Emily Loren Lahmann, Author

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DEDICATION

I would like to dedicate this project to my mom, Martha Tisdale. Without your help and support, I would have never completed this seemingly monumental task. Thank you!

Biodiesel in Oregon: An Agricultural Perspective

Biodiesel: Background and Project Focus

At the 1900 World Exhibition in Paris, France, Mr. Rudolf Diesel unveiled the first diesel engine. This innovative engine ran on peanut oil, not the petroleum-based fuel we have become so dependent on today (Stirrings). Mr. Diesel envisioned that his new engine would allow farmers to grow their own fuel. Today, more than a century later, we are working to fulfill his dream by considering the many benefits of biodiesel and the role of farmers in the future of this alternative fuel (Gosiak).

“Biodiesel is an alternative diesel fuel that is produced from animal fat or vegetable oil (such as soybean oil or recycled cooking oil)” (Schnepf). This domestically produced fuel is renewable, non-toxic, and biodegradable (Schnepf). Since biodiesel has properties similar to petroleum diesel fuel, it can be blended with petroleum diesel fuel in any ratio and has been registered with the Environmental Protection Agency as both a fuel and fuel additive (Washington State University Extension Energy Program). With a production to consumption cycle of only one year, as opposed to millions of years for petroleum-based diesel, biodiesel a very real option for developing a sustainable fuel supply, prompting increased interest in this biofuel (Hackleman and Auyong). The benefits of increased use of biodiesel are many, including reduction of U.S. dependence on foreign oil, creation of new markets for U.S. farmers, and protection of the environment (Freeborn).

Oregon is a leader in programs and initiatives encouraging energy efficiency, including the use of renewable resources (Searle, “Bio-Diesel in Oregon”). Combined with the state’s commitment to improve and protect the environment, “Oregon is ready-made for a strong renewable-fuels industry. This state has the farmers, the cropland, the sites for production plants and the proud history of leading on environmental issues. It’s ready for biofuels” (“Fueling Oregon’s future”).

Recent spikes in the cost of petroleum have led to increased interest in alternative fuels. In Oregon, where the majority of energy consumed comes from outside the state, the effect of oil price hikes and shortages is even more pronounced (Freeborn). It makes good sense to capture some of the 7.6 billion dollars Oregon spends on energy every year by producing more of our own energy, including biodiesel. Because biodiesel can be produced from agricultural feedstocks, Oregon agriculture has a significant role to play in the future of this energy source. Oregon “agriculture is well positioned to become an important component in the strategy to develop and use alternative energy sources” (Ugarte and Walsh).

Oregon agriculture contributes over 8 billion dollars of economic activity to the state each year. Eight percent of all jobs in Oregon are in the agricultural sector, with a payroll of \$2.8 billion (Bushue and Coba). In 2003, Oregon ranked first in the nation in the production of fifteen agricultural commodities, including blackberries, ryegrass seed, crimson clover, fescue seed, sugarbeet seed, and Christmas trees (Oregon Agricultural Statistics Service). The Oregon Department of Agriculture website describes the

Willamette Valley, a region along the I-5 corridor, as “perhaps the most diverse agricultural region on earth with more than 170 crops including grains, hays, grass and legume seed field crops of all kinds, tree fruits and nuts, small fruits and berries, wines, fresh and processed vegetables, Christmas trees, nursery products of all descriptions, dairy, poultry, and beef... all produced in this amazing valley”. This valley is responsible for 63 percent of all statewide gross agricultural sales (Oregon Agricultural Statistics Service).

For production of biodiesel to be a viable option in the Willamette Valley, it must “provide an income to farmers comparable to that which they could earn producing conventional crops on the same land” (Walsh and Becker). The income provided by growing biodiesel feedstocks must equal or surpass the income that a farmer could make growing grass seed, nursery products, or Christmas trees, etc. This challenge is “the major obstacle to the economic feasibility of biodiesel” (Noordam and Withers). In Oregon, other limiting factors to widespread biodiesel production include the following: lack of infrastructure, lagging consumer demand, absence of financing sources, and high production costs (Searle, “Bio-Diesel in Oregon”).

These hurdles have not dampened the enthusiasm for biodiesel in the state. In June 2005, there were ten companies expressing interest in developing biodiesel processing facilities in Oregon (Rose, “State’s first biodiesel”). However, the future of biodiesel in the Willamette Valley will not be driven by enthusiasm, alone. *This project identifies the opportunities and limitations for a partnership between agriculture and biodiesel in the*

Willamette Valley and the state of Oregon more broadly. Strategies for overcoming identified obstacles are proposed and perhaps the future of biodiesel will be moved, ever so slightly, forward.

Biodiesel: A Description

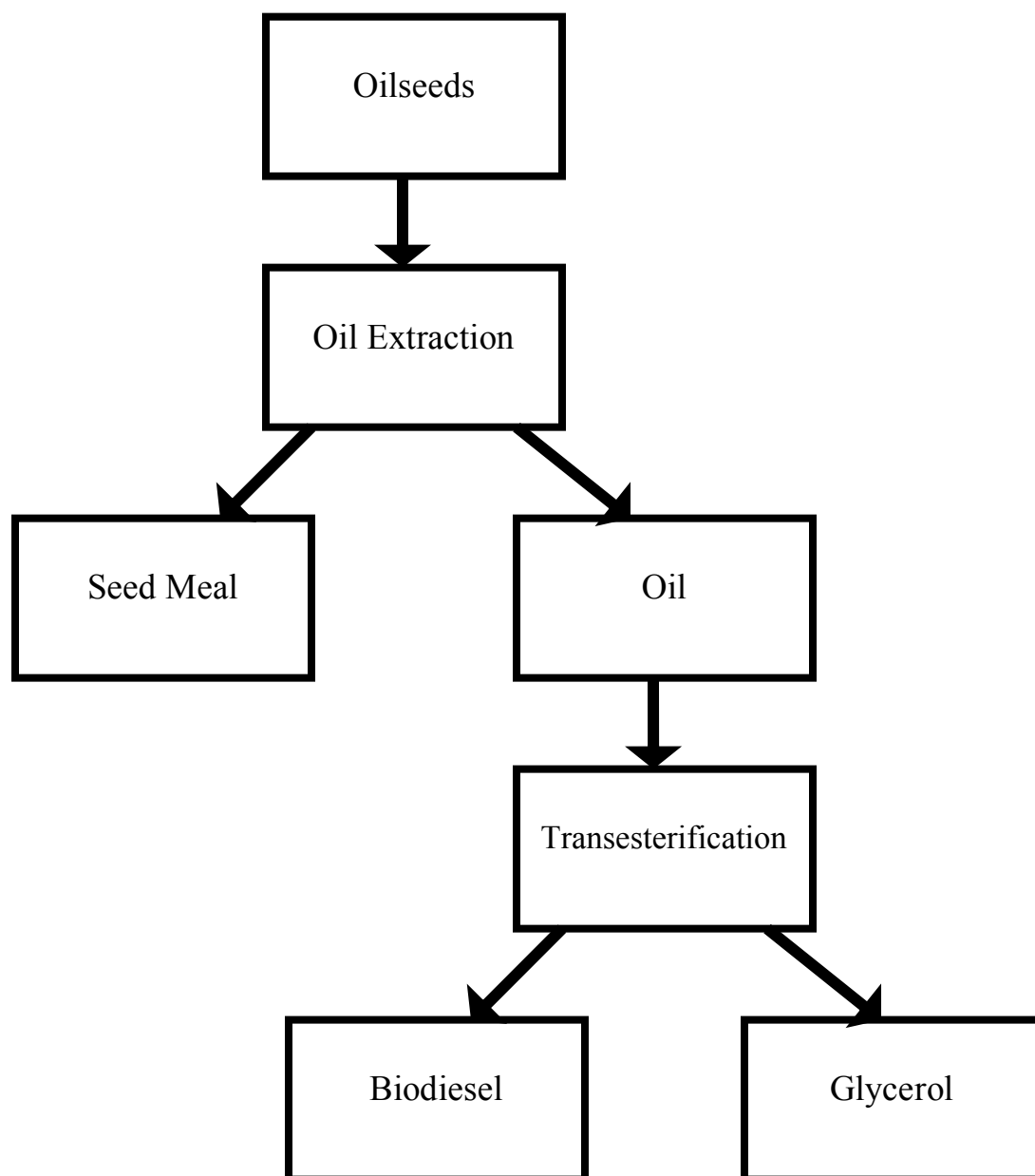
Biodiesel is made from plants or plant-derived material, such as oilseeds and used vegetable oil. With its agricultural emphasis, this project focuses only on production of biodiesel from oilseed crops. The chemical process to convert oilseeds to biodiesel includes two steps: 1) extracting oil from the seed feedstock, and 2) transesterification.

On their website, the Oregon Department of Energy provides a description of the biodiesel conversion process. Oil is extracted from seed feedstock using either a mechanical press or a solvent extraction method. The mechanical press extraction process heats the oilseed feedstock to 110 degrees Fahrenheit, and then crushes the seed in a screw press. The solvent extraction method uses a solvent to dissolve the oil from the oilseed feedstock. After extraction, a distillation process separates the oil from the solvent. Although requiring more costly equipment, the mechanical press process yields a more pure vegetable oil than the solvent extraction method.

Oil extracted by the aforementioned processes is used as an alternative diesel fuel without further processing. However, addition of the transesterification process reduces the viscosity and yields a higher quality fuel. The Oregon Department of Energy website describes the transesterification process as vegetable reacting with alcohol (methanol or ethanol) in the presence of a catalyst. With canola oil, the products of this reaction are glycerol and methyl or ethyl ester (RME or REE). Both RME and REE can be used straight or blended with petroleum diesel. B20, the most common biodiesel blend is

comprised of 20 percent biodiesel and 80 percent petroleum diesel. B100 refers to pure biodiesel (Washington State University Extension Energy Program). Figure 1 depicts the biodiesel production process from oilseeds.

Figure 1. Biodiesel Production from Oilseed Feedstock



As a renewable energy source, biodiesel contributes less to global warming than petroleum oil. It provides a market for excess production of vegetable oils and animal fats while offering excellent lubricating qualities. Biodiesel burns cleaner than petroleum fuel, while offering the potential for decreasing a country's dependence on foreign oil (Van Gerpen). Nations with surplus agricultural commodities, high greenhouse gas emissions, and high dependency on oil imports are particularly interested in this alternative biofuel and have begun to increase investments in its benefits (Shapouri).

In the United States, biodiesel production has grown dramatically in recent years. The U.S. Department of Energy predicts that by 2008, more than 500 million gallons of biodiesel will be consumed, "making it a billion dollar market" (Lackey). This growth is striking when one considers that in 2004, only 30 million gallons of biodiesel were produced. To accommodate the projected growth of the biodiesel market, some have proposed that forty-two million acres of cropland in the U.S. "could be converted to energy crop production" (Walsh). Forty-two million acres represents ten percent of all cropland acres in the U.S. and include thirteen million Conservation Reserve Program (CRP) acres. Future cultivation of CRP acres will require a change to existing law (Walsh).

Biodiesel in Oregon: Two Scenarios

SeSequential Biofuels, LLC is a biofuels marketing and distribution company founded in 2002 (“Natural Potato Chips”). With ninety percent of U.S. biodiesel made from soybean oil, most of the biodiesel sold by SeSequential comes from the Midwest (Schnepf; Renee). SeSequential is “Oregon’s largest distributor of biodiesel”, selling over 250,000 gallons of B100 through its distributors in 2004 (“Natural Potato Chips”). As a biofuels marketing and distribution company, SeSequential’s focus is on developing partnerships with regional fuel distributors. These partnerships have led to sale of SeSequential fuels throughout Oregon, including Portland, Eugene, Corvallis, Bend, Hood River, McMinnville, Medford, and Roseburg (“Natural Potato Chips”).

According to their website, since 2002 SeSequential Biofuels has experienced success in increasing distribution points for biodiesel. SeSequential’s new biodiesel processing plant in Salem, Oregon represents its first effort to produce biofuels from “feedstocks collected or produced in the Pacific Northwest”. In partnership with Pacific Biodiesel, Inc., SeSequential Biofuels will produce one million gallons of biodiesel fuel per year from used cooking oil supplied by Kettle Foods (Rose, “State’s first biodiesel”). This processing plant is expected to more than meet the yearly demand for biodiesel in Oregon (Rose, “State’s first biodiesel”). Tomas Endicott of SeSequential Biofuels “plans to push the market a lot harder and create demand for more than one million gallons of biodiesel” (Rose, “State’s first biodiesel”). Time will tell if this marketing strategy will work, but

already financial backers for this venture are optimistic that “demand for biodiesel in Oregon will grow exponentially” (Rose, “State’s first biodiesel”).

With SeQuential’s Salem plant already running at 20 percent, backers of SeQuential’s new biodiesel processing plant know that in the long run, Oregon cannot sustain biodiesel based on used cooking oil alone (Hackleman). Oregon “will need to start growing oilseed crops to supply vegetable oil” as a feedstock for biodiesel (Rose, “State’s first biodiesel”). Still, biodiesel enthusiasts see the Salem plant as the “start of a new era of home-grown energy” (Rose, “State’s first biodiesel”). But is it?

The waste vegetable oil provided by Kettle Foods to SeQuential Biofuels for processing at their new Salem plant is made from sunflowers and/or safflowers, as noted on Kettle Foods’ website. Since sunflowers and safflowers are not grown in Oregon in any measurable quantity, it could be argued that the biodiesel produced at SeQuential’s Salem plant is not “home-grown”. The vegetable oil waste is produced in Oregon, but the source feedstock is not. According to SeQuential Biofuels’ website, “biodiesel creates new markets for American farm products”. In the case of SeQuential Biofuels, these American farm products are not from Oregon.

In contrast, Pendleton Grain Growers, “a 75-year-old cooperative that serves the grain marketing and agronomic needs of 2,400 members in Morrow, Umatilla, Union, and Wallowa counties in northeastern Oregon”, is all about Oregon farmers and farm products (BCS Communications, LLC). Pendleton Grain Growers (PGG) hopes to

establish two seed crushing plants by fall of 2005. Canola grown in these Oregon counties would provide the feedstock for these crushing plants, and the byproduct, canola hulls, would be used as a high-protein feedstock in PGG's feed mill. The oil from the seed crushing plants would be processed into biodiesel at PGG's two new conversion plants. This biodiesel would then be blended with petroleum diesel and marketed as furnace oil by PGG to its members and community (Gosiak; Lies, "Pendleton co-op").

In an interview with Al Gosiak, president of PGG, Mr. Gosiak states that biodiesel works for PGG because they have the infrastructure, i.e. grain storage and a feed mill, and they are already in the heating fuel business. Gosiak understands that the key to encouraging area farmers to grow canola is to "increase what the cooperative can pay for it" (Lies, "Pendleton co-op"). Gosiak expects that the value of canola will increase as the byproducts generated by the canola to biodiesel conversion process find markets. As a high-protein feedstock, canola hulls have a ready-made market. However, Gosiak continues to search for a viable market for glycerin. By developing markets for these products, Gosiak hopes to increase the price of canola from 8.6 - 8.7 cents per pound to 10 - 12 cents per pound.

Historically, regional prices for commodities are "depressed by the cost of transportation to markets outside the region" (Nunez). Through development of local markets for canola seed, PGG's biodiesel business will circumvent transportation costs, pushing regional prices upward. In her thesis, "The Economic and Public Policy Factors Impacting the Feasibility of Biodiesel Production in Oregon", Kathy Freeborn predicts that prices for

canola seed will rise as the value of canola meal, a byproduct of the biodiesel conversion process, moves upward. Freeborn suggests that canola meal will be more valuable if the processing plant producing the canola meal is located near a livestock producing area. As PGG implements the scenario outlined by Freeborn their biodiesel venture may succeed in increasing canola prices for their growers. Time will tell.

Pendleton Grain Growers “would like to produce 1.2 million gallons of biodiesel a year from 15,000 acres of canola” (Lies, “Pendleton co-op”). However, PGG has contracts for only 700 acres of canola in Umatilla County this year from which they expect to produce 20,000 gallons of biodiesel (Gosiak; Lies, “Pendleton co-op”). Gosiak is comfortable with this small-scale beginning. As a co-op, PGG’s philosophy is to contain this new biodiesel venture within the co-op, from grower to consumer, “locally based and locally benefited” (Lies, “Pendleton co-op”). In fact, Gosiak stated that the production-consumption cycle would stay within a 50 to 75 mile radius, enhancing the sustainability of this endeavor. It just makes sense to sell biodiesel close to the production site, holding down transportation costs and fuel consumption. Is this not the point of biodiesel as a renewable, sustainable, and alternative fuel?

On their website, SeQuential Biofuels writes, “value is greater than price alone”, implying that for SeQuential, the price of a gallon of biodiesel may not be the determinant factor in a consumer’s decision to purchase and use biodiesel. SeQuential Biofuels relies on the known environmental benefits of biodiesel to outweigh the higher cost of this alternative fuel. For biodiesel enthusiasts this may be true, but for farmers,

prices paid to the farmer for biodiesel feedstock grown and the price of a gallon of biodiesel at the fuel pump are the determinant factors in their participation in the development of a biodiesel industry in Oregon. For members of PGG the economic factors are foremost. PGG's biodiesel project will be successful because it "pencils out" for the farmers growing canola, for the cattle ranchers and dairymen purchasing the livestock feed, and for the consumers purchasing the furnace heating oil. The sustainability of biodiesel and its positive environmental impacts are added benefits – not the driving force.

Biodiesel: The Role of Public Policy

The significance of public policy cannot be understated when it comes to the creation of a viable biodiesel industry in Oregon. “In the absence of a well-functioning market for transportation fuels, the biofuel industry [will] require both federal and state incentives” to develop and thrive (Shapouri). In fact, well-crafted energy policy focusing on new gasoline standards, environmental regulations, and government incentives took the corn-based ethanol industry from nonexistent in 1970 to producing 1.9 billion gallons in 2001 (Ugarte and Walsh). United States agriculture is no stranger to the importance of public policy. Since the 1930s, agricultural commodity programs and policy have been instrumental in the development of a vibrant American agriculture industry that feeds the world (Ugarte and Walsh). In the late 1970s, new legislative initiatives at both the state and federal levels were enacted, designed to “encourage the production and use of agriculture-based renewable energy” (Schnepf).

In 2004, the American Jobs Creation Act was signed into law, and became the “primary federal incentive for biodiesel production” (Schnepf). The American Jobs Creation Act of 2004 includes a biodiesel production tax credit of \$1.00 for every gallon of agri-biodiesel blended with petroleum diesel (Schnepf). This Act includes a two-year federal excise tax credit on B20, which moves the price of this biodiesel fuel closer to that of petroleum diesel (McCoy 19). The American Soybean Association and the U.S. Department of Agriculture predict that the implementation of this Act will push biodiesel consumption from 30 million gallons per year to 125 million gallons per year (McCoy 19).

In August 2005, President Bush signed the Energy Policy Act of 2005 into law. At the signing ceremony President Bush said,

“The bill also will lead to a greater diversity of fuels for cars and trucks. The bill includes tax incentives for producers of ethanol and biodiesel. The bill includes flexible, cost-effective renewable fuel standards that will double the amount of ethanol and biodiesel in our fuel supply over the next seven years. Using ethanol and biodiesel will leave our air cleaner. And every time we use a home-grown fuel, particularly these, we're going to be helping our farmers, and at the same time, be less dependent on foreign sources of energy.”

The American Farm Bureau Federation views the Energy Policy Act of 2005 as a “big win for American agriculture” “boost[ing] the supply side of the energy equation” and providing benefits to suppliers of bio-based energy (“U.S. House Passes Energy Bill”).

Before the Energy Policy Act of 2005, the Farm Security and Rural Investment Act of 2002 (FSRIA) established a requirement that federal agencies purchase bio-based products unless those products are not readily available, fall short of performance standards, or are unreasonably priced (Freeborn). Under the bioenergy program administered by the FSRIA, biodiesel producers were paid almost two million dollars in the first quarter of 2004 (Freeborn). The Clean Air Act Amendment of 1990 placed an emphasis on alternative fuels such as biomass energy, which is friendlier to the environment than traditional petroleum-based fuels (Ugarte and Walsh). By September 2006, federal mandates will require that ultra-low sulfur diesel fuel (ULSD) replace “conventional on-road diesel nationwide” (Oregon Environmental Council). The lubricant qualities of biodiesel make this alternative fuel a viable additive to ULSD (Oregon Environmental Council). Further incentives to biodiesel development are “loans,

grants, and loan guarantees for rural clean energy projects... to be provided by the Federal Farm Bill Energy Title” (Freeborn).

In 2005, Congress passed a Transportation Bill “which contains funding critical to ensure acceptance of biodiesel in future diesel engines” (National Biodiesel Board). The Transportation Bill of 2005, in combination with private industry dollars, will ensure that biodiesel engines are included in engine testing programs currently funded by the Environmental Protection Agency. Passage of this bill will “play a major role in assuring biodiesel’s place in the future of our nation’s transportation sector” (National Biodiesel Board). Research and development is an important step in the development of new technology. This bill will play a vital role in the advancement of biodiesel, helping this innovative technology assume its place in a petroleum dominated fuel market.

Government programs are also important tools in the development of a viable biodiesel industry. In 2002, the United States Department of Agriculture (USDA) implemented an incentive program for biofuels. Because of this program, production of biofuels increased from 0.5 to 20 million gallons per year (Pokarney). The USDA Agricultural Commodity Credit Corporation U.S. Bioenergy Program provides for payments to bioenergy producers. These payments reduce the retail price of biodiesel by more than one dollar per gallon (Washington State University Extension Energy Program).

While federal legislation and government programs are important, state legislation may prove to be a more significant factor in building a future for biodiesel in Oregon. In 2005,

Oregon legislators introduced six House bills and one Senate bill addressing all parts of a viable biofuel industry (Casper). These seven bills outlined incentives for farmers to grow biodiesel feedstock, for producers to process, blend and distribute biodiesel, and for consumers to purchase biodiesel (Casper). In 2003, similar bills received little support, but in 2005, these bills received broad bipartisan support, as well as support from such divergent interests as the Oregon Farm Bureau, and the Oregon Environmental Council (Casper). Toward the end of the 2005 Legislative session, these seven pending bills were combined into HB 3481 Omnibus Biofuels Bill (Biofuels 4 Oregon).

Supporters of HB 3481 hoped that this legislative package would “propel Oregon into the forefront of the emerging market for renewable fuels such as... biodiesel” (“Fueling Oregon’s Future”). HB 3481 included the following provisions:

- Property tax exemptions for processing facilities,
- Pollution Control Tax Credits,
- Farmer tax credits for growing crops (5 cents/gallon of biodiesel) – non-transferable tax credit,
- Research and development tax credit up to \$100,000 maximum for qualifying equipment,
- Streamlines energy facility siting, exempting biodiesel and ethanol facilities from certificate process, and
- Provides an exemption from the motor fuel excise tax of \$0.24 cents per gallon per 1 percent biodiesel blend, or 24 cents per gallon for B100 (Searle, “Personal Interview”).

The new language in HB 3481 dropped the Renewable Fuel Standard that was proposed in HB 3033, and expanded the Pollution Control Tax Credit previously outlined in HB 3031 (Biofuels 4 Oregon). These two changes led to an evaporation of bipartisan support and the Omnibus bill, as drafted, failed to win support and died in committee (Cole). The business lobby succeeded in expanding the controversial Pollution Control Tax Credit to all industries, not just ethanol and biofuels plants. Environmental proponents of earlier biofuel legislation considered this extension of the Pollution Control Tax Credit to be a “deal-breaker” (Cole). This once promising piece of legislation, which brought together unique and diverse interest groups, rapidly lost support, and the future of biodiesel in Oregon was the loser.

Biodiesel's Future: The Impact of Rapeseed Production Districts

While legislative agendas are played out at state and federal levels, Oregon's agricultural community is wrestling with an issue of its own, which will have far-reaching effects on the future of biodiesel in Oregon. The Oregon Department of Agriculture (ODA) established rapeseed production districts in Oregon in 1990 (Hilburn). These districts were drawn to "separate and prevent cross-pollination between edible-type (canola) and industrial oil-type rapeseed and to protect seed crops of related species from cross-pollination with canola grown for seed" (Hilburn). With increased interest in biodiesel and a desire by some to grow large acreages of canola for biodiesel feedstock, the ODA proposed new rules to protect specialty seed crops. Revisions to the Rapeseed Control Areas were introduced to address the potential negative impact of canola on other agricultural products grown in Oregon. The proposed rules prohibit production of canola for oil in "all counties of the Willamette Valley, three counties in Central Oregon, three counties in northeast Oregon, and a three-mile wide strip in Malheur County along the Idaho border" (Notice of Proposed Rulemaking Hearing). The Oregon Department of Agriculture published maps for the rapeseed control areas in 2005 (Appendix A).

On July 19, 2005, a public hearing was held in Salem, Oregon to provide opportunity for public testimony on the Oregon Department of Agriculture proposed rule, "Rapeseed Control Areas". Testimony presented at this hearing demonstrates that regardless of the numerous benefits of biodiesel, established agricultural interests may limit the rapid development of this alternative fuel industry in the Willamette Valley.

“Canola is a *Brassica* oil seed crop bred specifically for human consumption” (Chastain, “Canola: A biodiesel crop”). Since canola is closely related to some vegetable crucifers, interspecific and intergeneric crossing can occur (Myers). In the Willamette Valley, cabbage, rutabaga, radish, broccoli, and cauliflower are some of the crops affected by outcrossing with canola (Myers). For crops that may be adversely affected by canola outcrossing, the Oregon Agricultural Information Network reported the following acreages and values for the Willamette Valley in 2004:

Figure 2. Crops Potentially Affected by Canola Outcrossing

CROP	ACREAGE	VALUE OF SALES
• Radish	340 acres	\$400,000
• Rutabaga	440 acres	\$1,214,000
• Cabbage	702 acres	\$2,196,000
• Radish seed	750 acres	\$996,000
• Cauliflower	30 acres	\$104,000
• Broccoli	45 acres	\$122,000
TOTAL	2,307 acres	\$5,032,000

In 2004, reports from the Oregon Agricultural Information Network reported 8,150 acres of miscellaneous vegetable and truck crops and 3,410 acres of vegetable and flower seed crops grown in the Willamette Valley. It is likely that a portion of these 11,560 acres, with a combined value of sales of \$45,944,000, might also be impacted by canola outcrossing.

In addition to the problem of outcrossing, there is concern that canola may be a significant weed infestation threat to red, crimson, and white clover seed fields (Schmitz, “Biodiesel has Oregon”). Canola seed blown from trucks onto road shoulders, as well as volunteer seeds in fields previously planted with canola are two significant sources of canola weed infestation (Myers). The challenge of this weed infestation is exacerbated by the fact that few herbicides are able to tackle broadleaf *Brassica* crops (Schmitz, “Biodiesel has Oregon”). As Tim Dierickx, Chairman of the Oregon Clover Commission, said, “Right now, there really isn’t any kind of herbicide we have that can clean volunteer rapeseed out of our fields.” (Schmitz, “Biodiesel has Oregon”). The scope of the potential problem of canola weed infestation is significant. According to the Oregon Agricultural Information Network for 2004, the following clover acreages and values were reported for the Willamette Valley:

Figure 3. Willamette Valley Clover Acreages and Values

CROP	ACREAGE	VALUE OF SALES
• Red Clover	10,720 acres	\$5,833,000
• Crimson Clover	8,440 acres	\$2,807,000
• White Clover	4,850 acres	\$3,170,000
TOTAL	24,010 acres	\$11,810,000

For those concerned about Genetically Modified Organisms (GMOs), there are serious questions about the potentially negative impact of canola cultivation in the Valley. Some predict that GMO canola will contaminate the genetic purity of *Brassica* vegetable seeds produced for foreign markets. For this group of growers, “GMO seed would be the nail

in the coffin for the vegetable seed producers” in the Willamette Valley (Myers). At the Public Rapeseed Rules Hearing on July 19, 2005, Craig Armbrist, President of the Willamette Valley Specialty Seed Growers, submitted a copy of a letter from the Japan Seed Trade Association as testimony (Appendix B). This letter describes a scenario under which the Japanese market would not purchase *Brassica* vegetable seed grown in areas with potential for outcrossing or GMO contamination from canola. In his letter to Director Coba of the Oregon Department of Agriculture, Mr. Watanabe of the Japan Seed Trade Association (JASTA) wrote, “JASTA and our members would like to continue to support the expansion of vegetable seed production in Oregon, but we cannot take this position if canola seed production is allowed, and encouraged in the Willamette Valley and other seed producing area. In fact, if there is danger of outcross from canola in our seed crops in Oregon, we will have to move our business out of Oregon.”

Troy Rodakowski, General Manager of Pacific Seed Production, in Junction City, Oregon, echoes Mr. Watanabe’s sentiment. Rodakowski, who sells Oregon-grown specialty vegetable seed to Europe, Canada, South America, and Asia, reports that his international customers will not purchase his product if there is a possibility of contamination from canola.

By the end of September 2005, the revisions to Rapeseed Control Areas set aside all counties in the Willamette Valley as Protected Districts, in which “canola production for oil [is] prohibited, except under special permit” (“Notice of Proposed Rulemaking Hearing”). In the Willamette Valley, canola crops for seed, forage, and covercrop would be permitted. Canola grown for seed is six times more valuable than canola grown for oil,

and can be produced on smaller acreages (Lies, “Mapping canola’s future”). With such a high value, canola seed growers are likely to spend more on disease prevention, making this canola crop less of a threat to specialty vegetable seed growers (Lies, “Mapping canola’s future”). However, any canola production would have to meet current requirements, “including 2 to 3 mile isolation from related crops with which rapeseed/canola will cross-pollinate” (“Notice of Proposed Rulemaking Hearing”). These canola-free zones offer the best solution for protection of the specialty vegetable seed industry in Oregon (Myers). Advisory groups will consider exceptions to the rules in the control areas. These advisory groups will make a determination if growers in controlled areas who “want to plant canola for oil production” have “put into place sufficient safe guards, production practices to minimize impacts on the specialty seed growers” (Searle, “Re: OSU Agriculture”).

For Tomas Endicott and John Miller of SeQuential Biofuels, the 2005 amendments to the Rapeseed Control Areas represent a step backward for the future of biodiesel in Oregon. By placing the Willamette Valley off limits to production of canola for oil, commercial biodiesel production is in question. SeQuential hopes to contract canola at 12 to 14 cents per pound for fall 2005 (Miller and Endicott). This is an unlikely scenario, as the revised Rapeseed Control Areas take effect. For Miller and Endicott, the idea that 3,000 acres of specialty seed crops in the Willamette Valley, out of a total 900,000 production acres, would result in a prohibition of canola is, to say the least, hard to swallow (Miller and Endicott). Nevertheless, the views of Tim Dierickx and the history of agriculture in the Valley will not be overcome by a passion for biodiesel. As Dierickx says, “Why are we

looking at a crop [canola] that's low income, low value, and low yielding? Quite frankly, it's liable to cause a lot of problems for a lot of families and a lot of people that have been building this [vegetable/clover seed] industry for the past 70 to 80 years" (Schmitz, "Biodiesel talks"). Miller and Endicott will likely need to consider other regions of the state that will remain open to the production of canola for oil.

Biodiesel: The Canola Connection

Canola was developed in Canada by research scientists looking for a way to lower the “levels of erucic acid in the oil and glucosinolates in the meal” of rapeseed (Agriculture and Agri-Food Canada, “The United States Canola Industry”). By selectively breeding rapeseed, these scientists developed and introduced CAN(ada) O(il) L(ow) A(cid), or canola, in 1974 (Burcon NutraScience). Canola is a *Brassica* oilseed, with low erucic acid in the oil and low glucosinolates in the meal (Chastain, “Canola: A biodiesel crop for Oregon”). There are both winter and spring cultivars available for canola (Chastain, “Canola: A biodiesel crop for Oregon”).

Today, canola “is the second largest oilseed crop in the world” (Agriculture and Agri-Food Canada, “The United States Canola Industry”). By 1985, the United States was the seventh largest producer and processor of canola (Agriculture and Agri-Food Canada, “The United States Canola Industry”). By 2004, 828,000 acres of canola were harvested in the United States, yielding 1,339,530 pounds of canola seed (Crop Production 2004 Summary). North Dakota accounts for almost 90 percent of total canola production in the U.S. (Agriculture and Agri-Food Canada, “The United States Canola Industry”). Unlike North Dakota, Oregon farmers harvested only 3,246 acres of canola in 2004 (“Commodity Report for Canola Oil in 2004”).

Biodiesel can be produced from a variety of feedstocks, including rapeseed, flaxseed, meadowfoam, and canola (Freeborn). Canola is considered the best fit for Oregon

(Pokarney). “No other crop can produce canola’s high oil and energy yield at low cost under Oregon conditions” (Chastain and Ehrensing). Figure 4 depicts why canola is a superior choice when compared with other biodiesel feedstocks, such as soybean and sunflower. The energy ratio in Figure 4 demonstrates that for canola, 4.2 gallons of biodiesel are produced for every 1 gallon of fossil fuel expended in canola-based biodiesel production. This energy ratio includes the entire lifecycle of canola production, as well as the conversion of canola oil to biodiesel.

Figure 4. Why Canola? (Chastain and Ehrensing, “Canola: A biodiesel crop for Oregon”)

SOURCE	OIL YIELD Gallons/Acre	ENERGY RATIO Gallon : Gallon
Canola	100 – 200	4.2 : 1
Soybean	15 – 25 (57 U.S. Average)	3.2 : 1
Sunflower	90 – 100	2.6 : 1

With a seed yield of 2,400 pounds per acre, 100,000 acres of canola grown in the Willamette Valley would produce 63 million gallons of B20 (Chastain and Ehrensing). If another 100,000 acres of canola were cultivated in Central and Eastern Oregon, Oregon farmers could produce the feedstock to process 125 million gallons of B20 annually (Chastain, “Canola: A biodiesel crop for Oregon”). One hundred twenty five million gallons of B20 represents 15 percent of diesel fuel currently consumed in Oregon (Schmitz, “Biodiesel talks”).

One and one half million acres of canola, with a 100 gallon per acre yield, would meet 100 percent of demand for diesel in Oregon with B20 (Chastain, “Canola: A biodiesel crop for Oregon”). With 17 million acres of farmland in Oregon, but only 4.4 million cultivated acres, it is unlikely that 34 percent of the cultivated acres, or 1.5 million acres, will ever be dedicated to canola production (Chastain, “Canola: A biodiesel crop for Oregon”). However, if diesel demand was met with a B2 blend, Oregon farmers, using current technology, could provide 800 million gallons of biodiesel through cultivation of 160,000 acres with a 100 gallon per acre yield or 80,000 acres with a 200 gallon per acre yield (Chastain, “Canola: A biodiesel crop for Oregon”). A recent trial of canola in the Willamette Valley suggests that yields may in fact be greater. “Under the best fertilizer rates, all cultivars of winter canola yielded more than 4,000 pounds [of seed] per acre. This translates to oil yields of approximately 211 gallons per acre... higher than the national average” (Chastain, “Canola for biodiesel trial results”).

There are over 910,000 harvested acres in the Willamette Valley. More than 470,000 of these harvested acres are grass seed (Chastain, “Canola for biodiesel trial results”). Oregon produces 99 percent of all ryegrass seed in the world (Freeborn). Canola offers significant benefits as a rotation crop for grass seed growers in Oregon. In fact, using canola as a rotation crop can increase grass seed yields by up to 30 percent (Pokarney). According to Chastain, most grass seed growers do not plant rotation crops at all, with many fields in grass seed cultivation for forty years or more (“Personal Interview”). “Grass seed crops grown in the valley are limited in quality and yield, in part, by the lack of viable rotation crops” (Chastain, Garbacik, Ehrensing, and Wysocki). This situation

has resulted in disease problems, “build up of weed populations, and the development of herbicide-resistant weeds” (Chastain, Garbacik, Ehrensing, and Wysocki). Using canola as a rotation crop in the Willamette Valley will discourage disease and pest cycles, by “breaking up the production cycle, allowing for different management techniques and different chemicals to help control problem grass weeds” (Freeborn). Canola’s strong taproot, which penetrates soils that fibrous rooted grasses cannot, provides benefits to soil ecology, which can increase grass seed yields over time (Freeborn; Pokarney). In addition, canola may provide an added source of income for Oregon farmers without the need for new equipment or added expertise (Pokarney; Freeborn). Finally, canola as a rotation crop may play a role in reducing oversupplies of grass seed (Pokarney).

In spite of the benefits of canola as a rotation crop, and with non-GMO varieties of canola so well adapted to the Pacific Northwest, why are so few acres of canola actually planted and harvested in Oregon? (Ehrensing). When making decisions about whether or not to grow canola as a rotation crop, farmers evaluate the profitability of canola compared with other rotation crops (Nunez). The “economic returns must be greater than those of alternative use of the land” and the outcome must benefit their main crop (Nunez). In a 1996 economic feasibility study of producing biodiesel from canola, analysts determined that canola would not be a profitable crop unless higher prices or larger yields could be achieved (Noordam and Withers). Today, this challenge remains. In an interview with Brent Searle from the Oregon Department of Agriculture, he stated, “For wheat farmers in Eastern Oregon, canola may represent a viable rotation crop if and when the price of canola per pound is above 12 cents”. In his examination of canola

production in the Columbia Basin, Nunez reported that stable canola prices of 13 to 14 cents per pound would “result in an increase in canola production”.

In the case of canola in the Willamette Valley, policy trumps economics. The implementation of the Revised Rapeseed Rules severely restricts production of canola for oil in the Willamette Valley. Even if there were a scenario where the price of canola was between 12 and 14 cents per pound, production of canola seed for oil is prohibited. The nexus between public policy and agriculture may spur innovative, risk-taking farmers to explore new ideas for profitable rotation crops suitable for biodiesel production, perhaps sunflowers or mustard.

Biodiesel: What Does “The Man On The Street” Think and Know?

Understanding what people think and know about biodiesel is important to ensure a future for biodiesel in the Willamette Valley. To assess these public attitudes, a survey was conducted on July 16, 2005 at the daVinci Days Festival in Corvallis, Oregon. The website for daVinci Days describes the event as “inspired by the genius of Leonardo, [that] sparks creativity, celebrates innovation, and fosters the understanding and integration of art, science, and technology”. During daVinci Days, the College of Engineering sponsored a booth in the Oregon State University Wireless Village. The author and Dr. David Hackleman conducted surveys from this booth. Self-selected respondents completed seventy-four surveys. Each survey included demographic items, as well as questions about familiarity with and knowledge of biodiesel (Appendix C).

The largest group of respondents (34 percent) is forty-five to fifty-four years old; followed by the second largest age group of respondents (27 percent) who are younger than twenty-five years. Census data for 2000 for Benton County, Oregon, reports that nearly 42 percent of the population is under twenty-five years of age and only 14 percent is forty-five to fifty-four years old (“Profile of General Demographic Characteristics: 2000, Geographic Area: Benton County, Oregon”). Survey respondents are older than the general population of Benton County.

Figure 5. Age of Respondents in Years

< 25	25 – 34	35 – 44	45 – 54	55 – 64	≥ 65
27%	9%	11%	34%	11%	8%

Census data for Benton County shows a community with equal numbers of male and female residents (“Profile of General Demographic Characteristics: 2000, Geographic Area: Benton County, Oregon”). Survey respondents for this research include more females than males. Sixty-five percent of respondents are female and 35 percent are male. Almost 30 percent of survey respondents report living outside the state of Oregon, while almost 64 percent live in the Willamette Valley.

In the context of daVinci Days and a booth located on the Oregon State University campus, it is not surprising that a majority of survey respondents (77 percent) have completed at least some college education. In Benton County, for the population twenty-five years of age and older, almost 78 percent have completed at least some college (“Profile of Selected Social Characteristics: 2000, Geographic Area: Benton County, Oregon”). For the United States population, slightly over 50 percent of the population twenty-five years of age and older have completed some college or more (“Profile of Selected Social Characteristics: 2000, Geographic Area: United States”). The presence of Oregon State University in Corvallis certainly contributes to the high educational attainment for Benton County residents, as a whole.

Figure 6. Education of Respondents

Some High School or Less	High School Graduate	Some College	College Graduate	Post-graduate
23% (17)	0% (0)	19% (14)	32% (24)	26% (19)

Data collected about attitudes toward and knowledge of biodiesel proved interesting. An overwhelming majority of respondents (95 percent) report that they have never used biodiesel. With a backdrop of low usage of this alternative fuel, over 60 percent of respondents (45 respondents) are very knowledgeable or somewhat knowledgeable about biodiesel and 76 percent (55 respondents) are very or somewhat knowledgeable about the relationship between agriculture and biodiesel.

In spite of the fact that 95 percent of survey respondents report never using biodiesel, 80 percent think that the U.S. market for biodiesel will grow rapidly in the next ten years.

Figure 7. U.S. markets for biodiesel will grow rapidly in the next ten years.

Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
22% (16)	58% (43)	16% (12)	4% (3)	0% (0)

For the U.S. biodiesel market to grow, consumers must purchase this alternative fuel.

Can we assume that given opportunities to purchase biodiesel, these survey respondents will do so? Survey results show that 68 percent of respondents would use biodiesel regardless of price. This finding suggests that commercially available biodiesel, may, in fact be a viable business in Corvallis, and the wider Willamette Valley.

Figure 8. Regardless of price, I would be interested in using biodiesel in my vehicle or as heating fuel.

Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
19% (14)	49% (36)	15% (11)	15% (11)	3% (2)

Given the unique setting for this survey, it is unlikely that these survey findings can be extrapolated to a more general representative population for the Willamette Valley. Nonetheless, the findings are interesting, and represent a beginning framework for a viable future of biodiesel in the Willamette Valley. What Oregon farmers think about biodiesel will likely determine the pace at which this alternative fuel industry will grow.

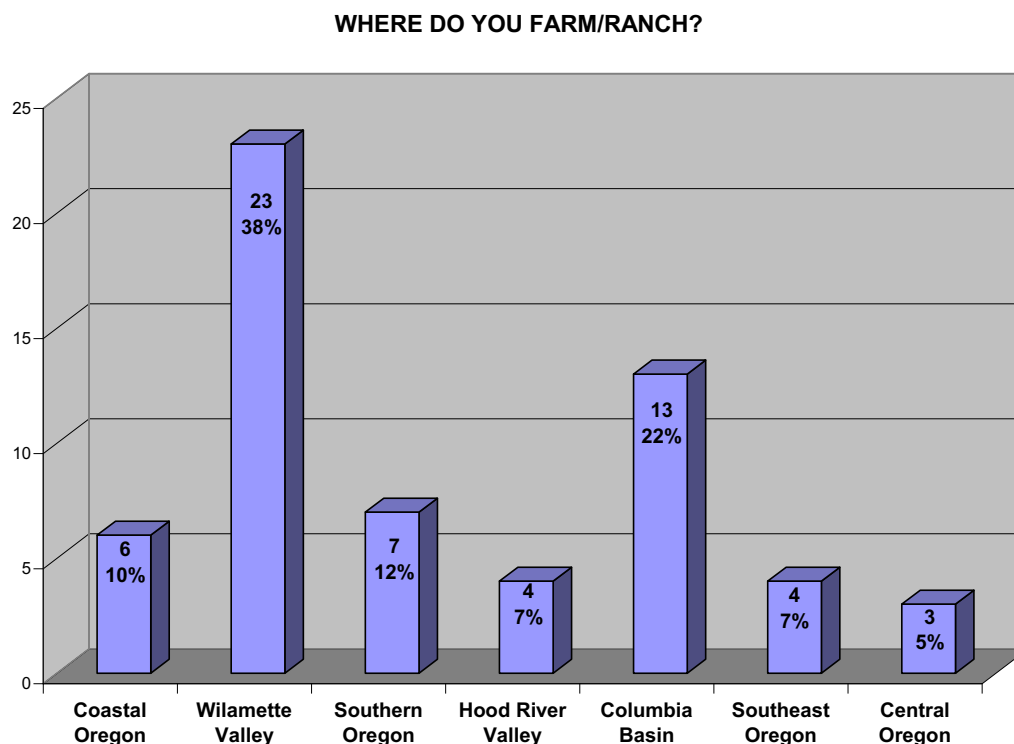
Biodiesel: What Do Farmers Think and Know?

A survey of farmer attitudes toward, familiarity of, and experience with biodiesel was conducted by mail and e-mail (Appendix D). Five distribution points for the farmer survey were used, including the following:

- E-mail News Briefs to Oregon Farm Bureau members
- E-mail to the member list of the Oregon Women for Agriculture (OWA)
- Board meeting of the OWA - August 19, 2005, McMinnville, Oregon
- E-mail to the Oregon Department of Agriculture BioFuels Network
- E-mail to members of the Pendleton Grain Growers Co-op

Sixty-six surveys were completed and forwarded by mail or email to the author. Six of these surveys were not completed by farmers and were not included in this analysis. It is understood that this small sample is not scientific. Nonetheless, the findings are instructive and provide a glimpse into the thinking of Oregon farmers.

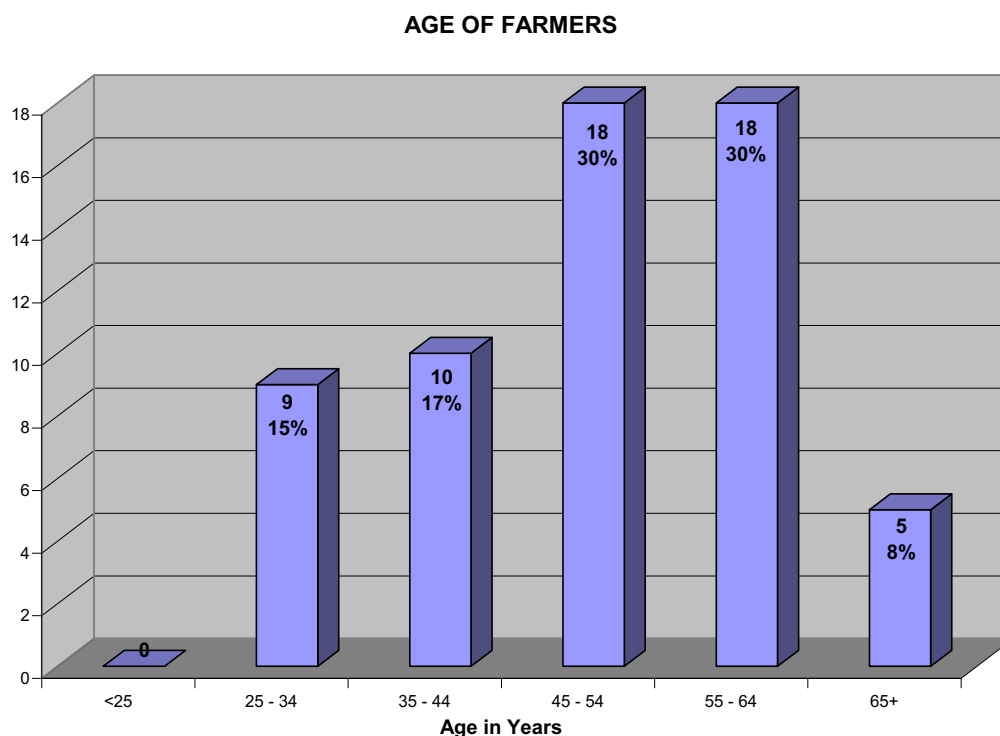
Because surveys were distributed by email, completed surveys were received from farmers in all growing regions of Oregon. Thirty-eight percent of surveys were returned from Willamette Valley farmers, with the next largest group of farmers from the Columbia Basin (22 percent).

Figure 9.

A majority (53 percent) of farmers completing the survey report farming 500 acres or more and over 43 percent of farmer respondents indicate they farm 1000 or more acres. The size of farming operations among survey respondents is significantly greater than most farms in Oregon. The Oregon Department of Agriculture reports that most (62 percent) farms in Oregon operate on less than 50 acres and only 10 percent of Oregon farmers farm 500 acres or more (Oregon Agricultural Statistics Service). However, with the average size of farms in Oregon being 430 acres, survey farmers are more like Oregon farmers, than not (Oregon Agricultural Statistics Service). As with farmers throughout the state, survey farmers overwhelmingly report they own their farms, with 84 percent indicating that they are either a full or part owner of their farm. In Oregon, almost 88 percent of farms are individually owned (Oregon Agricultural Statistics Service).

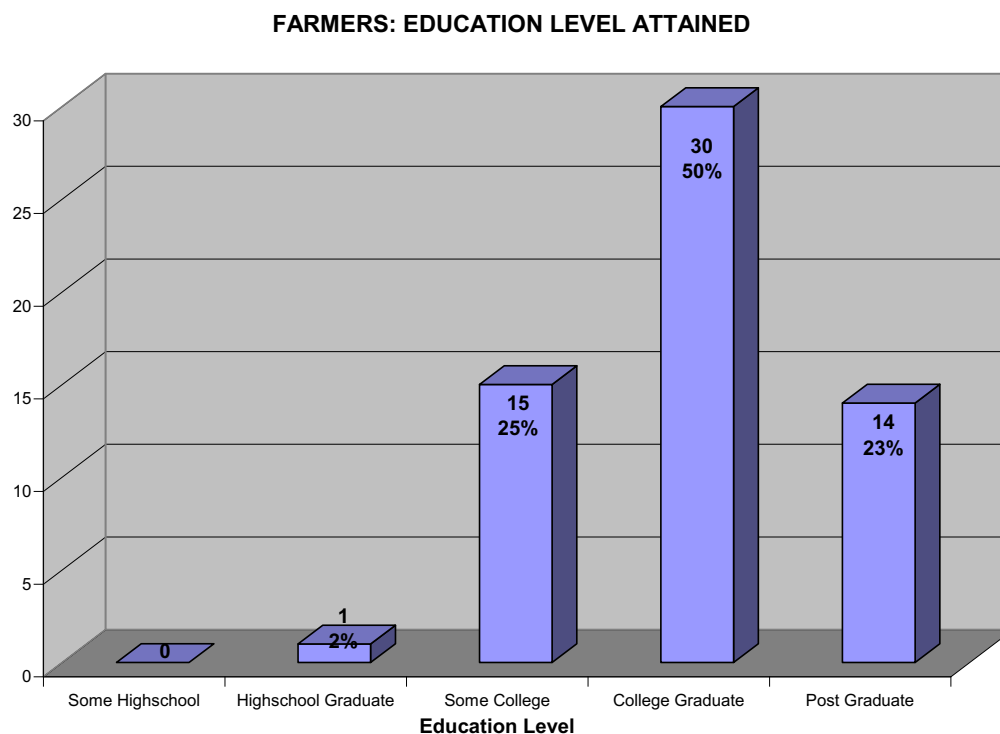
Compared with farmers throughout Oregon, surveyed farmers are disproportionately younger. In Oregon, only 4 percent of farmers are ages 25 to 34 years; but among farmers completing the project survey, 15 percent report being 25 to 34 years old (Oregon Agricultural Statistics Service). In addition, the Oregon Department of Agriculture reports that over 29 percent of farmers are age 65 and older; but among surveyed farmers, only 8 percent are 65 years of age and older (Oregon Agricultural Statistics Service). Considering the focus of the survey, it is not surprising that the respondents are disproportionately younger farmers. Biodiesel and alternative fuels, more broadly, are current topics and focus on the “innovative”. Younger farmers could be expected to be more interested in new technologies than their older counterparts are.

Figure 10.



Although surveyed farmers are disproportionately younger than farmers in Oregon are, respondents represent many years of farming. Fifty-five percent of farmers report farming or ranching for 21 years or more, with 32 percent indicating they have been farming for more than 30 years. This long-term farming experience is important when considering the survey findings. Perhaps, one can be comfortable that these farmers know what they are talking about, speaking from many years of farming decisions and decades of ups and downs in the Oregon agriculture economy.

Over 98 percent of farmers surveyed report having completed at least some college. In fact, 73 percent of respondents are college graduates. The educational background of respondents, along with the disproportionate number of younger farmers, may have significant influence in the recorded responses with regard to attitudes and knowledge of biodiesel.

Figure 11.

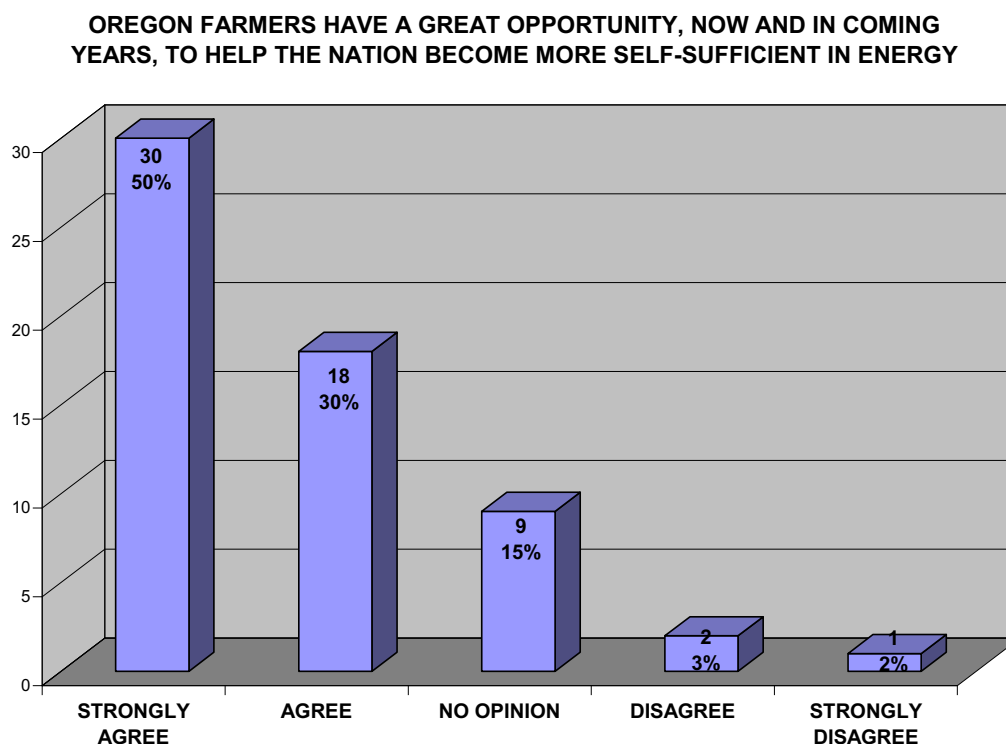
Farmers were asked about their net income after taxes for 2004. Forty-four percent of respondents say they have net income of \$50,000 or more, with 22 percent reporting net income of \$100,000 or more. The largest number of farmers surveyed report that their predominant agricultural commodity is grains (20 percent), followed by 15 percent who report grass as their primary commodity, and 14 percent reporting tree fruits and nuts as their primary crop.

Of the 60 farmers who completed the survey, only 25 percent report that they have used biodiesel fuel, while 75 percent said they have never used this alternative fuel. Although most farmers surveyed report they do not use biodiesel, the vast majority of farmers (94 percent) say that they would use this alternative fuel in their farming/ranching operations,

if it was competitively priced with conventional diesel. Despite the fact that the majority of farmers report never using biodiesel, the majority (89 percent) report they are very or somewhat knowledgeable about biodiesel. Regardless of biodiesel usage among surveyed farmers, 60 percent report that they are very aware of the role of agriculture in the future of biodiesel and another 37 percent are somewhat aware.

The future of biodiesel may be a bright one when one considers that 80 percent of farmers either agree or strongly agree that Oregon farmers have a great opportunity to help the nation become more self-sufficient with regard to energy needs. Acknowledging this future role is the first step in mobilizing more participation by farmers in the production of biodiesel feedstocks.

Figure 12.



A majority of surveyed farmers indicate that they agree or strongly agree that biodiesel production will provide an important national market for Oregon agricultural products in the next ten years. Eighty-six percent of survey respondents agree or strongly agree that U.S. markets for biodiesel will grow rapidly in the next ten years. Only 5 percent disagree with this statement, with another 8 percent having no opinion. To date, participation by farmers in an Oregon biodiesel industry is lagging behind their expressed interest in their future role in biodiesel.

Figure 13.

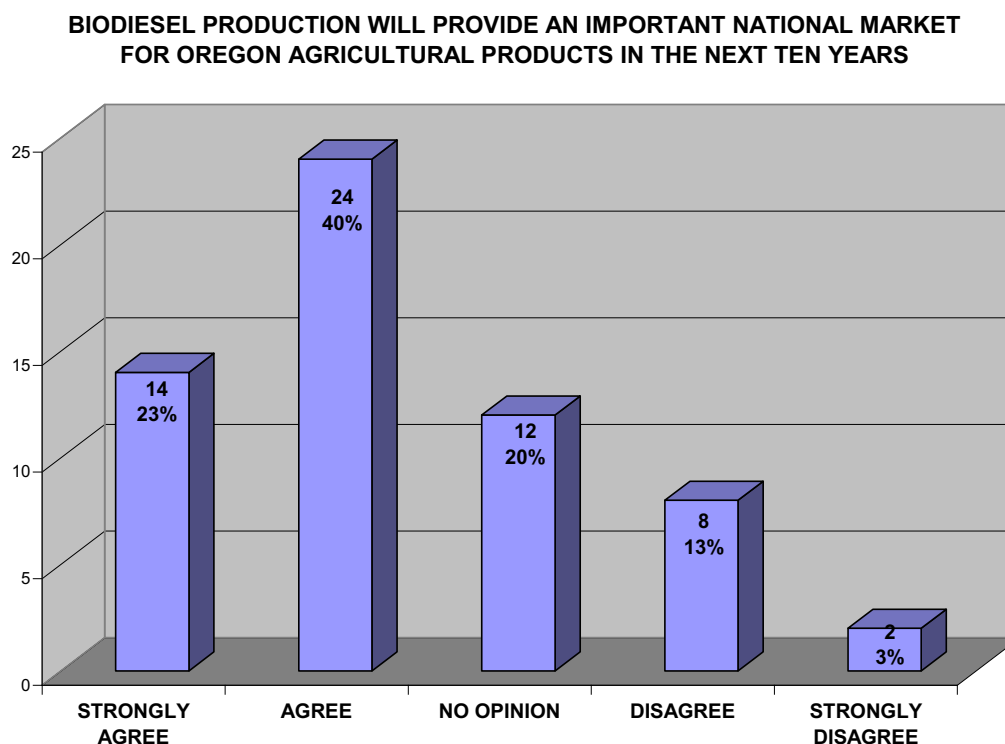
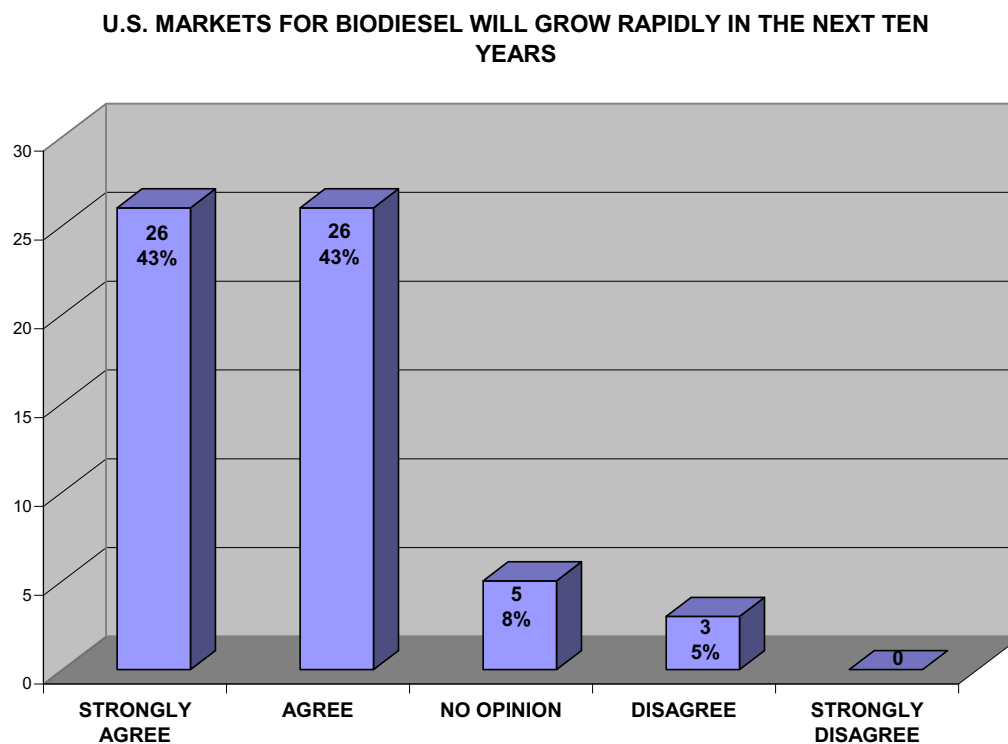


Figure 14.

Sixty-seven percent of survey respondents believe that biodiesel made from canola, rapeseed, or mustard could be profitably produced in the region of Oregon where they farm/ranch. The phrasing of this survey question is ambiguous, and probably does not suggest that canola, rapeseed, or mustard could be profitably grown, but rather indicates that biodiesel could be produced profitably with these feedstocks. Among the 40 farmers who agree with the aforementioned statement, 21 (53 percent) report they would be willing to grow canola or rapeseed for biodiesel production. However, 11 farmers or 28 percent of this group of 40 farmers indicate they are not willing to grow any crop at all for biodiesel production. For the 20 farmers who do not believe that biodiesel made from canola, rapeseed, or mustard can be profitably produced in the region of Oregon where

they farm/ranch, reasons given include that the price of canola is too low, land is too expensive, a need for more information, and the specialty vegetable seed grower conflict.

Figure 15. If yes, which crop would you be willing to grow for biodiesel production?

CROP	PERCENT (NUMBER).
Canola	33 % (13)
Rapeseed	18 % (7)
Mustard	13 % (5)
Other	10 % (4)
None	28 % (11)

Farmers were asked what aspects of growing a crop suitable for biodiesel production interest them most. The most frequent answer was the potential biodiesel has in decreasing U.S. dependence on foreign oil. Profitability of a particular crop was listed as the second most frequent answer. Environmental benefits, sustainability, and the benefits of a biodiesel feedstock as a rotation crop were listed equally as the third most frequent response. Fifty-two percent of farmers surveyed say they were familiar with Oregon legislation providing incentives to farmers/ranchers to produce crops for biodiesel production, but 95 percent of the total 60 survey respondents report they have never taken

advantage of any of the incentives available with regard to biodiesel production and/or use.

Biodiesel and Farmers: A Closer Look

“Bioenergy crops offer a win-win option” for America’s agricultural future, providing “increased income for American farmers” while reducing dependence on foreign oil (McLaughlin et al.). But do Willamette Valley farmers agree with this optimistic outlook? In addition to conducting surveys with 60 farmers, this project completed in-depth interviews with five farmers. The insight of these farmers is a sobering look at the short-term prospects for biodiesel in Oregon.

Among the five farmers interviewed there is consensus that biodiesel has a future in Oregon, but that the future is many years down the road. The economic viability of growing biodiesel feedstocks is the primary obstacle to an active role by farmers in biodiesel production. As one farmer said, “The future of biodiesel in Oregon is years down the road. It will have to happen, but it won’t until it works monetarily” (Rodakowski). Not surprisingly, these farmers are negatively impacted by the rapidly increasing price of fuel, and would welcome biodiesel as an alternative for petroleum-based fuels, but only if the cost of biodiesel was competitive.

For one farmer, a business decision to use or not to use biodiesel was made three years ago. This farm uses older equipment that simply will not support biodiesel, and the decision was made to absorb fluctuating and increasing costs of petroleum-based fuels. With the breakdown of older equipment, this farmer is willing to hire additional employees rather than replace equipment with newer models that would support

biodiesel. With a company philosophy that embraces sustainability, this farmer believes writing a paycheck has fewer externalities than the purchase of new equipment. Fabrication of new equipment exploits raw materials, creates production waste, and uses fossil fuels in transport to the farm. Simply put, the lifecycle of manufacturing new farm equipment uses more resources than one new employee. Although this farmer places a high value on sustainability, he does not think that biodiesel is the best alternative energy option for the Willamette Valley – right now. Today, he speaks about ethanol, growing crops for boiler consumption, using wastes from forest products as a feedstock for alternative energy production, and cogeneration of steam. He is an innovative forward-thinking member of the agricultural community, but has not yet embraced biodiesel.

“Farmers are major consumers of diesel in their vehicle and equipment fleets” (Chastain and Ehrensing). As a significant consumer of diesel, agriculture is very sensitive to rising fuel prices and interviewed farmers are no exception. When queried about the future of biodiesel in the Willamette Valley, one farmer said, it would be “a hard sell until biodiesel rivals or beats the price of petroleum”. There is consensus that dwindling oil supplies and increased demand will cause oil prices to rise, making biodiesel more and more attractive to these farmers. But with the cost of biodiesel feedstock production simply not penciling out at this time, these farmers do not see a near term future in biofuels production. For one farmer, who has been “watching” biodiesel for 15 years there is increased optimism for a viable future for biodiesel as interest for this alternative fuel grows beyond specialized niches.

All five of the interviewed farmers express reservations about growing canola in the Willamette Valley. They are particularly wary of GMO varieties of canola and echo the concerns of the specialty vegetable seed growers in the Willamette Valley. Among these farmers, there is support for the Revised Rapeseed Rules. As one farmer puts it, “North Dakota would be the best place for a large scale biodiesel plant, because of its ability to grow canola and accessibility to Canada”.

Since 1996, the production of renewable energy by agricultural communities has increased each year (Schnepf). What are the driving forces behind this? Studies show that farmers are generally confident in their ability to manage risk and handle change (Agriculture and Agri-Food Canada, “Adapting to Change”). Farmers are risk takers – there are few guarantees; weather and global competition only two of the uncontrollable factors. Facing risk, most farmers are “strong individualists with a generally positive outlook for the future of their farm operations (Agriculture and Agri-Food Canada, “Adapting to Change”). Successful farmers must be willing to implement new and untried strategies and interviewed farmers are no exception to this rule. As one of the project farmers describes it, the progression of any new technology requires pioneers, early innovators, and imitators. This farmer says that he “strives to be an imitator”, because that is the “safest place to be”. If the partnership between agriculture in the Willamette Valley and biodiesel is ever to thrive, more pioneers and innovators must be found. Dean Freeborn, a grass seed and grain grower in Rickreall, Oregon is a pioneer. Freeborn says he would “be growing canola if there was someone who would gas up and fuel their vehicles with his biofuel” (Casper). As obstacles are minimized, pioneers will

step forward. The only questions are: how soon will the future of biodiesel in Oregon be visible and what will this future look like?

Biodiesel: Obstacles or Opportunities?

Agriculture in Oregon is a vital and growing industry with more than 17 million acres of farmland (Oregon Agricultural Statistics Service). Of these 17 million acres, over 3 million are harvested (“Harvested Acreage Summary Report for 2004”). Oregon has the capacity, the farm acreage, and expertise necessary to be an essential partner in a burgeoning biodiesel industry. Nonetheless, agricultural interests in Oregon have yet to join the biodiesel future with enthusiasm. Why? What are the obstacles and how might they be overcome?

Historically, farmers and ranchers led westward expansion in America by claiming the land and cultivating it. The Homestead Act of 1862 gave 160 acres to heads of households, widows, and single persons. The patent or legal title, to this acreage was awarded only after the settler had resided on and cultivated the land for five years (Glicksman and Coggins). The historic ideals of private land ownership, individual freedom, self-sacrifice, and perseverance influence how we view farmers and ranchers today. Observers see vast acres of farm and ranch land in Oregon, and assume that farmers and ranchers have personal control over what takes place on that land. This simply is not the case. One only has to search the websites of the Oregon Department of Agriculture and the U.S. Department of Agriculture to understand how complicated and how regulated farming in America truly is.

Oregon agriculture, like agriculture throughout the United States, is highly regulated. There are a myriad of rules, regulations, and policies that influence what a farmer may or may not do on a daily basis. Government agencies define what a crop is, why it is important, how it should be grown, how much should be grown, how it can be marketed, what research should be done, and what consumer education programs might be adopted. Canola is no exception to the role of government in agriculture.

Agricultural rules, regulations, and policy can be written and subsequently implemented which can move the agriculture and biodiesel partnership either forward or backward. At both state and federal levels, numerous policies are in place to encourage the production of biodiesel in Oregon. However, adoption of the Revised Rapeseed Rules in Oregon may turn out to be an obstacle to the implementation of agricultural policies promoting biodiesel production – effectively moving the agriculture and biodiesel partnership backward.

To place this partnership on a forward trajectory, new strategies to overcome obstacles created by the Revised Rapeseed Rules must be found. In order to protect Oregon's specialty seed agricultural sector, the Revised Rapeseed Rules prohibit cultivation of canola for oil in the Willamette Valley. Of the 909,866 total harvested acres in the Valley, only 4,160 are in vegetable and flower seed production, while almost 470,000 are in grass seed (Chastain and Ehrensing). In spite of their disproportionately small amount of acreage, vegetable seed growers in favor of the revision to the Rapeseed Rules faced little to no opposition from grass seed growers, who may have actually benefited from

canola as a rotation crop. The cooperation and unity among farmers as a group, regardless of their individual crop, allowed the Revised Rapeseed Rules to sail through the public hearing process toward adoption. With less harmony among Oregon farmers, perhaps the Willamette Valley would still be open to production of canola for oil; in this scenario, farmer cooperation and unity may have become an obstacle to biodiesel.

However, stepping away from the Willamette Valley, it may turn out that adoption of the Revised Rapeseed Rules will be a plus for the partnership between agriculture and biodiesel. While designating the Willamette Valley, along with entire counties in Central Oregon, Northeastern Oregon, and portions of Malheur County as Protected Districts, the Revised Rapeseed Rules “also opens up production in the rest of the state as unrestricted” (Searle, “Re: Oregon agriculture”). Under the previous rule “most of the state is not allowed to produce canola because there are no advisory groups of growers organized in those areas” (Searle, “Re: Oregon agriculture”). With adoption of the Revised Rapeseed Rules, requirements to form advisory groups in order to grow canola in unrestricted areas are removed. The elimination of this requirement creates new opportunities for canola production – a seeming obstacle turned opportunity.

Well-crafted and implemented legislation can play an important role in nurturing a mutually beneficial relationship between agriculture and biodiesel (VanWechel, Gustafson, and Leistritz). The federal government and the state of Oregon have both passed legislation supporting the development of biodiesel. However, the positive

impacts of these policies may have been trumped by recent adoption of the Revised Rapeseed Rules.

The Oregon Department of Agriculture (ODA) serves the legislative agenda for Oregon, while meeting the needs of farmers in the state. If the Oregon legislature considered biodiesel one of their top priorities, it is unlikely the ODA would have pushed an agenda for the Revised Rapeseed Rules. The Oregon legislature, in this case, becomes an obstacle to biodiesel; passing legislation without enforceable mandates and failing to identify biodiesel as a legislative priority. With dramatically rising petroleum fuel prices, Oregon legislators were unable to reach a compromise on HB 3481 and this bill, once a promising biofuels initiative, died before the end of the 73rd Legislative Assembly. Unlike Oregon farmers, Oregon legislators have a difficult time coming together, even in the face of record high fuel prices. The cost of this lack of cooperation and political inertia will be high, particularly so for farmers who are major consumers of diesel.

Red Carpet Express Fuel represents both the bright future and the limitations for biodiesel in Oregon. This fuel station is “the first and only public fuel station in Central Oregon to sell biodiesel at the pump.” Mike Fassett, owner of Red Carpet Express Fuel, purchases his fuel from SeQuential Biofuels, which sells biodiesel “made from soybeans and shipped from the Midwest” (Bousquet). Mike Fassett is selling biodiesel that has been grown and produced in the Midwest. This business scenario highlights the limitations that an Oregon biodiesel industry must overcome. While many feedstocks suitable for biodiesel production including canola, mustard, and rapeseed, can be grown

in Oregon, these crops remain untapped for production of this promising alternative biofuel (“Oregon Renewable Energy Action Plan”).

The future for biodiesel in Oregon remains unsure. Currently, the combination of a limited supply and low demand for biodiesel leads to a high equilibrium price, and low equilibrium quantity. For biodiesel to succeed, supply and demand must be increased, resulting in an affordable equilibrium price and quantity. “The most important element of Oregon’s biodiesel strategy and most complicated to implement is the development of local supply of inexpensive feedstock” (“Oregon Renewable Energy Action Plan”). Agricultural producers, however, are reluctant to shift toward biodiesel feedstock production with prices for these crops so low. As long as the cultivation of biodiesel feedstock does not pencil out for Oregon farmers, it is unlikely that an affordable equilibrium price and quantity will be achieved.

With almost 17 million acres of land owned by Oregon producers, no one questions the enormous potential for biomass production in the state. Nevertheless, without a “market-pull mechanism with mandated goals to support a biodiesel production industry in Oregon”, biodiesel feedstocks remain out of focus for agricultural producers (“Oregon Renewable Energy Action Plan”). To spur the production of biodiesel feedstocks, a crushing plant is needed. But with “consumer awareness ... low for biodiesel”, a viable seed crushing plant is likely far off in the future (“Oregon Renewable Energy Action Plan”). If biodiesel is to successfully penetrate the petroleum fuel market, well thought

out and successfully implemented incentives will be needed (“Oregon Renewable Energy Action Plan”).

Using agricultural commodities for energy pulls these resources out of the feed and food production pool (Ugarte and Walsh). Direct competition for feedstock by biodiesel producers may alter the feed market, affecting the price of feedstock and impacting demand for biofuel (Ugarte and Walsh). “The bottom line is that a small increase in demand of fats and oils for biodiesel production could quickly exhaust available feedstock supplies and push vegetable oil prices significantly higher due to the low elasticity of demand for vegetable oils in food consumption. At the same time, it would begin to disturb feed markets” (Schnepf).

While searching for strategies to overcome obstacles and spur development of a biodiesel industry, one must be careful that acreage dedicated to the cultivation of biodiesel feedstocks does not disrupt domestic food production or food for export (Peterson). This is particularly important when one considers that the United States “is now the world’s largest agricultural exporter” playing a vital role in feeding the world” (“Why Agricultural Trade Is Important”). “American farmers export 45 percent of their wheat, 34 percent of their soybeans... and more than 60 percent of their sunflower oil” (“Why Agricultural Trade Is Important”).

Productivity among American farmers has risen steadily over the last 50 years, with corn yields tripling and wheat yields doubling” (“Why Agricultural Trade Is Important”).

These dramatic increases in productivity may represent opportunities for biodiesel as farmers look for new markets for their products. In spite of the fact that “biodiesel has potential to be a very large agriculturally produced commodity”, [it] will “never displace a significant portion of our petroleum diesel because of the limited capacity we have to produce vegetable oil and because there are more important food uses for the major portion of our edible fats and oils” (Peterson).

Findings from the farmer survey highlight both obstacles to and opportunities for a future for biodiesel in Oregon. Overwhelmingly, farmers report they do not currently use biodiesel fuel, but would do so **if** the fuel was competitively priced with petroleum-based diesel. A majority of farmers are aware of the role agriculture can play in the future of biodiesel, agree that they have an opportunity to help reduce our nation’s dependence on foreign oil, believe that biodiesel will be an important national market for Oregon agricultural products in the next ten years, and are interested in the ability of biodiesel to provide a profitable crop. The opportunities are obvious; farmers are positively predisposed to biodiesel and wait for openings to become full participants in Oregon’s biodiesel future. The challenge is to implement strategies that minimize the impact of the Revised Rapeseed Rules and increase the profitability of biodiesel feedstock crops. Perhaps we need to look beyond just canola.

Biodiesel: Where Do We Go From Here?

Today, a trip to the local gas pump is a reality check for most Americans. The rapidly rising cost of fuel, with dramatic spikes in the aftermath of Hurricane Katrina, has served as a wake up call (Hildner). Issues and questions about fuel supply and rising costs are familiar topics of conversation among American consumers. We are asking, “How do we reduce our dependence on foreign oil?” “How high will prices climb at the gas pump?” “What can I do?”

For some, biodiesel is front and center as a future solution. Its environmentally friendly qualities are touted alongside the potential this biofuel offers to reduce our dependence on foreign oil. For many others, struggling with escalating prices at the gas pump, the primary issue is a pocket-book one. In this arena, biodiesel does not offer immediate relief. During the first week of October 2005, the website for SeQuentiqual Biofuels reported that a gallon of B99 cost \$3.20 in Portland, Oregon, while a gallon of petroleum diesel cost \$3.00. When and if the price of a gallon of biodiesel fuel falls below petroleum diesel and does so for an extended time, the future of biodiesel will move forward positively and rapidly.

In Oregon, it is unlikely that biodiesel will be able to compete successfully with petroleum diesel until farmers engage in the future of biodiesel through cultivation of biodiesel feedstock crops. To date, the agriculture community in the Willamette Valley

and Oregon, as a whole, is waiting for political leadership and general popular support before committing to cultivation of biomass feedstock (Casper).

Oregon is positioned to capture the economic growth from the biofuels industry. To participate in the burgeoning biofuels industry, Oregon “needs to ensure a stable local market for biofuels and to encourage construction of crushing and refining facilities” (Oregon Business Association and Oregon Environmental Council). Brent Searle of the Oregon Department of Agriculture describes the problem as a “chicken and egg” dilemma – Do we need crops in order to get facilities or facilities in order to get crops? “A Catch-22 situation arises in which the development of local markets is inhibited by a lack of local feedstock, which doesn’t exist because there is no local market” (Nunez). Strategies to address issues of public demand, biodiesel feedstock, and crushing facilities must be developed simultaneously. “None of this will happen overnight. [There is] no silver bullet. But the potential is real, and worth evaluating and pursuing where it makes economic sense” (Bushue).

With adoption of the Revised Rapeseed Rules, alternatives to canola as a biodiesel feedstock will have to be developed to move biodiesel’s future forward in the Willamette Valley and Oregon. In Colorado, Blue Sun Biodiesel is investing in the future through research and development of oil seed crops such as mustard and false flax, as well as canola and other rapeseed varieties (Hildner). Biodiesel entrepreneurs in Oregon must remain flexible in their search for suitable biodiesel feedstock. What new crops will form the base for a strong partnership between Oregon farmers and biodiesel producers?

With the failure of HB 3481, “the only existing incentive for biofuel production is the Business Energy Tax Credit” (Searle, “Re: Oregon agriculture”). Since this tax credit only applies to processing renewable fuel at the plant level, this credit does not directly provide incentives to farmers to grow biodiesel feedstock. Because the economics of biodiesel are marginal, a successful biodiesel industry will require well-crafted and implemented public policy initiatives (Petersen; Fortenbery). Although Oregon and the federal government “have made strides in that direction...much more will be required if vegetable oils are to achieve their potential” (Petersen).

On the surface, the relationship between agriculture and biodiesel appears simple. Oregon has all the necessary ingredients for a successful biodiesel future. It has the land, a strong agriculture industry, a committed environmental community, innovative entrepreneurs, and supportive public officials. The challenges are many, but the opportunities are endless. Solutions will be found when these disparate groups work together with flexibility, creativity, and continued research.

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Appendix A: Rapeseed Control Area Maps

Protected Districts



General Rapeseed Production Area



Appendix B: Japan Seed Trade Association Letter

JAPAN SEED TRADE ASSOCIATION

25-11, HONGO 2 CHOME, SUNKYO-KU,
TOKYO 113-0033 JAPAN
TEL:03-3811-2654
FAX:03-3818-6039

June 24, 2005

Ms. Katy Coba
Director, Oregon Department of Agriculture
635 Capitol St. NE
Salem, OR 97301

Dear Director Coba,

We Japan Seed Trade Association (JASTA) wish to respectfully address you to the subject of rapeseed (canola) production in the state of Oregon. It has recently drawn our attention that the Oregon legislature is working on bills that will encourage the production of canola in Oregon for bio-diesel. While it is not our position to interfere in the affairs of the Oregon legislature, we feel we must state to you, as Director of Agriculture, our highest possible concern about the production of canola in the vegetable seed producing areas of Oregon.

You may be aware of the vegetable seed trade that exists between Oregon and Japan. It is quite large and very important to seed companies both in Japan and Oregon. This is just part of the large and fruitful agriculture trade between your state and our country. Oregon has been our strong business partner for more than 25 years and the relationship continues to grow stronger each year. We believe that this strength is coming from the high quality seed production in Oregon.

JASTA and our members would like to continue to support the expansion of vegetable seed production in Oregon, but we cannot take this position if canola seed production is allowed, and encouraged, in the Willamette Valley and other seed producing areas. In fact, if there is danger of outcross from canola in our seed crops in Oregon, we will have to move our business out of Oregon. Again, we do not wish to offend, simply to state the facts.

JASTA and our members strongly encourage the Oregon Department of Agriculture to take all necessary measures to prevent any unfortunate situation that would force us to withdraw our trade from your state.

We very respectfully hope that you will consider very carefully our letter and understand that we consider this to be a very grave matter.

With best regards,



Eietsu WATANABE
President
Japan Seed Trade Association

FROM : AG ALTERNATIVES

FAX NO. : 3608566016

Jul. 01 2005 08:20AM P2

Appendix C: Survey of daVinci Days Attendees

- 1) Your age in years:
 - ☐ Less than 25
 - ☐ 25 – 34
 - ☐ 35 – 44
 - ☐ 45 – 54
 - ☐ 55 – 64
 - ☐ 65 and older

- 2) What is the highest education level you attained?
 - ☐ Some high school or less
 - ☐ High school graduate
 - ☐ Some college
 - ☐ College graduate
 - ☐ Post graduate

- 3) Where do you live?
 - ☐ Coastal Oregon
 - ☐ Central Oregon
 - ☐ Willamette Valley
 - ☐ Southern Oregon
 - ☐ Hood River Valley
 - ☐ Columbia Basin
 - ☐ Southeast Oregon

- 4) Do you currently or have you ever used biodiesel fuel?
 - ☐ Yes
 - ☐ No

- 5) How knowledgeable are you about biodiesel? (Have you heard about it or discussed it with others?)
 - ☐ Very knowledgeable
 - ☐ Somewhat knowledgeable
 - ☐ Not knowledgeable

6) How aware are you of the role of agriculture in the future of biodiesel?

- ☐ Very aware
- ☐ Somewhat aware
- ☐ Not aware

7) The U.S. markets for biodiesel will grow rapidly in the next ten years.

Do You:

- ☐ Strongly agree
- ☐ Agree
- ☐ No opinion
- ☐ Disagree
- ☐ Strongly disagree

8) Regardless of price, I would be interested in using biodiesel in my vehicle or as heating fuel.

Do You:

- ☐ Strongly agree
- ☐ Agree
- ☐ No opinion
- ☐ Disagree
- ☐ Strongly disagree

9) Are you familiar with legislation that provides incentives to farmers to use or produce biodiesel?

- ☐ Very familiar
- ☐ Somewhat familiar
- ☐ Not familiar

10) Are you familiar with legislation that provides incentives to consumers to use biodiesel?

- ☐ Very familiar
- ☐ Somewhat familiar
- ☐ Not familiar

Respondent: Male ____ Female ____

Comments: _____

Appendix D: Survey of Farmers

- 1) Do you currently or have you ever used biodiesel fuel?
☐ Yes
☐ No
- 2) How knowledgeable are you about biodiesel? (Have you heard about it or discussed it with others?)
☐ Very knowledgeable
☐ Somewhat knowledgeable
☐ Not knowledgeable
- 3) How aware are you of the role of agriculture in the future of biodiesel?
☐ Very aware
☐ Somewhat aware
☐ Not aware
- 4) Oregon farmers have a great opportunity, now and in the coming years, to help the nation become more self-sufficient in energy.
(Mark the rating that most clearly matches your opinion.)
☐ Strongly agree
☐ Agree
☐ No opinion
☐ Disagree
☐ Strongly disagree
- 5) The U.S. markets for biodiesel will grow rapidly in the next ten years.
(Mark the rating that most clearly matches your opinion.)
☐ Strongly agree
☐ Agree
☐ No opinion
☐ Disagree
☐ Strongly disagree

- 6) Biodiesel production will provide an important national market for Oregon agricultural products in the next ten years.

(Mark the rating that most clearly matches your opinion.)

- ☐ Strongly agree
- ☐ Agree
- ☐ No opinion
- ☐ Disagree
- ☐ Strongly disagree

- 7) If priced competitively with conventional diesel, I would be interested in using biodiesel on my farming/ranching operation.

(Mark the rating that most clearly matches your opinion.)

- ☐ Strongly agree
- ☐ Agree
- ☐ No opinion
- ☐ Disagree
- ☐ Strongly disagree

- 8) Do you believe that biodiesel made from canola, rapeseed or mustard could be profitably produced in the region of Oregon where you farm/ranch?

- ☐ Yes

Which crop would you be willing to grow for biodiesel production?

Canola

Rapeseed

Mustard

Other: _____

None
- ☐ No

Why not? _____

- 9) What aspects of growing a crop suitable for biodiesel production interest you the most?

(Select three)

- ☐ Environmental benefits (cleaner air)
- ☐ Innovative
- ☐ Profitability
- ☐ Potential for decreasing U.S. dependence on foreign oil
- ☐ Tax incentives
- ☐ Beneficial rotation crop (improved yields, soil quality, weed control)
- ☐ Sustainability
- ☐ Market potential
- ☐ High-protein feedstock as a byproduct of the biodiesel conversion process

- 10) Are you familiar with Oregon legislation that provides incentives to farmers/ranchers to produce crops for biodiesel production?
- ☐ Very familiar
 - ☐ Somewhat familiar
 - ☐ Not familiar
- 11) Are you currently or have you ever taken advantage of any of the incentives available for farmers/ranchers with regard to biodiesel use and/or production?
- ☐ Yes
If yes, what incentive programs:

 - ☐ No
- 12) Your age in years:
- ☐ Less than 25
 - ☐ 25 – 34
 - ☐ 35 – 44
 - ☐ 45 – 54
 - ☐ 55 – 64
 - ☐ 65 and older
- 13) What is the highest education level you attained?
- ☐ Some high school or less
 - ☐ High school graduate
 - ☐ Some college
 - ☐ College graduate
 - ☐ Post graduate
- 14) How many years have you been farming/ranching?
- ☐ Less than 5
 - ☐ 5 – 10
 - ☐ 11 – 20
 - ☐ 21 – 30
 - ☐ More than 30

- 15) For the farm(s)/ranch(es) you operate, you are:
- ☐ A full owner (sole proprietorship)
 - ☐ A part owner in a partnership, family held corporation, or other corporation
 - ☐ A renter
 - ☐ Other (please describe): _____
- 16) What was your net income after taxes from farming/ranching in 2004?
- ☐ negative (less than \$0)
 - ☐ \$0
 - ☐ \$1 - \$9,999
 - ☐ \$10,000 - \$14,999
 - ☐ \$15,000 - \$24,999
 - ☐ \$25,000 - \$34,999
 - ☐ \$35,000 - \$49,999
 - ☐ \$50,000 - \$74,999
 - ☐ \$75,000 - \$99,999
 - ☐ \$100,000 - \$149,999
 - ☐ \$150,000 or more
- 17) Where do you farm/ranch?
- ☐ Coastal Oregon
 - ☐ Willamette Valley
 - ☐ Southern Oregon
 - ☐ Hood River Valley
 - ☐ Columbia Basin
 - ☐ Southeast Oregon
 - ☐ Central Oregon
- 18) How many acres do you farm/ranch:
- ☐ Less than 50
 - ☐ 50 – 99
 - ☐ 100 – 249
 - ☐ 250 – 499
 - ☐ 500 – 999
 - ☐ More than 1000

19) What is your predominant agricultural commodity?

- ☐ Field crops
- ☐ Grains
- ☐ Grass & legumes
- ☐ Hay & forage
- ☐ Nursery & greenhouse crops
- ☐ Small fruit & berries
- ☐ Small woodlots & Christmas trees
- ☐ Tree fruit & nuts
- ☐ Vegetables & truck crops
- ☐ Other specialty products
- ☐ Cattle & calves
- ☐ Dairy products
- ☐ Poultry
- ☐ Other animal products