



IRRIGATION RESEARCH & EXTENSION COMMITTEE

2006



FOR IRRIGATION CROPPERS

Biodiesel in australia - small scale production

TRENT POTTER

SARDI

Naracoorte SA

Ph: 08 8762 9132

Email: potter.trent@saugov.sa.gov.au

DON MCCAFFERY

NSW DPI

Orange NSW

IREC

C/- CSIRO Land and Water, Griffith
Private mail bag 3 Griffith NSW 2680

Tel: 02 69601550 **Fax:** 02 69601562 **Email:** irec@irec.org.au

Latest Information

- Biodiesel is a renewable fuel that reduces greenhouse gas emissions and has the potential to offer grain growers an alternative market for their oil-based grains
- Many large scale plants are scheduled for completion during 2006 and 2007
- A number of individual farmers or farmer groups are interested in setting up smaller scale regional biodiesel plants
- Thorough research into all of the production factors, sale of co-products and costs of production (including feedstock availability and cost) must be known before investing in biodiesel production.

Introduction

Biodiesel is the name of ester-based oxygenated fuels commonly manufactured from vegetable oils (i.e. canola, sunflower etc), animal fats and tallow. Dr Rudolf Diesel first developed the "Diesel Engine" to run on vegetable oil in 1895 and he demonstrated the engine in 1900 using peanut oil at a World Exhibition in Paris.

Globally there are over fifty different vehicle manufactures that honour warranties for the use of biodiesel in their engines, with over two million registered vehicles in Europe. In the United States there are over four hundred registered fleets (up to one thousand vehicles per fleet – eg. US postal service) using biodiesel. In Australia production capacity of biodiesel from larger scale factories is likely to reach over 500 ML by mid 2007 and there is also significant interest by individual farmers or farmer groups in the development of small scale facilities to produce their own fuel needs for farm operations.

What is biodiesel?

Biodiesel is produced by chemically reacting triglycerides (oil from vegetable or animal source) with an alcohol (usually methanol), using either sodium or potassium hydroxide as a catalyst. The process involves displacing the glycerol molecule from the triglyceride (fatty acid molecule) with a methanol molecule. This produces methyl esters (biodiesel) and the co-product glycerin. The process is known as transesterification.

Biodiesel can be made in this way in any scale plant from commercial production plants of up to 150 million litres per year to farm scale production of 20,000 litres per year.

Of the co-products from biodiesel production, meal has a value if it can be easily marketed into intensive livestock production markets and glycerin may have a market if it is produced in larger scale plants. It is possible that the glycerin produced from small scale plants will have little or no value due to difficulties in marketing small amounts.

Small scale production

Many farmers or farmer groups are considering setting up small scale production facilities for biodiesel production. Many factors need to be considered to make this economically feasible.

1. Scale of operation

Larger scale plants will have lower costs of production per litre of biodiesel than small plants. However most, if not all, on-farm plants will fall into the higher cost per litre category.

2. Type of plant

Canola oil needs to be extracted from the seed to begin the process of biodiesel production. Small scale cold press extraction plants will leave about 7% oil in the meal, compared to less than 2% oil in meal when solvent extraction is used in larger commercial plants.

3. Feedstock to be used

In general, on farms in southern Australia, the most likely feedstock will be canola or mustard oil. These crops will be competing with food end-uses and will be priced as such. As well, the production of mustard in low rainfall areas will tend to be variable based on the timing of the seasonal break and the rainfall conditions during the season. Current yield data shows that mustard has a yield advantage over canola in areas where yields are below 1 t/ha but canola will yield more than mustard where yield potential is about 1.5 t/ha or better. For larger plants, other feedstock options can be considered eg. importing palm oil from Asia, but biodiesel from palm oil may not perform as well as biodiesel from other sources at colder temperatures.

4. Do you crush your own feedstock or do you buy oil already crushed?

It may be possible to buy oil if you are near a crusher.

5. Use of meal

Meal from smaller scale cold-press extraction plants has higher a oil content and therefore a high energy content. If this meal is being sold it needs to attract a high price to offset the reduced production of biodiesel. Growers close to feedlots could have a ready market or could use meal to finish lambs in their own feedlots to maximise the value of the meal.

6. Glycerol

Glycerol is a co-product of biodiesel production but smaller scale plants may have difficulty in disposing of glycerol and getting paid to do so. Some farmers see uses such a degreasing agents etc but with the world price of glycerol halving due to increased biodiesel production it is likely that returns for glycerol from small scale plants will be at little or no profit.

7. Risk management based on mineral oil prices

It is hard to envisage at present but biodiesel is only economic when mineral oil prices are high, that is above, say, \$US60 per barrel. Investment in small scale plants for biodiesel production has a risk that needs to be managed if oil prices return to lower levels or vegetable oil prices rise.

8. Government taxes

Farmers need to investigate the impact of taxation rulings on production of biodiesel for on-farm use or the possibility of increased production to allow some sales of excess biodiesel.

9. Is there a place for the use of straight vegetable oil in some machines?

There may be a place for using straight vegetable oil in harvesters, tractors etc without producing biodiesel. This should be investigated. Before putting any biodiesel or biodiesel mixes in farm machinery fuel tanks, warranties need to be checked with the manufacturer.

10. Do you use 100% biodiesel or use blends with diesel?

Costs of production

Studies in Western Australia (Oilseeds WA, 2006) have suggested that costs of production for biodiesel can range from as low as 63 cents per litre if manufactured from palm oil in a large scale plant up to 190 cents per litre using canola oil as a feedstock in a small scale plant. Farmers need to investigate the relative costs and benefits of plant size and feedstock to assess the chances of success with biodiesel production.

Many farmers are investigating biodiesel production and many have invested in it. An example is Steven Hobbs from Kaniva in Victoria who has built a small biodiesel plant on his farm and uses his own oil grown from canola and mustard (*Brassica juncea*), currently producing approximately 30% of his fuel requirements. He has plans to commission a new plant this year which will be capable of producing up to 300,000 litres of fuel annually and has a vision of decentralised energy facilities being established where

towns generate their own energy requirements through cooperative type arrangements (Steve Hobbs, pers. comm.).

Feedstock

SARDI is undertaking a breeding program to develop oilseeds as a feedstock source for biodiesel production in South Australia and will aim to develop both mustard and canola for this use. Other oilseed options will also be investigated.

Conclusion

Biodiesel is attractive from an environmental perspective, with high fuel prices driving current interest. However, in the longer term alternative sources of fuel will need to be developed. Agriculture in general, and oilseeds in particular have only limited capacity to replace much of the current and future fuel demand. Any local or regional investment in biodiesel needs to occur with a thorough knowledge of the costs and the risks associated with variable prices and feedstock availability, regardless of whether it is used cooking oil, tallow, canola or mustard.