IS BIG ALWAYS BEAUTIFUL?
- a review of biodiesel production at a range of scales

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The history of biodiesel production in Europe since its inception in the early 90s has seen a steady move to larger and larger production plants. Larger plants can offer significant economies of scale partly through lower plant investment needs per tonne rapeseed processed, opportunities for increased labour efficiency and lower processing costs per unit of production. Indeed, some of the small scale industrial units that were first developed have now been closed in favour of larger plants.

Scotland is well placed for growing oilseed rape; producing high average yields and high oil contents, and oilseed rape is an important part of the arable rotation. No rapeseed processing facilities currently exist in Scotland however, with all rapeseed being exported for crushing, whilst rapeseed meal required for livestock rations, is imported. These movements incur transport costs placing the Scottish rapeseed sector at a disadvantage to other areas. Downward pressure on markets in recent years has resulted in a decline in oilseed rape and in 2004 40,000 ha were grown in Scotland, producing 130,000 t. In 2005, a number of Local Government Authorities in Scotland joined together to fund a study of biodiesel processing. The aim of the study was to assess viability of biodiesel production in Scotland, and to investigate optimum scale for processing facilities based on Scottish produced rapeseed.

The SAC team commissioned to conduct this work gathered data relating to biodiesel production at a range of scales from 190 tonnes to more than 250,000 tonnes processed annually (see Table 1).

Table 1. Processing options considered

OSR (tonnes)	Option	Scale	Product	Capital cost
190	1A	Farm	Crude Oil **	£7.3k
355	1B	Farm	Biodiesel	£30.4k
1,030	2	Small Group	Crude oil **	£81.2k
15,000	3	Group	Biodiesel	£3.6m
60,000	4	Medium	Biodiesel	£10.2m
250,000+	5	International	Biodiesel	£25m

** Not eligible for fuel duty rebate

All production plants in this study were ‘off the shelf’ biodiesel plants from a number of manufacturers with a recognised history in biodiesel technology. The

two smallest scales examined (1A and 1B) were of a size appropriate for a single large arable farm. Scales 2 and 3 were appropriate for a small group – perhaps a co-operative – whilst scale 4 was a substantially sized plant which could operate at a regional level utilising 20,000 hectares of produce. The largest scale examined was 250,000 t – a size of plant currently being constructed at a number of locations across the world.

Financial assessments were then built up to provide the production cost per litre of biodiesel. (See Column 2, Table 2). The production cost took into account the purchase cost of the rapeseed, the capital cost of the plant, operating costs – such as labour, power, maintenance overheads, interest etc – and sale of by-products such as glycerine and the meal.

Table 2. On-the-road price for 5 biodiesel options (p/litre)

Option	Production cost	Retail margin	Duty	Sub-total	VAT 17.5%	Total cost
1A	57.9	2	47.1	107.0	0	107.0
1B	61.3	2	27.1	90.4	0	90.40
2	39.6	5	47.1	91.7	16.05	107.75
3	55.2	10	27.1	92.3	16.15	108.45
4	41.3	10	27.1	78.4	13.72	92.12
5	38.0	10	27.1	75.1	13.14	88.24

Production costs followed the expected pattern with the smallest scale having the highest cost and the largest scale the lowest cost (NB Options 1A and 2 were for the non-esterified, oil, product and had therefore significantly lower costs).

However, taking these production costs and adding a retail margin, excise duty and Value Added Tax (VAT) produced a rather different ranking order (see Column 7 Table 2). Whilst Option 5, the large international scale of production was still cheapest in terms of 'on the road' price, option 1B (the on-farm biodiesel option) was a surprising close second.

There were 2 factors which were major contributors to this. One was a much lower anticipated retail margin (2p versus 10p) and secondly was the absence of VAT paid. VAT is only paid at point of sale thus if the biodiesel producer is producing for his own use, then no sale takes place. Similarly the argument for the low retail margin for home production is that the 2/p litre is simply a small recompense for on-farm management costs. Indeed, the viability of on-farm biodiesel production could be improved further should rapemeal be used on the same farm and priced on the basis of its saving on imported feed. Linked to this are savings in haulage, utilisation of possible spare labour, the crediting of the total EU Energy Crop Supplement (currently 45 Euros/ha) and possible on-farm capital grants for the

equipment. It should also be noted that biodiesel qualifies for a 20p/L fuel duty rebate in the UK at present, taking the duty payable to 27.1p/L instead of 47.1p/L. Unesterified vegetable oil, as described in options 1A and 2 does not qualify for this rebate, hence the higher duty payable.

One major concern from the perspective of the biodiesel lobby is quality control and the risk of poor quality biodiesel undermining the reputation for reliability that has been built up over many years. A reassurance here is that, inorder to qualify for the duty rebate, samples of biodiesel produced must be submitted to Customs and Excise, and the duty rebate will only be granted if the product meets biodiesel quality standards.