DEFRA/DTI Nov 2006
A strategy for non-food crops and uses Two year progress report

The report lists current and developing applications of non-food crops and other measures designed to reduce dependence on fossil fuels and to increase sustainability and to reduce environmental impact. It also lists current drivers and barriers to uptake. In our view, opinion as to drivers and barriers is essential when forming opinion of potential liability exposure should there be any potential for harm associated with the product.

If non-food crop products and substances are taken up widely then risk managers would need a view as to the potential for new personal injury liabilities. The report lists new uses for plant derived substances [see a full listing below]. Our own initial views as to the potential for harm from these are as follows:

- Plant based metal-working fluids would encourage the growth of populations of novel forms of microorganism and, their decomposition products and metabolic products may be more bioactive than those found for mineral oils. They may be more readily oxidized (perhaps a problem for damage to equipment).
- Nut and soya oils may include allergens.
- Composting as opposed to land fill: may reduce the active degradation of the remaining landfill.
- Plant and animal based building insulation materials could encourage mould and other hygiene problems if damp, could be more accommodating for insect life, could be less resistant to fire, could be water absorbent.
- Feedstock augmented food crops (e.g. potato designed to increase proportion of insoluble polymers) could end up in the food chain. Gene migration. Co-existence [with GM] problems.
- Renewable fuels produce large quantities of waste biomass and ash.
- Small scale biofuels production may escape appropriate engineering and operation standards or inspection. Waste management facilities may be inadequate.
- Phytopharmaceuticals: environmental harm, gene migration, accidental inclusion in food.

Potential benefits are many, but probably beyond the scope of this report.

The listing presents views as to the drivers and barriers to uptake. Risk managers could use these views to help decide whether or not risk management action is currently warranted.

Glossary

OSR = Oilseed rape
COSHH = Control of substances hazardous to health regulations
SRC = short rotation coppice
VOC = volatile organic compounds

Market Sector	Stage of develop-ment*	UK feedstocks (current or potential)	Other crop feedstock examples	Examples of applications	Drivers for implementation	Barriers to uptake
Biolubricants						
Metal working fluids	C	Oilseed rape (OSR)	Sunflower, crambe, nut oils, soya bean	Ford Motor Company using vegetable based fluids in some of its manufacturing plants	Performance, cost, Health and Safety (COSHH), improved working conditions	Changes to manufacturing systems
Slip agents	C	HEAR, crambe	Soya bean	Erucamide from both Crambe and HEAR oil, used as a slip agent to reduce friction in manufacture of plastics. Also used on supermarket carrier bags to aid opening	Performance	
Total loss lubricants	C	OSR	Sunflower, nut oils, castor oils	Environment Agency and Forestry Commission insist on the use of vegetable based lubricants in its chain saws	Biodegradability, environmental procurement policy and performance	Cost relative to conventional oils
Hydraulic fluids	C	OSR	Sunflower, OSR, nut oils	Environment Agency and Forestry Commission require environmentally 'considerate' lubricants to be used in sensitive areas, these can be vegetable based or synthetic esters.	Biodegradability, environmental procurement policy	Hydraulic equipment must be flushed out and may need alternative seals
2-stroke engine oils	C	OSR	Sunflower, castor oil	British Waterways are currently phasing-in the use of lubricants based on renewables for its marine engines	Biodegradability	Cost relative to conventional oils
Mould Release Agents	C	OSR	Soya bean	Concrete mould release agents used in construction industry	Reduced environmental impact	
Drilling mud additives	R	OSR	Palm	Vegetable oils for offshore drilling operations (VOODOO) (Link project 1997) assessed the potential for using OSR oil for drilling fluids, results were favourable but not taken up commercially.	Biodegradable, risk of sea pollution with conventional mineral oil fluids	Water based alternatives are also available
Fibres						
Automotive textiles	C	Hemp		Interior car panels, parcel shelves, door linings	ELV directive, cost performance-weight saving, health and safety.	
Clothes manufacture/ textiles	C (mainland Europe) R, (C mainland Europe	Flax, hemp Nettles	Cotton	Traditional linen. Hemp in mainland Europe for textile industry STING project currently investigating nettles as a fibre crop for the UK	Eco-friendly market, fashion	Lack of processing facilities and scaling up of production

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Fibres (continued)						
Building Composites	C	Hemp	Hemp, tropical fibres e.g. kenaf, kapok, coir	Hemp/lime mix used to produce building blocks as a substitute to concrete. e.g. new Adnams brewery distribution centre. Straw fibreboard	Sustainable construction, high thermal and strength performance	Awareness and examples of use
Insulation	C	Sheep's wool, hemp, flax		Sheep's wool insulation marketed as Thermafleece by Second Nature. Hemp insulation in Europe (Germany)	Sustainable construction. Performance favourable compared to glass fibre	Costs currently higher than con-ventional insulation products. Awareness and lack of distributors
Biosolvents						
Printing solvents/ cleaning solvents	C	Oilseed rape	Soybean, coconut, palm, sunflower	Solvents for use in the printing industry have been trialled in UK. Performance good in some applications but slow uptake by industry	Heath and safety, potential for reducing/ eliminating operator exposure to VOC's	Cost. Not suitable for all applications. Change in working practice
Bioploymers						
Bioplastics-packaging	C (Germany, US)	Wheat, potatoes, oilseed rape	Maize, potatoes, soya, sunflower	Polylactic acid from starch fermentation used to produce bioplastics by Rodenburg, Germany; Cargill Dow, US. Starch polymers used for biodegradable packaging e.g. bags, nappies etc.	Bioplastics may be biodegradable, can be diverted from landfill and composted	Disposal/waste segregation issues. Biodegradable plastics not suitable for all applications
Bioplastics	C (US)	Sugar beet	Maize	Production of bio-propanediol which is then polymerised to produce engineering plastics (DuPont)	Equivalent performance to oil derived plastics	
Incorporation in tyre manufacture	C		Maize	Goodyear manufacture BioTRED tyre, maize starch used in composite to improve tyre performance and fuel economy	Performance, eco-market	Cost/awareness
Plasticisers	R	Crambe, OSR	Castor oil	The BioComposites Centre at the University of Wales are currently developing a polymer plasticiser from an ester of brasscylic acid which is derived from crambe oil. Plasticisers are used to transform unplasticised PVC (uPVC) into a plasticised flexible form such as flexes, tubing and hoses	Need for alternative to conventional dioctyl phthalate about which there are health concerns. Indications are that performance is as good as conventional plasticisers	Development is ongoing to improve manufacture and purification techniques

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Biocomposites						
Automotive biocomposites	C (mainland Europe)	Hemp		Hemp produced in UK exported for this purpose, used by major car manufacturers and accounts for 80% of hemp use	ELV vehicle directive, other performance and health & safety benefits	Processing carried out in Europe, relatively small Hemp acreage in UK
Packaging	C (NZ) C	Potatoes, Wheat	Maize	Potatopak (NZ) produce biodegradable disposable plates, cutlery, punnets/trays from potato starch Wheat based packaging (polystyrene alternative) produced in UK	Biodegradability	Unit cost/ promotion, only suitable for short life applications in some cases. Disposal/waste segregation
Energy						
Small scale heat/CHP generation	C	SRC, miscanthus, forestry residues, cereal grains, cereal straw		Numerous examples of small scale heating systems running on SRC/forest residues. Harper Adams University College has installed a small scale combined heat and power plant	Alternative farm income, local supply chain, capital grants	Investment costs. Grid connection and contractual obligations limits electricity generation. Slow development of UK supply chains
Large scale power generation	C	SRC, miscanthus, forestry residues, cereal straw	Olive and other crop by-products	SRC used for co-firing in power stations such as Cottam and Drax. Miscanthus may also be used. Elean power station uses cereal straw as main fuel source	Renewables Obligation, tradable ROC's	Competitor biomass costs. Slow development of UK supplies
Biodiesel	C	OSR	Palm oil, waste vegetable oils, soy oil, sunflower oil	Numerous commercial plants in production or under construction. Significant tonnage of OSR exported to Germany for biodiesel production	Renewable Transport Fuels Obligation. Duty reduction	Engine warranty issues. Technical constraints with some blends
Bioethanol Biobutanol	C R	Sugar beet	Maize	British Sugar is currently constructing a bioethanol plant at its Wissington site. British Sugar in collaboration BP and DuPont are looking at the feasibility of producing biobutanol	Renewable Transport Fuels Obligation	User awareness. Engine warranty issues
Bioethanol	C	Wheat, sugar beet	Maize	Green Spirit Ltd. to construct bioethanol plant at Henstridge, Somerset. Other ethanol plants at planning stage. First E85 bioethanol pump opened in Norfolk.	Renewable Transport Fuels Obligation	

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Phytopharma-ceuticals						
	C/R	Poppy, Artemisia, daffodil, *Cannabis sativa*		Currently around 28 drugs produced commercially from plants to any significant degree worldwide. Current UK research projects include examining the potential for growing Artemisia for novel malaria treatment and galanthamine from daffodils	Some plant derived drugs found to perform better than synthetic counterparts, innovation	Stringent regulatory framework-expensive to register products
Speciality						
Personal care	C	Various; calendula, hemp, lavender, echium	Numerous camelina, marigold, camomile, coconut	Wide range of products in this sector	Marketing and media	Cheap imports
Paints and surface coatings	C	Linseed	OSR, castor oil	Linseed oil paint, putty etc.	Technical performance, drive to reduce VOC's	
Nutraceutical	C	Borage, evening primrose, echium	Borage, evening primrose	Borage marketed as Starflower as health supplement, also used in baby foods and cosmetics	Marketing and media	Cheap imports and overseas production, novel foods approval issues
Dyes	C (on very small scale in UK)	Woad (Indigo)		Used only for small-scale natural dyeing purposes. India currently supplies most of the world's consumption of natural indigo.	Renewable, craft/speciality market	Synthetic alternatives. Cost, performance, environmental concerns with mordants (fixing agents). Not suited to dyeing synthetics.
Agro-chemical adjuvants	C	OSR	Sunflower	Used to improve efficiency of agrochemicals	Performance and crop safety	
Surfactants	C (mainland Europe)	Various, probably not UK.	Camelina, pot marigold, camomile, soybean, coconut oil	Ecover currently market a range of detergents and cleaning products based on vegetable surfactants ingredients	Eco-friendly consumers, market	Cost
Printing Inks	C	OSR, linseed	Soya bean, linseed and others	Small market in UK, not suited to lithographic systems	Measures to reduce use of VOC's in the workplace	Some technical limits to use

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Comment

Regulatory action will continue to bias the market in favour of renewable sources. The body charged with coordination and knowledge transfer (NNFCC) has not yet produced independent guidance on potential liability issues.

The above points relating to potential risks should be self-evident to the product developers.