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Biofuel on contaminated land

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Desktop studies of two Swedish contaminated sites has indicated that growing biofuel crops on these sites may be more environmentally beneficial than alternative risk management approaches such as excavation / removal or containment

The demand for biofuel increases pressure on the cultivatable soil of the world. While contaminated land is not very suitable for food production, cultivation of low and medium contaminated soil may remove some pressure from agricultural soils. For larger sites, biofuel cultivation may be economically viable without a remediation bonus. Suitable sites have topographic conditions that allow agricultural machinery, are not in urgent need of remediation, and contamination levels are not plant toxic.

Life cycle assessment (LCA) was done for two cases. The (desk top) case studies were
- Case K, a 5000 m2 site where salix (willow) was cultivated with hand-held machinery and the biofuel harvest was left on site, and
- Case F, a 12 ha site were on site ensuring was being considered, and were salix might have rented an economic profit if the remediation had not been urgent due to exploitation pressure.

Some selected results for biofuel K; biofuel F; excavation K; and on site ensuring F respectively:
Energy: 0,05; 1,4; 3,5; 19 TJ
Waste: 1; 9; 1200; 340 ton
Land use off-site: 190; 3 500; 200 000; 1 400 000 m^2 a
Global warming: 3; 86; 230; 1 200 ton CO2 eq
Acidification: 25; 1 000; 2 600; 14 000 kg SO2 eq
Photochemical smog: 10; 180; 410; 2 300 kg ethene eq
Human health: 2; 51; 150; 620 index

The environmental impact of the traditional remediation methods of excavation and on-site ensuring was mainly due to the transport of contaminated soil and replacement soil, and landfilling of the contaminated soil. Biofuel cultivation avoids these impacts, while fertiliser production and agricultural machinery would have a lower environmental impact than moving large volumes of soil around. Journeys of a controller to check on the groundwater quality also contributed to the biofuel impacts.

The net CO2 equivalent emission on a 100 year basis per MJ energy in the Salix Vinimalis was between -0.02 and -0.1 kgCO2e/MJ. The fate of the stubble and roots of the salix was crucial for the carbon footprint. While stubble and roots remain in the soil (as increased soil organic matter), the carbon dioxide they took up while growing is not contributing to global warming. This pool was much larger than the CO2 emissions from soil transport and other processes.

Biodiversity was difficult to include, and the results are uncertain. But the results indicated that biodiversity impact of biofuel cultivation may be large compared to "easier" categories like global warming and human health, and the net impact of biofuel cultivation may well be benifical to the environment instead of damaging.