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The Global Invasive Species Programme
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ASSESSING THE RISK OF INVASIVE ALIEN SPECIES PROMOTED FOR BIOFUELS

CONTEXT

Many countries are currently looking at growing high-yielding crops for the production of biofuels as alternatives to traditional fuels (petrol and diesel) to address imminent shortages and reduce impacts of climate change. If these initiatives are not carefully assessed, however, promoting the cultivation of some popular species for biofuel production will increase two of the major causes of biodiversity loss on the planet: clearing and conversion of yet more natural areas for monocultures, and invasion by non-native species.

Habitat conversion is already the leading cause of biodiversity loss worldwide, and limiting the enthusiastic cultivation of new crops to areas already converted is not an easy or popular task. The issue addressed here, though, is that a number of the most commonly recommended species for biofuel production are also major invasive species in many parts of the world. Thus, they need to be assessed for the likelihood of invasion before being cultivated on a large-scale for biofuels production. Some of these species are spread by birds, small mammals and other animals, making their control difficult or impossible, with impacts increasing over time and long-term production prone to more financial losses than gains.

This note provides basic information and recommendations for project proposals on biofuels using species that have a history of invasion and require careful management if they are to be used on a large scale and not contribute to natural habitat and biodiversity loss.

RECOMMENDED ACTIONS

The Global Invasive Species Programme has identified a number of actions to avoid impacts on biodiversity from the use of inappropriate species for biofuels and is ready to provide further support to countries on this issue. Specifically, the development of biofuels projects should consider:

- **Selection of low risk species:** using information from popular biofuels species already listed above as many are already notorious as having a strong history of invasion in many parts of the world with similar climates and conditions to those where they will be planted in monoculture;

- **Information gathering:** checking national noxious weed lists, databases and websites for references relevant to the countries where biofuel plantations are proposed;
- **Risk assessment:** using risk assessment protocols to evaluate the risk of invasion by species in biofuel proposals, especially from countries with less experience in addressing biological invasions or screening for impacts on biodiversity;
- **Risk management:** including monitoring and contingency planning in proposals for biofuels, especially for control in cases of escape and according to results of risk assessments. Control procedures have to be viable and well-tested, so invading species dispersed by animals and other active means must not be used without a tried and tested contingency plan for escapes;
- **Benefit/cost analysis:** performing market studies and presenting business plans that can show real benefits for the proposed activities before funds are made available, as there are many known cases of introduced species that never achieved commercial value (but still remained as problems); and
- **Use of native species wherever possible:** creating incentives for the development and use of native and non-invasive species that pose the lowest risks to biodiversity.

The Global Invasive Species Programme recommends that countries do not develop activities that are based on the use of known invasive species for biofuels production programmes. The risks to biodiversity are just too great. Recognising the reliance on biodiversity by many millions of people, especially in developing countries, GISP feels that risk assessment, monitoring and contingency planning are justified and should be mandatory for the support of projects to grow biofuels *en masse* – as the inadvertent introduction of invasives species may result in diminished livelihoods, reduced development and more inroads into biological diversity.

SPECIES THAT POSE RISK

The following table lists species recommended for biofuel production in different countries and provides a preliminary categorization regarding their potential degree of risk.

SPECIES USED OR BEING CONSIDERED FOR BIOFUEL PRODUCTION

Categories are:

1 - Species being cultivated and already known to be invasive
2 - Species not yet being cultivated but indicated for biofuels
3 - Species being cultivated but not yet expressed as invasive
4 - Species that are not prone to invasion

Species	Common name	Native range	Habitat type	Invasive in	Vectors	Category	Reference
Amelanchier canadensis	Serviceberry	North America, Europe, Asia	temperate forests	United States	Animals	1	Biomass 9 (1986) 49-66
Artocarpus communis, A. altilis	Breadfruit	Pacific Islands, Southeast Aisa		Fiji, Kiribati, Line Islands		1	www.hear.org/pier
Arundo donax	Giant reed	Eurasia	Wetlands and riparian areas	United States, Mexico, the Caribbean, Southern Europe, South Africa, Thailand, Australia, New Zealand, Hawaii	Water (vegetative spread)	1	Global Compendium of Weeds
Azadirachta indica	Neem	India, Burma, Sri Lanka, Myanmar, Bangladesh	Arid lands	West Africa; Australia, Fiji, Mauritius	Birds, Bats	1	Global Compendium of Weeds
Brassica napus	Rapeseed/canola	Eurasia	Well-drained soils	Australia, Ecuador, Fiji, Hawaii, New Caledonia		1	
Camelina sativa	False flax	Eastern Europe and Southwest Asia	Well-drained soils	North America, Western Europe, Australia, Central America, South America, Japan		1	Feb. 2007 Biodiesel Magazine
Cocos nucifera	Coconut	Unknown		Australia, United States, Micronesia, Japan		1	
Crataegus spp.	Hawthorn	North America, Europe, Asia		Australia, United States	Birds, mammals, insects	1	Biomass 9 (1986) 49-66

Diospyros virginiana	Persimmon	Eastern United States	Bottomland swamps, along stream banks, in upland forests, in fields, pine woods, and dry scrub lands		Animals+F32	1	
Diospyrus kaki	Oriental persimmon	China, Japan			Insects	3	Biomass 9 (1986) 49-66
Elaeis guineensis	African oil palm	West Africa (Madagascar)	Tropical riparian forests	Brazil, Micronesia, Florida USA	Animals	1	
Gleditsia triacanthos	Honeylocust	Eastern North America	Forests	Central Argentina, South Africa, Australia, USA, New Zealand	Insects	1	
Jatropha curcas	Physic nut	Tropical America	Arid and semi-arid lands	Australia, South Africa, United States, Pacific Islands, Puerto Rico	Water and in mud on vehicles and machinery or animals	1	
Maclura pomifera	Osage orange	Central United States	Well-drained soil	Europe, USA, Australia, South Africa	Animals	1	
Miscanthus x giganteus	Chinese silver grass	Asia	Well-drained soil	United States, Australia	Wind	1	
Morus alba	Mulberry	Asia		Brazil, Ecuador, United States	Animals	1	Biomass 9 (1986) 49-66
Olea europaea	Olive tree	Mediterranean Europe	Dry areas	Australia, Hawaii, New Zealand	Animals	1	
Panicum virgatum	Switch Grass	United States, Central America	Prairies and open ground	Hawaiian Islands	Wind	1	
Phalaris arundinacea	Reed canarygrass	Europe, Asia, North America	Wetland	United States, South Africa, Australia, New Zealand, Chile, most temperate countries	Wind, water	1	

Prosopis spp.	Mesquite	America	Arid and semi-arid lands	Eastern Africa (Sudan, Eritrea, Ethiopia, Djibouti), Southern Africa, India, Australia	Animals	1	
Quercus acutissima	Sawtooth oak	Eastern Asia, Korea, Japan, China		North America, Europe	Wind, squirrels	1	Biomass 9 (1986) 49-66
Ricinus communis	Castor bean	East Africa	Riparian areas	Many countries - Brazil, Australia, Pacific islands, New Zealand, South Africa, Mexico, United States, Western Europe	Animals and water	1	
Rubus cf. fruticosus	Blackberry	North America and Europe	Forests and prairies	One of Australia's 20 top weeds, New Zealand, South Africa, Western Europe, United States	Animals	1	Biomass 9 (1986) 49-66
Rubus idaeus	Raspberry	Eurasia	Forest clearings or fields	Western Europe, Australia, Eastern Europe, New Zealand		1	Biomass 9 (1986) 49-66
Sambucus canadensis	Elderberry	Central and North America	Riverbanks and forest edges, swamps	Australia	Birds	1	Biomass 9 (1986) 49-66
Sapium sebiferum/Triadica sebifera	Chinese tallow	China, Japan	Wetlands and riparian areas	United States, Australia, Puerto Rico	Birds	1	
Sorghum halepense	Johnson grass	Mediterranean to India	Fertile lowland areas	United States, Australia, Pacific Islands, Central and South America, Indonesia, Thailand	Birds, livestock, water, wind	1	
Vaccinium cf. angustifolium	Blueberry	North America		Germany		1	Biomass 9 (1986) 49-66
Viburnum trilobum	Highbush cranberry	North America				3	Biomass 9 (1986) 49-66

Ziziphus mauritiana	Chinee apple, jujube	India, China	Arid lands, sandy, well-drained soils and do less well in heavy, poorly drained soils	Australia, Africa, Afghanistan, China, Malaysia, northern Australia, some Pacific archipelagoes and Caribbean region	Insects and wind	1	Biomass 9 (1986) 49-66
Helianthus annuus	Sunflower	America				4	
Glycine max	Soy	Unknown				4	
Saccarum officinarum	Sugar cane	Unknown				4	
Ipomoea batatas	Sweet potato	South America				4	
Arachis hypogaea	Peanut	Brazil				4	
Triticum	Wheat	Unknown				4	
Sorghum bicolor	Sweet sorghum	Northern Africa				4	
Manihot esculenta	Cassava / yuca	Brazil				4	
Gossypium spp.	Cotton	Unknown				4	