Project presentation

The Research Council of Norway

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Green biodiesel from African tree

The fruit of the jatropha tree consists of roughly 35 per cent oil that can fuel standard diesel engines. So as a biofuel, is this oil an environmental godsend or a castle in the air?

Jatropha has been championed as a major environmental opportunity for developing countries with a semi-arid climate and marginal soil. Scientist Karl Hilding Thunes of the Norwegian Forest and Landscape Institute has been investigating whether this small, hardy and relatively pest-free tree lives up to its billing.

Biofuel of the future
Jatropha is a top candidate for future large-scale biodiesel production, according to investment bank Goldman Sachs. TIME Magazine reported that jatropha could yield 6 tonnes of biodiesel per acre (15 tonnes per hectare) annually. The New York Times wrote that this otherwise worthless weed far eclipses corn's efficiency as a biofuel.

Furthermore , since it can grow in soils and climates poorly suited for cultivating edible crops, jatropha poses little threat to food production in developing countries.

A few years ago, a Stavanger-based company secured the rights to cultivate jatropha in Ghana on a tract of land nearly twice the size of Luxembourg . The ambitious plan is to eventually produce 20 000 barrels of oil per day, which would make the company Norway's second-largest oil producer, behind Statoil. Other international companies have permits to grow jatropha at a number of sites around Africa.

"Jatropha has undoubtedly been over-hyped somewhat in recent years. Expectations have become more realistic now, but there is no question that jatropha has major potential," asserts Dr Thunes.

The scientist has conducted studies and field trials with jatropha in Ghana and Niger. He has surveyed the pest risk factors that threaten jatropha crops, and studied how to cultivate the tree in order to minimise pest problems and prevent mass invasion.

Robust in dry heat
"Jatropha is indeed a hardy tree that thrives in hot, dry climates," explains Dr Thunes. "But it is not as invincible as some people have trumpeted."

Karl Hilding Thunes has experimented with jatropha at the ICRIS research station in Niger. (Photo: Karl Hilding Thunes)

"It's true that jatropha does well in quite extreme conditions, but in order to yield plenty of fruit for producing oil, it needs sufficient water, fertiliser and care. A poorly tended plantation of jatropha is an easy target for destruction by a grasshopper swarm."

Dr Thunes has carried out controlled experiments with irrigation and fertilisation of jatropha at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), which is an institute in Niger under the auspices of the Consultative Group on ▶▶▶

Jatropha oil is probably more environment-friendly than sugar cane and corn for production of biodiesel. (Image: Shutterstock)

▶▶▶ International Agricultural Research (CGIAR). The Research Council of Norway administrates a grant scheme funded by Norad that allows researchers to stay and work at one of the 15 CGIAR institutes around the world.

Toxic, yet environmentally friendly?
The entire jatropha tree, including its oily fruit, is toxic when consumed by people and most animals. But its oil is highly suitable as a fuel alternative to the burning of coal in power plants, for instance. By weight, jatropha fruit contains more energy than coal.

There is keen interest in the potential for blending jatropha biofuel with petrol or diesel for more climate-friendly energy consumption. International airlines have conducted successful trials in which fully 50 per cent of jet fuel was replaced with biofuel from jatropha. Other experiments are underway in several African countries, as well as in Brazil, China, India, Malaysia and the Philippines.

Native to Central America, the toxic, foul-smelling jatropha tree has been employed for centuries to deter animals from grazing on edible crops. In Mali alone, farmers grow it so extensively for this purpose that all the trees lined up in a row would stretch 22 000 kilometres.

Simple anti-pest measures
"A number of species consume jatropha, such as grasshoppers, beetles, mites, butterflies and thrips," says Dr Thunes.

However, he has found no serious pest threat to the jatropha he studied in Africa. He concludes that if the plant is properly cared for, pests should not pose a serious risk to large plantations.

Dr Thunes contends that pest attacks can be effectively contained using simple preventative measures such as establishing blooming hedges that help with pollination, or planting natural barriers of mango or avocado trees between fields of jatropha. Cultivating low-lying plant species below the jatropha trees is another tactic, but care must be taken not to crowd the trees.

The seeds of the jatropha fruit are rich in oil. (Photo: Wikipedia Commons)

Producing any biofuel crop, however, whether sugar cane, corn or jatropha, requires large volumes of water and fertiliser – a fact that diminishes the environmental benefit. Jatropha can be fertilised with its nutrient-rich press cake (a residue of the oil extraction process) and survives on far less water compared to sugar cane and corn.

Throughout Africa, in places without electricity, jatropha also represents opportunities for localised oil production for running small, local power-generating plants.

The NORGLOBAL-program

NORGLOBAL shall strengthen Norwegian research on and with the South. It includes Povpeace, Cgiar, Women- and gender research, Globalisation of the environment-, energy- and Climate research, Econpop, Western Balkan and The networks. New research related to development might be placed under NORGLOBAL

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