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Production of biodiesel from perennials

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Department of Agriculture and Food
Government of Western Australia



PRODUCTION OF BIODIESEL FROM PERENNIALS

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RESEARCH INTO THE PRODUCTION OF BIO-DIESEL FROM PERENNIALS

A scoping study funded through South West Catchment Council (SWCC)/National Action Plan (NAP) into the development of industries for saline land, identified three plant species suitable and potentially economically feasible for this environment. The main product of two of these plant species, is the production of bio-diesel. The mentioned plant species are *Moringa oleifera* and *Pongamia pinnata*. Both are tolerant to high salinity levels, waterlogging, frost and drought. Their pods are harvested, meaning that the trees keep on growing, using water and reducing the high watertable whilst sequestrating carbon.

Bio-fuels must be sustainably, with these two plant species fitting all the criteria.

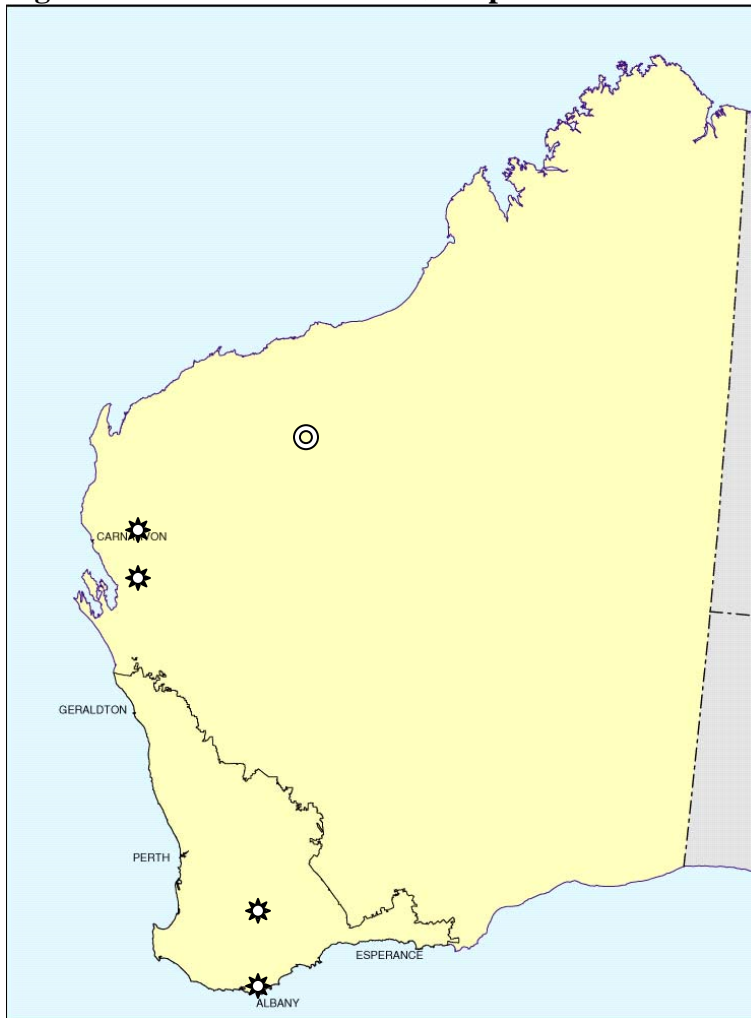
- It is salt tolerant: Land salinisation is one of the greatest challenges to land productivity and water resource management in the SW Agricultural region with dryland salinity affecting 30 per cent of the SW Agricultural Region in Western Australia (1 million hectares) or at risk of being affected in the future.
- It can grow on marginal land: Traditional cropping of marginal land combined with continuous rising input costs is not economically viable. Land has to be farmed according to its capacity.
- It sequester carbon and reduce greenhouse gasses: Climate change and greenhouse gas emissions are becoming more important by the day. Addressing these issues as part of every farming system is crucial, not only for the environment but also for market access and premium prices.
- It is an ethical land use: Utilising crops suitable for human consumption or land traditionally producing grain for bio-fuel production is contentious, however these trees can be grown on marginal land. Supply and demand factors and energy balance make other bio-fuels less of an option but the energy balance is positive for these trees and it does not compete with traditional food for human consumption.

Although the ideal climatic conditions for these plants are dry-temperate, they do grow in Mediterranean climates with not much known about yields in this environment. Because none of these plants is grown on a commercial scale in Australia, international data on yields was used for an analysis, which produced promising results in terms of profitability. These data suggests that:

- *Pongamia pinnata* produce 2,000 – 4,000 litre bio-diesel per ha per year. Production starts from year 4 onwards. The oilcake is used for fertiliser and contains a natural insecticide. Water requirements under rain-fed conditions are 500mm plus and internal rate of return calculated at 47 per cent (non-irrigated).
- *Moringa oleifera* produce 1,000 to 2,000 litres bio-diesel per ha year. Production starts within a year and the oil cake and leaves are excellent stock feed. Minimum water requirements under rain-fed start at 250mm whilst the internal rate of return was calculated at 41 per cent (non-irrigated).

Research trials (Figure.1) were planted in October 2006 at Denbarker (southcoast of WA, in partnership with Great Southern Plantations), Katanning Research Station February 2007 (SWCC/NAP funded) and May 2007 at Carnavon Research Station and Wooramel Station (funded by Great Southern Plantations) to establish yields in WA. Propagation of the plants was done in conjunction with a commercial nursery (Blyths Tree Nursery). More trials are planned for later in the year in the Pilbara.

Figure 1: Location of current ✨ & planned ☉ trial sites



The trial in Denbarker is on a shedding site in a high rainfall area (900mm per annum, mediterranean climate). The Katanning sites are in the Wheatbelt, medium rainfall area (430mm per annum, mediterranean climate) and are split into two different sites. One site is on typical shallow duplex soil with varying levels of salinity (slightly to moderately affected), whilst the other site is on deep sands and to be irrigated with saline water (1200 and 700mS/m). The trials in the Gascoyne (sub-tropical climate) is irrigated with fresh and brackish water on Carnavon Research Station and irrigated with water from the Artesian Basin on Wooramel Station.

Initial results confirm the drought tolerance of the plants and especially the quick growth rate of *Moringa*. Positive results in terms of yields will lead to real landscape changes and the production of large, continuous and reliable quantities of bio-diesel.

Figure 2. *Moringa oleifera* and pods



Figure 3. *Pongamia pinnata* and pod

