Tequila plant could fuel vehicles and help reduce emissions

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The first trial of the agave plant in Australia at Kalamia Estate, Queensland in July 2009. Credit: Don Chambers

In an article published today in the journal *Energy and Environmental Science*, plant physiologist Dr Daniel Tan and his University of Oxford collaborators have analysed the potential to produce bioethanol (biofuel) from the agave plant, a high sugar succulent widely grown in Mexico to make the alcoholic drink tequila.

The agave plant has not yet been widely cultivated as a fuel source, but it promises some significant advantages over existing sources of ethanol such as sugarcane and corn, Dr. Tan and his Oxford colleagues argue.

"The agave plant is probably one of the most promising crops we can

grow to produce ethanol-based fuels," said Dr. Tan, a senior lecturer in the Faculty of Agriculture, Food and Natural Resources. "It can grow in arid areas without irrigation; it doesn't compete with food crops or put demands on limited water supplies."

A pilot agave farm to produce ethanol has been established in Kalamia Estate, Queensland (near Ayr) but more work needs to be done. "Further research is obviously needed to improve the understanding of the agave plants and to develop the technology involved," the paper notes.

Dr. Tan and his co-authors - including Sir David King, a former chief scientific advisor to the UK Government - analysed the production of ethanol from the agave plant in a hypothetical farm and production facility and found it had a number of other benefits.

"Ethanol derived from agave has a positive energy balance - the energy created is five times that required to produce it. This compares favourably to the highly efficient sugarcane, and to the less efficient corn as a source of biofuel," Dr. Tan said.

"It also compares favourably to sugarcane-derived ethanol for its ability to offset greenhouse gas emissions, which we calculated at 7.5 tons of CO2e per hectare per year - taking into account the crop's complete lifecycle, from planting and harvesting to production and processing."

Xiaoyu Yan, lead author and postdoctoral researcher at the Smith School of Enterprise and the Environment, University of Oxford said:

"Our analysis highlights the promising opportunities for bioenergy production from agaves in arid or semi-arid regions, causing minimum pressure on food production and water resources. The results suggest that ethanol derived from agave is likely to be superior, or at least comparable, to that from corn, switchgrass and sugarcane in terms of

energy and GHG balances (net GHG offset per unit land area), as well as ethanol output."

An agave production facility would also be self-fuelling, with the plant's woody by-products (bagasse and residue) fuelling the production facility's energy requirements, says Dr. Tan.

More information: pubs.rsc.org/en/journals/journalissues/ee

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