



CLEW Case Study: Assessing Interdependencies among Energy, Water, Land-Use and Climate Change in Mauritius



Sustainable Development Goals Addressed



Organization, Institution or Company
Food and Agricultural Research and Extension Institute (FAREI), Mauritius and International Atomic Energy Agency (IAEA)
Location of project site, Country
Mauritius
Brief narrative description of objective/project/activity/initiative
<p>With limited land and energy resources, along with geographic isolation, Mauritius faces significant challenges relating to land use, water and energy, along with high vulnerability to climate change. The country relies on imports for 70% percent of its food needs and over 80% percent of its energy needs, while the economy is highly dependent on exports of sugarcane. To respond to climate change, while reducing dependence on energy imports, one option for Mauritius is to utilize sugarcane for ethanol production.</p> <p>The IAEA supported national experts in Mauritius to examine the potential implications of alternative biofuel production strategies on GHG emissions, land use, and water and energy balances using an integrated CLEW (Climate, Land, Energy and Water) approach. Researchers in Mauritius utilized three integrated software models — one each for energy, water and land use — to analyse a set of scenarios to 2030. The models were calibrated with common assumptions for GDP growth, international energy and other commodity costs, domestic water constraints and other drivers.</p> <p>Alternative climate change scenarios were considered, including a base scenario without climate change and a scenario incorporating a reduction in precipitation due to climate impacts. For each climate scenario, three policy strategies were analysed to compare first- and second-generation biofuels from sugarcane as well as from alternative drought resistant crops.</p>
Economic, environmental and climate benefits, challenges and lessons learned
<p>Even in the absence of climate change, water and energy requirements (along with GHG emissions) are expected to increase steadily into the future, independent of changes to sugarcane cultivation, driven mainly by economic growth and municipal needs. Diverting a portion of sugarcane production to first-generation ethanol synthesis can reduce gasoline imports and GHG emissions while providing an additional source of income for sugarcane producers. However, this is expected to slightly increase water demand and electricity consumption for water pumping. While a switch to second-generation ethanol can further reduce gasoline imports and GHG emissions in transportation, the diversion of bagasse from electricity generation to ethanol production is likely to increase distillate and coal imports (for electricity generation), partially offsetting the reduction in GHG emissions. The higher costs of producing second-generation ethanol also offsets some of the savings from reduced gasoline imports.</p> <p>Accounting for possible impacts of climate change reveals a more complex picture, given that the agricultural sector is expected to be significantly affected as the north and west regions of Mauritius become less suitable for rain-fed sugarcane production. Changes to rainfall are likely to result in increasing demand for irrigation, seawater desalination and water pumping, and reduced hydropower output. Under these conditions, switching to first-generation ethanol is less attractive, and other crops requiring less water, such as jatropha, cassava, maize and miscanthus may be more suitable, despite the lower productivity and higher cost of these alternative crops compared to sugarcane.</p>

Overall, the analysis illustrates the value of an integrated approach to energy, water and land resource planning, and highlights how the impact of climate change, particularly on water availability, can have a substantial bearing on the suitability of biofuels for climate change mitigation.

Additional information: website addresses and contacts

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See also, <https://www.iaea.org/topics/energy-planning/capacity-building>

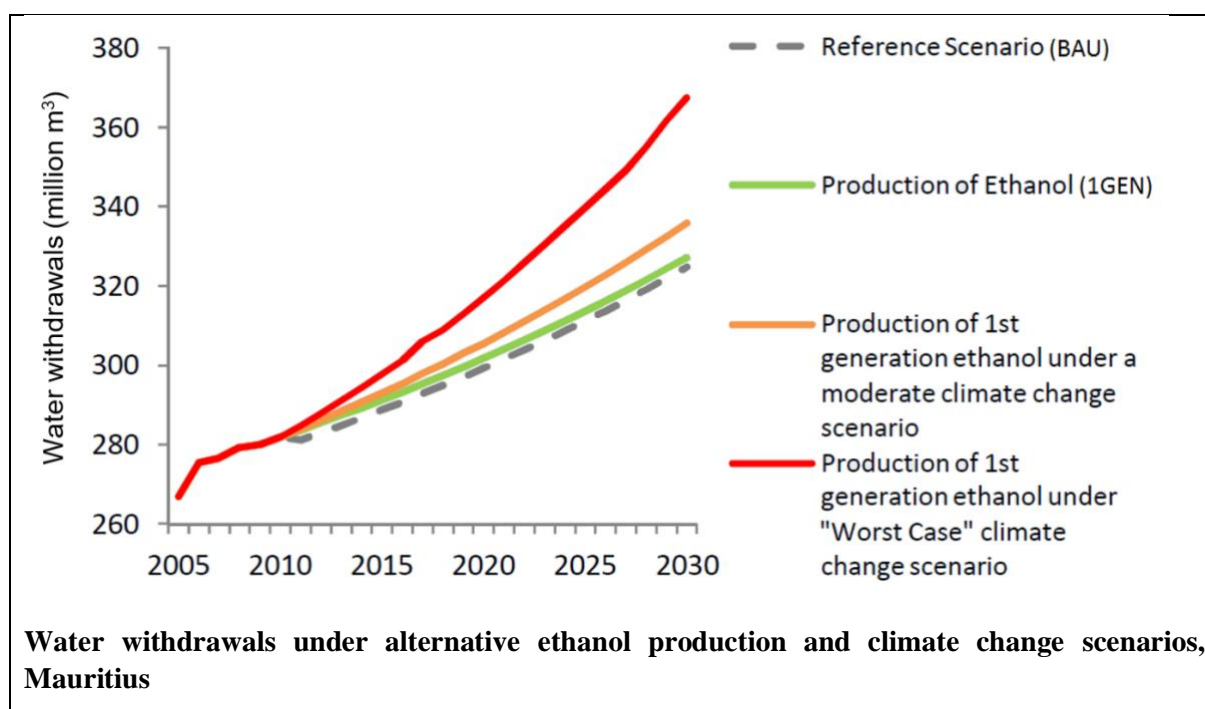


Photo (front page): view from sugarcane field, "Lion Mountain, Mauritius" by John Mauremootoo is licensed with CC BY-NC-SA 2.0. To view a copy of this license, visit <https://creativecommons.org/licenses/by-nc-sa/2.0/>