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An Input-Output Approach to Thailand's Energy Transition: Effects on the Land, Water and Food

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Population and economic growth have increased demand for food, energy, and other resources. At the same time, there is competition from those sectors on limited water and land resources. Thailand faces similar challenges as they transition towards energy independence by increasing renewable energy production for energy security, and to become future exporters of energy. Thailand implemented the Alternative Energy Development Policy (AEDP) in 2012, which led to shifting land use from rice for food to sugarcane for energy production, especially from crop residue. Currently, crop residue use for electricity production is well below its potential. In 2017, 1.06% and 4.44% of total potential of paddy husk and sugarcane bagasse respectively were being used for electricity generation (DEDE, 2017). The AEDP looks to increase energy production from residue use, by targeting future growth in demand, technological changes, and potential areas for renewable energy production. This policy will also impact food supply, water and land use. The sugarcane act in Thailand sets minimum internal prices, in line with international sugar prices, to safeguard the industry, and farmers. However, this safeguard does not apply to sales for energy production, thus discouraging farmers to sell sugarcane to power plants. The study uses an input-output model to understand the economic effects of using crop residue for electricity on the economy, land, labour, etc. The study runs two future scenarios and two historical years (2011 and 2014) to assess these impacts. The first scenario looks at the policy from the Ministry of Industry to stop sugarcane residue burning by 2022. The second scenario looks at the AEDP, which seeks to rapidly increase the generation of electricity from biomass by 2036. The results demonstrate that in the first scenario, where the entire potential of sugarcane bagasse is used for electricity production, electricity generated from all other sources remains nearly the same. Therefore, reliance on non-renewable sources do not change from 2014 to 2022. Similar results are seen for water use, labour and capital, where there is no change over time. The second scenario shows that while the AEDP increases production from biomass, it is not capturing the full potential and therefore electricity production is much lower from crop residues than in scenario 1. This leads to increasing production of electricity from other non renewable sources. We also see a reduction in paddy production and a rise in cane production before the implementation of the AEDP to the future. We conclude that while Thailand is moving towards energy security, policies should target technological development and mechanization at the farm level. The subsidies targeting farmers selling cane for sugar production should also reach those used for energy production, as well as to rice. To ensure reliability of energy supply, irrigation would also be required, as droughts and flooding are both common in different regions of Thailand. Another solution would be to increase

the AEDP target, where a larger potential of sugarcane and rice residues are being used for electricity generation.