Stockholm Environment Institute

Bioeconomy In Thailand

At a glance

SEI brief
January 2021

May Thazin Aung

IMAGE (ABOVE):
May Thazin Aung

Summary

Thailand's promotion of the bioeconomy is aimed at helping the country to overcome the middle-income trap and also reducing both social inequality and harmful environmental impacts. These goals are expressed in several policy documents on national development, as well as within sectoral development plans.

To facilitate this development, the government is fostering partnerships with industrial actors from both the sugarcane and cassava sectors (Aung et al. 2020). These two crops have been targeted for developing the bioeconomy due to their abundance and versatility. Yet, to achieve the equity and environment-relevant goals of the bioeconomy, regulatory, environmental, and social concerns need to be considered.

What is the bioeconomy?

According to the European Commission, the bioeconomy is "the production of renewable biological resources and the conversion of these resources and waste streams into value added products, such as food, feed, bio-based products and bioenergy" (European Commission 2012, p. 3). In Thailand, the definition of the bioeconomy is similarly focused on the use and conversion of renewable bio-resources into value-added products. Thailand's Board of Investment has defined the it as "the production and conversion of renewable resources into alternative products such as food or energy sources" (Thailand Board of Investment 2019a, p. 5)

Thailand is also promoting the circular economy as an alternative economic approach for creating greater value at different levels within production and consumption processes (Thailand Board of Investment, 2019b). However, the circular economy and bioeconomy are different; while the circular economy is about closing the loop in production and minimizing waste, the bioeconomy is geared towards creating new value, innovation, and improving old sectoral approaches.

The government's vision for the bioeconomy in Thailand

The Government of Thailand's vision of bioeconomy for the country rests on a plan to modernize agriculture by adding value to raw materials from farmers' fields. By converting biological resources, such as forests and fisheries, into goods and services, farmers can generate additional income for the local economy. In the government's view, this supports Thailand in overcoming the middle-income trap, which occurs when countries reach middle-income status, but are unable to generate enough further income to reach upper-income status (Oxford Business Group 2018).

In addition to its economic and biotechnical goals, the bioeconomy is also intended to reduce inequality and environmental impacts. This is explicitly stated in the description of the bioeconomy found in the 20-year National Strategic Plan (2017-2036): "[the bioeconomy shall … increase] the quality of life enhancement, social fairness improvement, environmental risks reduction, and environmental scarcity [reduction]" (National Strategy Secretariat Office 2018, p. 51).

To achieve these goals, the government has identified two major crops for bioeconomy development: cassava and sugarcane. These commodities have been selected due to both the fact that they are produced in large quantities in Thailand, and their versatility when it comes to being developed into a wide range of value-added products. These products include bioplastics (derived from cassava starch) and biofuels (from both sugarcane and cassava derivatives), among others (Thai Ministry of Industry 2018).

Although Thailand intends to promote the bioeconomy at both industrial and artisanal (community-based) levels, the industrial bioeconomy – particularly sectors related to sugarcane and cassava – is at a more advanced stage of development. This is due to the enhanced institutional structures – such as research and development, financing, and infrastructure – which have already been put in place (Chiengkul 2019).

Current policies on the bioeconomy

While there is no specific bioeconomy development strategy, several national- and sectoral-level documents outline Thailand's vision for the bioeconomy:

The Sufficiency Economy Philosophy
The principle of the "Sufficiency Economy Philosophy", promoted by the Late King Bhumibol Adulyadej, has underpinned many of Thailand's development strategies since 2002. This principle promotes "moderation, reasonableness and resilience", aligning with the bioeconomy's goals of efficient resource use (Thailand National Economic and Social

Development Board 2017, p. 103). The philosophy also emphasizes social equity and environmental aspects, such as sustainability and resilience in development, to improve the well-being and welfare of citizens (Mongsawad 2010).

The Twelfth National Economic and Social Development Plan
As previously mentioned, bioeconomy plans aim to support social equity, as well as sustaining the environment. The Twelfth National Development Plan identifies income equality, access to justice, and access to public services, as some of the pressing concerns related to inequality. Its specific aims are reducing poverty, enhancing land-ownership opportunities for the landless, and boosting communities' economic independence (Thailand National Economic and Social Development Board 2017).

Thailand 4.0 policy
Launched in 2016, the Thailand 4.0 policy is the government's sectoral development strategy for freeing Thailand from its middle-income trap, through the development of ten targeted industries. These "S-curve industries" include sectors related to the bioeconomy, such as food, bioenergy, biochemicals, and healthcare. The strategy outlines several areas related to supporting small-medium enterprises (SMEs), education, tax reform and digital infrastructure (Thailand Board of Investment 2016).

Institutional arrangement and governance of bioeconomy

Several stakeholders representing government, trade associations and industry are involved in decision-making and development of the bioeconomy. On the government side, the main actor is the Ministry of Industry's Office of Industrial Economics, which makes policies and convenes stakeholders in the bioeconomy. On the research and development side, a key policy body responsible for setting the funding the research agenda is the Office of National Higher Education, Science Research and Innovation in Policy Council, which falls under the Ministry of Higher Education, Science, Research and Innovation (Aung et al. 2020).

The 20-Year National Strategy also promotes a Public-Private Partnership (PPP) mechanism, which is integral for developing the industrial bioeconomy and drawing expertise from various sectors. A Public-Private Steering Committee was formed on 20 September 2015, in accordance with the Pracha Rat (People's State) Initiative, which encourages collaboration between the public sector, private sector, financial institutions and academia in developing the Thai economy. (Public Relations Department,2017)

Spotlight on Sugarcane

Sugarcane is an important commodity in the bioeconomy due to its abundance and the multiplicity of value-added products which can be derived from it, such as biofuels and biochemicals. By-products of the sugar milling process, such as bagasse and sugarcane molasses, can also be used by small-scale power producers and as a feedstock for bioethanol production (Silalertruksa et al. 2015). Though the majority of sugarcane produced goes towards the production of sugar, approximately 1-6% is used in bioethanol production, accounting for about 30% of total ethanol produced in Thailand (Manivong and Bourgois 2017).

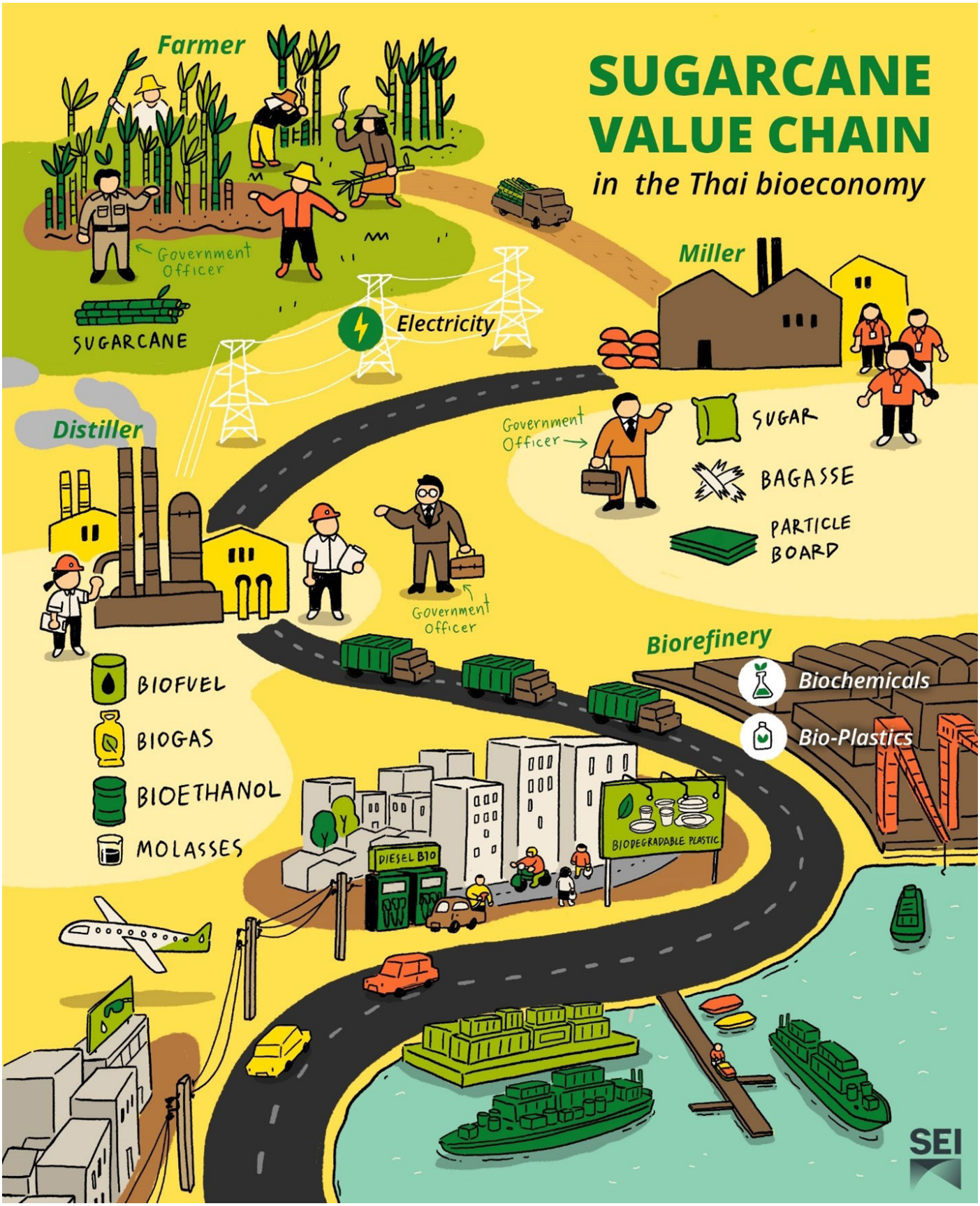
The sugarcane value chain generally involves farmers, millers, and other sugarcane processors. These actors play a role in the production, processing, and distribution of sugarcane. Regulatory bodies such as the Office of Cane and Sugar Board (OCSB) under the Office of Industrial Economics, set standards, pricing, and the research and development agenda for the sector (Manivong and Bourgois 2017). The figure in the following page presents some of the key stakeholders and products of the sugarcane bioeconomy.

However, some regulatory challenges remain in the sector, inhibiting progress in the development of the bioeconomy. For instance, the Cane and Sugar Act (1968) explicitly prohibits the direct use of sugarcane juice for processing into products other than sugar. Due to this law, farmers rely on by-products from the sugar industry, such as sugarcane bagasse and molasses, to produce ethanol instead of using sugarcane juice (Chaya et al. 2019; Silalertruksa et al. 2015).

Social and environmental aspects of bioeconomy development

The primary environmental concerns around the development of the bioeconomy relate to land and water scarcity. First is the issue of land availability, as energy crops such as cassava and sugarcane compete with rice for limited agricultural land (Chutharatkul 2019). There is also an issue of land quality: according to the Land Development Department, only 0.37 Mha of remaining land in Thailand is suitable for sugarcane cultivation, limiting options for future expansion (Chaya et al. 2019).

The second issue is that of water scarcity. A continuous supply of fresh water is critical for maintaining the high productivity of sugar and cassava crops (Pingmuanglek et al. 2017; Silalertruksa and Gheewala 2018). However, most cane-growing areas in the Northeastern and Central regions of Thailand currently have rain-fed water systems; only 10% of cane plantations in the nation are under irrigation. Sugarcane is also highly susceptible to drought, which caused its production to drop by 11% in 2015-2016 (Manivong and Bourgois 2017).


SUGARCANE
VALUE CHAIN
in the Thai bioeconomy
Farmer
Government Officer
SUGARCANE
Electricity
Miller
SUGAR
BAGASSE
PARTICLE BOARD
Government Officer
Distiller
Government Officer
BIOFUEL
BIOGAS
BIOETHANOL
MOLASSES
Biorefinery
Biochemicals
Bio-Plastics
DIESEL B10
BIODEGRADABLE PLASTIC
SEI

Lastly, there are social impacts associated with bioeconomy development. Existing research suggests inequality in wages and household incomes, and exposure to health risks are among some of the social issues affecting different stakeholders in the bioeconomy value chain. For instance, in 2015, Prasara-A and Gheewala found that workers in sugarcane plantations receive less than the national minimum wage of THB 300 per day (Prasara-A and Gheewala, 2018). Another study by Intarapoom et al. (2018), examined the impacts of converting rice to sugarcane on household food security. The study found that sugarcane-farming households had lower stable sources of food for consumption and nutrition, compared to rice-farming households (Intarapoom et al. 2018)

Some of these social impacts lead to direct environmental consequences. For example, labour shortages and costs are some of the main reasons that sugarcane farmers burn their sugarcane fields, as harvesting fresh cane is far more labour-intensive than harvesting burnt cane. This cane burning, however, results in air pollution and haze, lower biodiversity, soil erosion and exhaustion (Manivong and Bourgois 2017).

Discussion

Improving social inequality and sustainability are central aims of the plans to develop the Thai bioeconomy. Realizing these goals requires extensive engagement with diverse actors within the country's bioeconomy sector, including all those in the cassava and sugarcane value chains, from the smallest smallholder farmer to the largest millers. Inclusion of, and engagement with, additional actors involved in the development of other high-value products from biological resources is also important.

By understanding different perceptions of equity and sustainability among bioeconomy actors, the Government of Thailand can formulate design policies and programmes to ensure Thailand's equitable and sustainable future.

About the Stockholm Environment Institute:

Stockholm Environment Institute is an international non-profit research and policy organization that tackles environment and development challenges. SEI's research on the bioeconomy in Thailand seeks to understand different perspectives on bioeconomy and support the development of equitable and sustainable bioeconomy pathways.

Acknowledgements to Benjaluck Denduang and Pimolporn Jintarith for supporting the research.

References

Aung, M.T., Nguyen, H., Denduang, B. (2020). Power and influence in the development of Thailand's bioeconomy: A critical stakeholder analysis. Discussion Brief. Stockholm Environment Institute, Stockholm.

Chaya, W., Jesdapipat, S., Tripetchkul, S., Santitaweeroek, Y., Gheewala, S.H. (2019). Challenges and pitfalls in implementing Thailand's ethanol plan: Integrated policy coherence and gap analysis. Energy Policy, 132, 1050–1063. DOI: 10.1016/j.enpol.2019.06.061

Chiengkul, P. (2019). Uneven development, inequality and concentration of power: a critique of Thailand 4.0. Third World Quarterly, 40(9). 1–23. DOI: 10.1080/01436597.2019.1612739

Chutharatkul, C. (2019). Thailand Tapioca Development Institute. Interviewed by Benjaluck Denduang on May 30, 2019.

European Commission (2012). Innovating for Sustainable Growth: A Bioeconomy for Europe. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. European Commission, Brussels.

Intarapoom, I., Srisompun, O., Sinsiri, N. (2018). Impacts of Sugarcane Farmland Expansion towards Food Security among Sugarcane-farming Households in Khon Kaen Province, Thailand. Advanced Journal of Social Science, 4(1). 11–17. DOI: 10.21467/ajss.4.1.11-17

Manivong, P., Bourgois, E. (2017). White Paper: Thai Sugarcane Sector and Sustainability. FairAgora Asia Co Ltd, Bangkok.

Mongsawad, P. (2010). The philosophy of the sufficiency economy: a contribution to the theory of development. Asia-Pacific Development Journal, 17(1). 123–143. DOI: 10.18356/02bd5fb3-en

National Strategy Secretariat Office (2018). Thailand 20-year National strategy (2018-2037). Office of the National Economic and Social Development Board, Bangkok.

Oxford Business Group (2018). Economic indicators and development strategies contribute to a positive outlook for Thailand in 2018. Oxford Business Group, London.

Pingmuanglek, P., Jakrawatana, N., Gheewala, S.H. (2017). Freshwater use analysis of cassava for food feed fuel in the Mun River basin, Thailand. International Journal of Life Cycle Assessment, 22. 1705–1717. DOI: 10.1007/s11367-017-1286-y

Prasara-A, J., Gheewala, S.H. (2018). Applying Social Life Cycle Assessment in the Thai Sugar Industry: Challenges from the field. Journal of Clearner Production, 172. 335–346. DOI: 10.1016/j.jclepro.2017.10.120

Silalertruksa, T., Gheewala, S.H (2018). Land-water-energy nexus of sugarcane production in Thailand. Journal of Cleaner Production,182. 521–528. DOI: 10.1016/j.jclepro.2018.02.085

Silalertruksa, T., Gheewala, S.H., Pongpat, P. (2015). Sustainability assessment of sugarcane biorefinery and molasses ethanol production in Thailand using eco-efficiency indicator. Applied Energy, 160. 603–609. DOI: 10.1016/j.apenergy.2015.08.087

Thai Community Development Department (2018). Summary of Grassroot Economy and Pracharat Initiative development in Samutsakorn province.
Thai Ministry of Industry (2018). Thailand Bio-industry Development Measures 2018-2027. Thai Ministry of Industry, Bangkok.
Thailand Board of Investment (2019a). Thailand's Bio-economy. Thailand Board of Investment, Bangkok.
Thailand Board of Investment (2019b). Circular economy: shaping a sustainable future (Thailand Investment Review). Thailand Board of Investment, Bangkok.
Thailand Board of Investment (2016). Bioeconomy as Execution Model for Thailand 4.0. Thailand Board of Investment, Bangkok.
Thailand National Economic and Social Development Board (2017). Twelfth National Economic and Social Development Plan (2017-2021). Office of the National Economic and Social Development Board, Bangkok.

SEI Stockholm Environment Institute

Contact information:

May Thazin Aung
Project Manager

Stockholm Environment
Institute (SEI) Asia
Bangkok, Thailand
may.aung@sei.org

Visit us: sei.org
Twitter:@SEIresearch
@SEIclimate