

Energy efficiency guidance for the food & beverage sector

Across Malaysia, Myanmar, Philippines, Thailand and Vietnam

Energy consumption

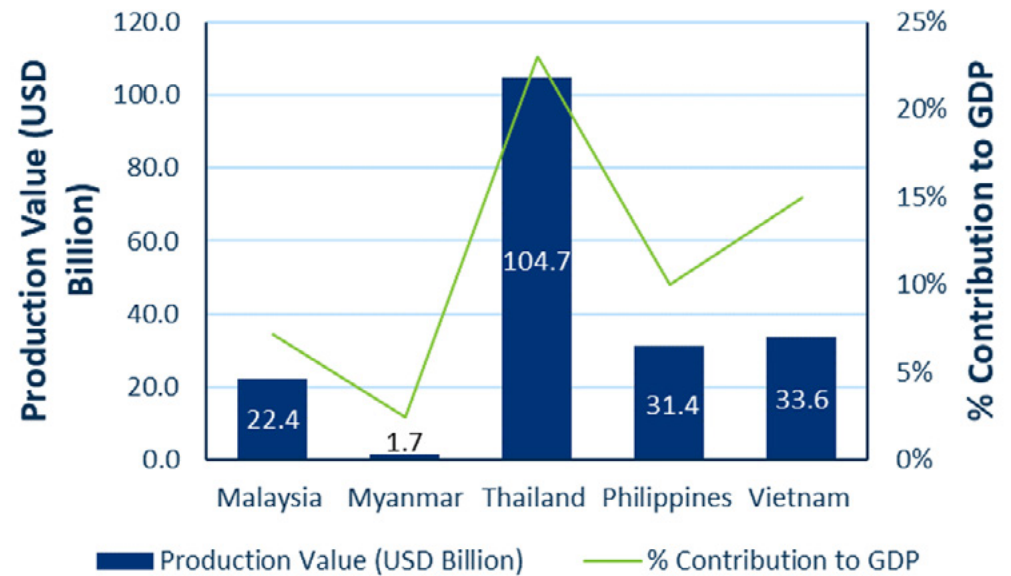
Food and Beverage (F&B) companies are an important contributor to the economy in Asia, and also one of the biggest consumers of energy. Energy consumption in the sector could be considerably reduced by implementing simple and effective energy saving measures, reducing carbon emissions and cutting the costs for businesses.



Across the five countries of focus under the ASEAN Low Carbon Energy Programme, the F&B sector is the largest by size in Thailand, and also contributes towards 22% of the country’s GDP as evident in Figure 1. Myanmar has the smallest F&B sector in terms of production value.



Figure 1: Production Value and Contribution to GDP by the F&B Sector (2017)¹



1. Malaysia: <https://www.dosm.gov.my/v1/> ;
 Myanmar: [https://www.foodexport.org/get-started/country-market-profiles/southeast-asia/myanmar-country-profile#:~:text=According%20to%20Euro-monitor%2C%20retail%20sales,US%24812.7%20million%20since%202012.](https://www.foodexport.org/get-started/country-market-profiles/southeast-asia/myanmar-country-profile#:~:text=According%20to%20Euro-monitor%2C%20retail%20sales,US%24812.7%20million%20since%202012.;) ;
 Philippines: http://agriexchange.apeda.gov.in/MarketReport/Reports/Food_Processing_Ingredients_Manila_Philippines_3-12-2019.pdf
 Thailand: https://www.boi.go.th/tir/issue/201508_25_8/42.htm#:~:text=At%20present%2C%20revenues%20of%20the,amount%20to%201%20trillion%20baht.
 Vietnam: https://www.gso.gov.vn/Default_en.aspx?tabid=491

Figure 2 highlights the various sources of energy consumed by the F&B sector:

Figure 2: Energy consumption in the F&B sector in 2017²

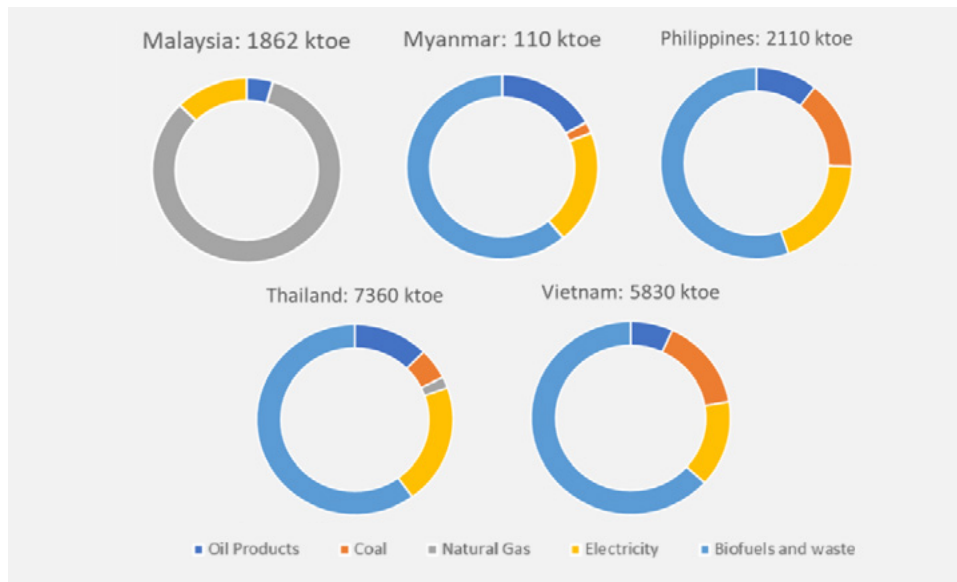


Figure 2 not only demonstrates how the amount of energy used by the F&B sector in each country reflects the size of production, but also illustrates the fuel composition for the F&B sector in each country. A key trend is that electrical energy contributes less as an energy source to the F&B sector across all countries compared to thermal energy sources. Within thermal energy, natural gas is the main energy source in Malaysia, while biofuels and waste are the main sources of energy in Myanmar, the Philippines, Thailand and Vietnam. Oil products are the next biggest source of thermal energy in Myanmar and Thailand, while coal is the second largest source of thermal energy in the Philippines and Vietnam.

2. International Energy Agency (IEA); Myanmar Energy Statistics

Figure 3: Energy intensity of the F&B sector in 2017³

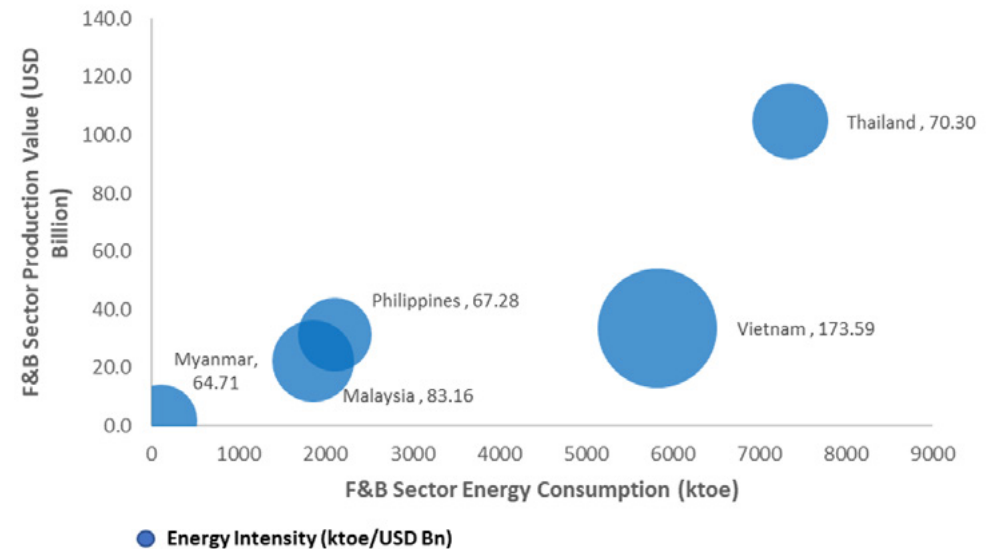


Figure 3 illustrates the energy intensity of the F&B sector in each country, with the findings largely mirroring the economy-wide energy intensity levels of each country. One reason for Vietnam’s energy intensity being significantly larger than other countries is because of their comparatively lower energy prices and tendency to substitute primary energy for other inputs such as labour and capital. Due to government policies indirectly subsidising energy prices, companies are not incentivised to consume energy efficiently.

3. Data from Figure 2 and 3



Country profiles of the food and beverage sector

Malaysia:

The F&B sector is primarily dominated by small and medium sized enterprises (SMEs) in Malaysia. According to the United States Department of Agriculture (USDA) Foreign Agricultural Service, there were 8,542 SMEs involved in food manufacturing in 2017. There are also several multinationals with regional production facilities based in Malaysia that focus on both export and domestic demand. Common local industry products include snack foods, poultry, dairy products, eggs, tropical fruits and vegetables, soft drinks and beer. The largest manufacturing segments include edible oils, dairy, confectionery, soft drinks, seafood, biscuits, baked goods, cereals and flour.

Malaysia's F&B sector relies mostly on natural gas as its energy source followed by electricity. Total GHG emissions from the F&B sector in Malaysia were 5,368 ktCO₂ in 2017

contributing towards².18% of the country's total emissions.

Myanmar:

According to United Nations Economic and Social Commission for Asia and the Pacific (UNESCAP), the F&B sector represent 60% of all companies in the industry sector in Myanmar. According to the Tha Bar Wa programme by World Wildlife Fund (WWF), there are approximately 27,000 F&B companies, of which 24,000 are registered, and it is estimated that 90% of these companies are SMEs. As of 2012, the sub-sectors with the largest number of companies include edible oil, confectionery and agricultural products. Across large F&B companies, edible oil (294 companies), confectionery (133 companies), alcohol and beverages (27 companies), and milk and milk products (25 companies) are the most common.

Myanmar uses primarily oil products to fuel the sector, with a small reliance on natural gas. Total GHG emissions from the F&B sector in Myanmar were 152 ktCO₂ in 2017, contributing towards 0.48% of the country's total emissions. The small contribution of the F&B sector to the country's total emissions can be attributed to the fact that the Industry sector only accounts for 6% of the country's energy consumption (according to the Myanmar Energy Master Plan 2015). That is, despite the F&B sector representing 60% of companies in Industry, given the small size of the Industry sector, the production activities of F&B companies does not make as significant an impact on total country emissions.

Philippines:

As of 2015, the Philippines' Food and Drug Administration estimated around 12,000 food processing establishments in the country, most of which are owned by single proprietors. The main

sub-sectors include fruits and vegetables, fish and marine products, meat and poultry products, bakery, beverages, dairy, snacks and oils.

Biofuels and waste make up the bulk of the energy source for the Philippines F&B sector, followed by electricity, coal and oil products respectively. Total GHG emissions from the F&B sector in the Philippines were 4,723 ktCO₂ in 2017, contributing towards 3.29% of the country's total emissions.

Thailand:

According to the National Food Institute, Thailand's F&B industry is highly fragmented with only 15% of the 10,000 companies in the industry considered medium to large enterprises. There are approximately 8,500 factories in the F&B processing sector with 91% considered small enterprises. The country's domestic market primarily comprises of meat products,

Country profiles of the food and beverage sector

seasoning, animal feed, baked products, vegetable oil, fish, vegetables and dairy.

Thailand's F&B sector relies primarily on natural gas for its energy source, followed by electricity, oil products and coal respectively. Total GHG emissions from the F&B sector in Thailand were 12,453 ktCO₂ in 2017, contributing towards 4.48% of the country's total emissions.

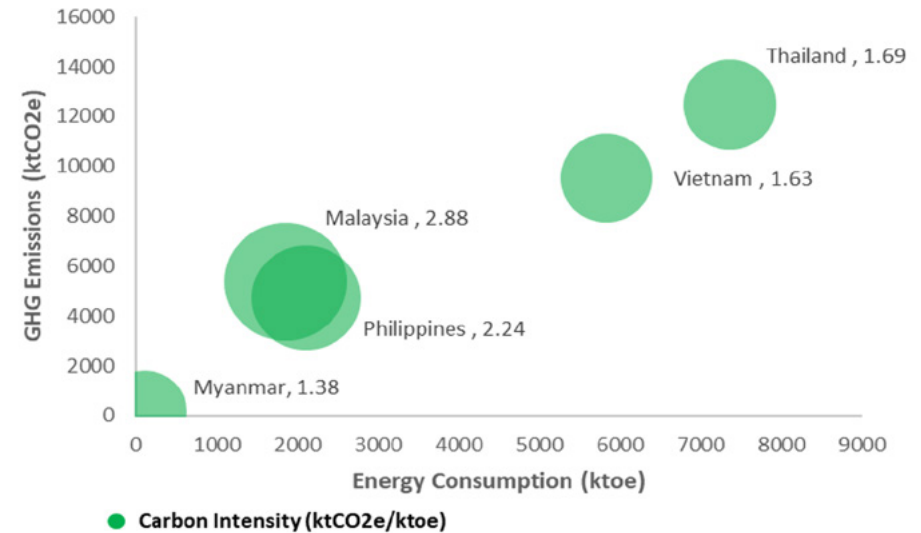
Vietnam:

According to the USDA Foreign Agricultural Service, the F&B manufacturing industry registered 9,428 companies in 2016. The food-processing industry remains largely fragmented except for a few key sectors, such as dairy and confectionery. 84% of the industry is dominated by small companies. Vietnam's domestic products primarily comprise of meat and poultry products, fruit and nuts, vegetables and dairy.

Vietnam's F&B sector relies primarily on biofuels and waste as the dominant source of energy, followed by coal, electricity and oil products respectively. Total GHG emissions from the F&B sector in Vietnam were 9,522 ktCO₂ in 2017, contributing towards 3.93% of the country's total emissions.

Figure 4 offers further insights on how the fuel composition of the F&B sector in each country impacts the level of carbon intensity. For example, while Malaysia's energy intensity is more than half of Vietnam's energy intensity (in Figure 3), Malaysia's carbon intensity is ~76% higher than Vietnam's. This has to do with natural gas being the major source of energy for the F&B sector in Malaysia which has a higher emissions factor compared to the use of biomass which is the main source of energy for the F&B sector in the remaining countries.

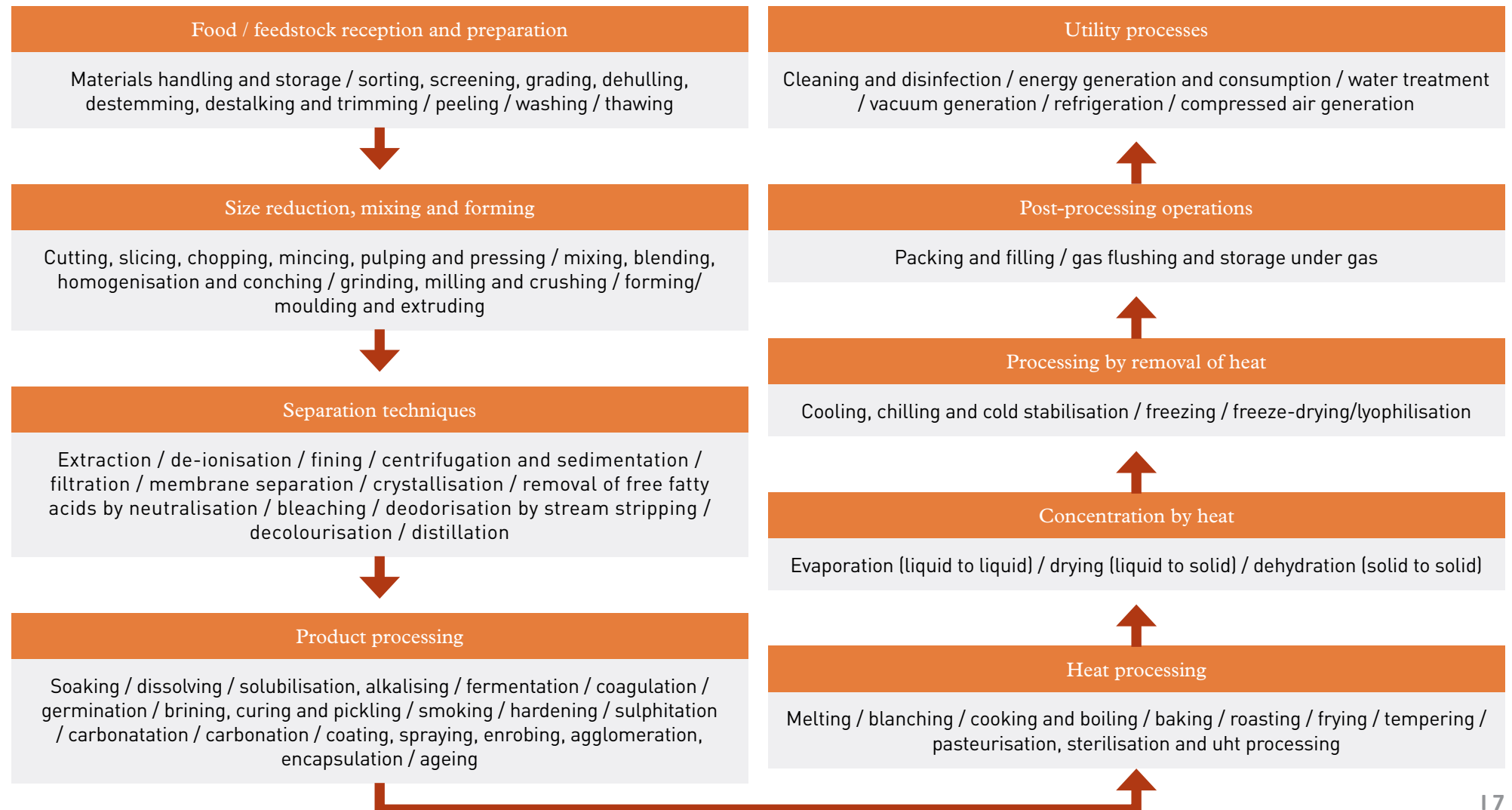
Figure 4: Carbon intensity of the F&B sector in 2017⁴



Overview of energy consuming processes

As illustrated in figure 5, companies within the F&B sector undertake a wide range of preparation and processing techniques in order to produce their products and they all require energy.

Figure 5: Common processing techniques in the F&B Sector. (this should be in blue pantin)



Why save energy?

It increases profit

The F&B industry is very energy intensive and many businesses in the sector wrongly believe that energy costs are a static overhead. However, energy costs are controllable. By implementing simple and effective energy saving measures, businesses can cut energy costs, reduce overhead expenditure and consequently increase profit margins and improve competitiveness.

Climate Change Agreements

The Nationally Determined Contributions set by each country commit to working towards a reduction in energy consumption.

For example, the national energy action plans commit towards the following:

- Malaysia: save 52,233 GWh of electricity by 2025 and 30,255 ktoe of fuel against business as usual operations
- Myanmar: save 2,300 ktoe by 2030 against business as usual operations
- Philippines: save 69,100 ktoe by 2030
- Thailand: reduce 30,000 ktoe by 2030 against business as usual operations
- Vietnam: reduce 50,000 – 60,000 ktoe of electricity by 2030

It is good for reputation

The general public is increasingly aware of the effects of climate change and the impact that it has on the environment, with expectations of low carbon business models. It is important for businesses to demonstrate their commitment to reducing carbon emissions to ensure that they retain consumer confidence and maintain their position in the marketplace.

It is good for employees

Saving energy and reducing environmental impact is good for morale. People like to feel that they are working as a team and making a positive contribution to improving their environment. Many energy saving actions can also improve working conditions and comfort for employees.

Quantifying the energy saving potential

The energy savings potential in the F&B Sector is determined by comparing the current energy intensive processes and technologies being used by companies against the best available processes and technologies that should be adopted to yield significant energy savings. Figure 6 highlights the estimated energy savings in the F&B sector in each country based on percentage estimations from market studies. The percentage estimations from the market studies are compared against the energy consumption data from Figure 2 to determine the estimated energy savings opportunity size in ktoe. It is important to note that these figures cannot be directly compared across countries given that these estimations are drawn using different samples of F&B sub-sector data based on availability.



Figure 6: Energy Savings Opportunity Size in the F&B Sector in ktoe and as a percentage of the sector's Current Energy Use⁵

380 ktoe

(20.4% of current energy use)

39 ktoe

(35% of current energy use)

317 ktoe

(15% of current energy use)

2061 ktoe

(28% of current energy use)

1866 ktoe

(32% of current energy use)

Malaysia	Myanmar	Philippines	Thailand	Vietnam
Percentage savings estimates from F&B and tobacco sector	Percentage savings estimates from sugar and rice mills sector	Percentage savings estimates from industry sector	Percentage savings estimates from F&B sector	Percentage savings estimates from seafood sector

5. Malaysia: Malaysia Energy Statistics Handbook 2017; Myanmar: Myanmar International Consultants (MMIC); Philippines: Philippines Energy Efficiency and Conservation Roadmap 2017 – 2040; Thailand: Energy Efficiency Developments and Potential Energy Savings in the Greater Mekong Subregion; Vietnam: Energy Conservation Research and Development Centre (ENERTEAM)

The energy savings values from Figure 6 are compared with the annualised Nationally Determined Contribution (NDC) targets for each country in Figure 7 to illustrate the impact of adopting energy efficiency measures in the F&B sector on each country's energy savings targets. Here, each country's total NDC targets to 2030 has been annualised to obtain a yearly national energy savings target. The annual energy savings potential of the F&B sector in each country that was identified in Figure 6 is then illustrated as a percentage of the annualised national energy savings target. It is important to note that the comparability of data in Figure 7 across countries is limited due to a lack of F&B sector representative data on energy savings as well as the country specific context of NDC targets.

Figure 7: Comparing the energy savings potential of the F&B Sectors with the Nationally Determined Contribution targets⁶

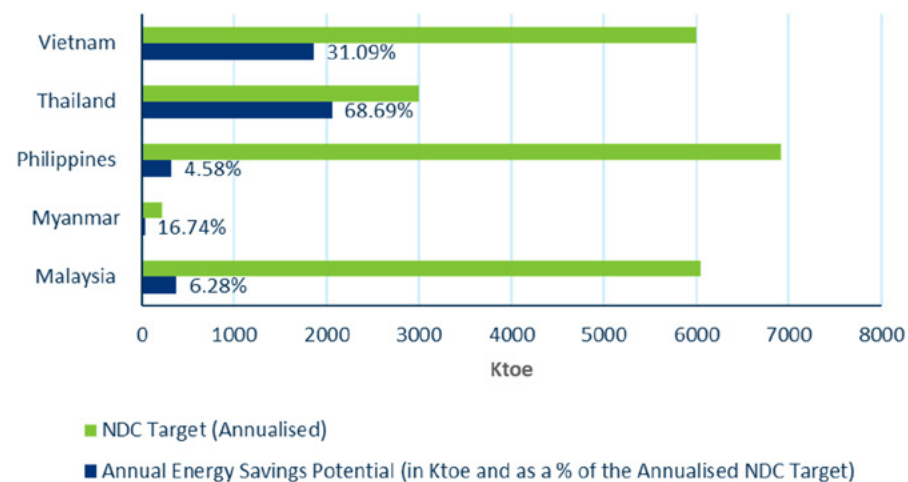


Figure 7 is illustrative of the material impact that the F&B sector can have on supporting national energy savings targets as a result of implementing energy efficiency measures. The relative contribution of energy savings from the F&B sector to the NDC energy savings targets depend on (i) the ambition of the NDC target, (ii) the current deviation of the F&B sector's energy use against its potential technical efficiency, and (iii) the current energy consumption of the F&B sector and how it compares to other economic sectors in the country.



6. Nationally Determined Contributions submitted to UNFCCC or taken from National Energy Action Plans (these values were then annualised to determine the yearly energy savings targets by country)

 Energy savings opportunities

Malaysia:

The sub-sectors with the highest energy efficiency potential are the edible oil and processed food industries. Both consume large quantities of thermal energy while achieving low levels of thermal energy efficiency. Due to the proliferation of SMEs in this sector, it is likely that the use of inefficient boilers and systems is widespread due to capital constraints on internal investment and that best practice optimisation is not being achieved. High potential for costs savings in this sector is likely to drive businesses to enact energy efficiency measures.

Energy savings opportunities exist for insulation (for boilers or storage) and heating equipment, as well as in air conditioning and cooling/freezing equipment. Most opportunities are relatively low/no cost, and thus do not require large concentrations of upfront capital. This is positive, as the market is largely constituted of SMEs for

which such capital requirements are not always feasible.

Myanmar:

As the F&B sector is largely constituted of SMEs, and these enterprises have smaller sites and machinery, as well as a smaller overall energy use, they have minimal opportunities for implementing measures at scale. SMEs are often capital constrained, and thus cannot replace antiquated machinery. As such, replacing very old inefficient machinery with modern upgrades offers relatively sizeable energy savings opportunities.

Food processing (particularly sugar and rice mills) have high electrical and thermal demands. For sugar mills this is particularly focused on thermal savings, whilst for rice mills the main energy load is electrical. Many rice mills operate aged processing systems leading to quality losses of 15-20%, as well as quantity loss.





Energy savings opportunities

Philippines:

SMEs in the food processing sub-sector have a high potential for efficiency, as many use electricity as their primary source of energy (sugar, rice and corn mills are the most significant consumers of biomass). Sugar mills are among the heaviest industrial users of motors. Large capacity sugar mills own and operate biomass plants to generate their power requirement and even sell excess to the grid, alongside using bagasse as feedstock to generate power for their own consumption.

Energy savings opportunities may be focused around replacement, with old machinery being replaced with new efficient alternatives, however there is also an opportunity to introduce efficient equipment and processes to new businesses.

Thailand:

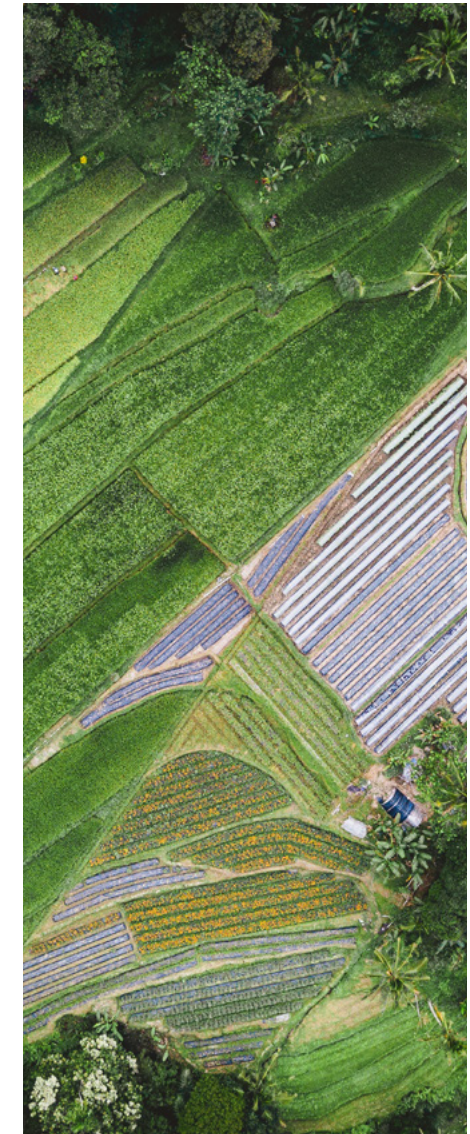
In Thailand, the fresh/chilled/frozen fish industry presents a big opportunity for energy savings as energy use is dominated by the refrigeration systems which have a high demand for electricity. Factories requiring large cooling systems will thus have relatively significant individual energy savings opportunities.

Within SMEs it is likely that best practice and the most recent technologies are not being used. Here, simple replacement can have high impact whilst being an easily implementable solution. Chilling and air conditioning technologies are highly mature and have a proven track record of delivering energy savings.

Vietnam:

The highest energy consumption and energy saving potential are frozen seafood and sugar subsectors. Experts estimate that the energy saving potential in the frozen seafood industry is 32% on average - much of this lies with efficient air conditioning systems.

Sugar mills are now moving away from the use of relatively backward technology towards the use of more energy efficient equipment as they increase factory capacity. Consequently, although the sugar product process consumes high amounts of energy, most of the large sugar factories in Vietnam have cogeneration systems that reduce their energy consumption below the 'energy intensive' threshold, i.e. only 2 enterprises are energy intensive among 38 entities.



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