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Food and Energy

Addressing sustainable goals together

Industries under pressure

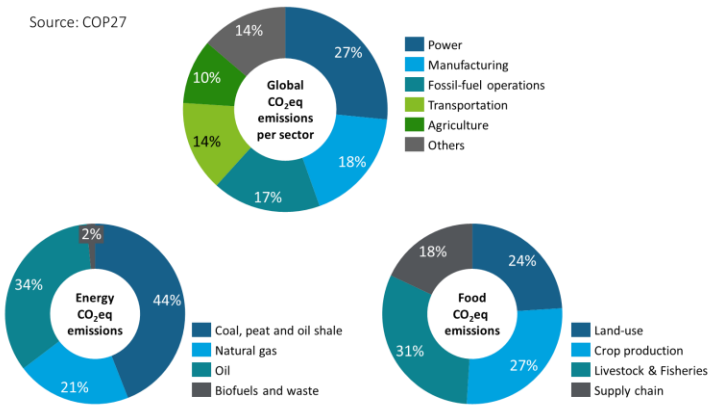
Several global challenges are severely testing both the Food and Energy industries currently. We have listed a few prominent issues below.

Climate change

The Food and Energy industries are key contributors to global greenhouse gas (GHG) emissions, which totalled 56 gigatons of CO2eq in 2021[1]. Direct emissions from the Energy sector in Power and Fossil-fuel operations account for 44% of global GHG emissions. However, this does not include energy usage in other sectors such as Manufacturing and Transportation. These emissions are almost entirely caused by fossil fuels such as coal, natural gas and oil. Agriculture is the main source of emissions in the Food sector and accounts for 10% of global GHG emissions[2]. Most of the emissions in the Food sector are caused early in the supply chain by land-use and crop- and livestock production.

The continuous increase of greenhouse gas emissions (GHG), including CO2 and methane, leads to a rapid and noticeable change in climatic conditions. This in turn is causing droughts, floods, cyclones, wildfires and other extreme climatic events[3]. To battle climate change, the United Nations (COP26: Glasgow 2021/COP21: Paris 2015) agreed to keep temperature rises within 1.5 ℃ and to reach net zero emission levels by mid-century. Governments and society are pressuring companies in the Food and Energy industries to search for sustainable value chains.

Source: COP27



Pressure on global supply chains

In addition, global risks, such as the COVID-19 pandemic and the war between Russia and Ukraine, have been putting pressure on global supply chains and the viability of linear economics and business models.

Global population growth

As global population is expected to grow by 25% between 2022 and 2050[4], food and energy production will need to increase as well. For instance, global food supply will need to expand by 50% by 2050[5] and global energy production will need to increase by 47% by 2050[6].

Three major objectives

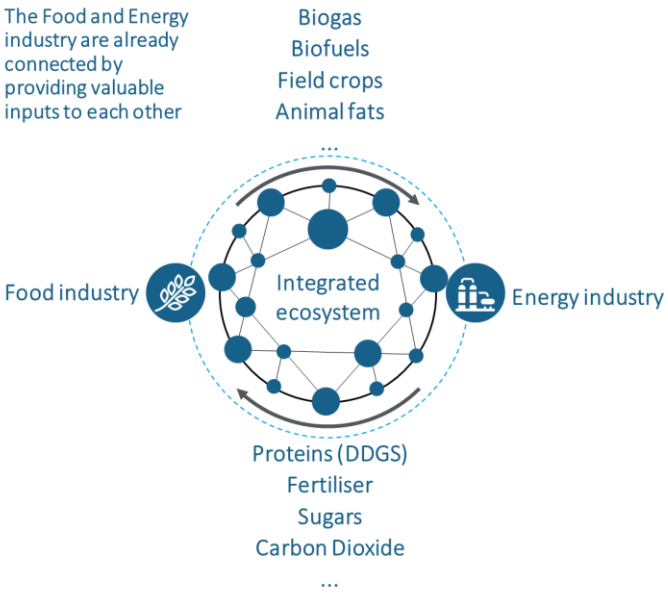
In order to build a greener future and to transform to sustainable industries, both the Food and the Energy sector have set objectives. These are actually quite similar.

Both industries aim to lower their GHG emissions significantly. The production, processing and consumption of food must be reinvented in order to realise net-zero emissions. Such reinventions could involve regenerative farming, and vertical integration such as farm-to-fork initiatives (e.g., reduction of environmental impact of primary production whilst ensuring fair economic returns for farmers[7]). Similarly, the energy production system should shift to alternative energy sources based on green electricity and green molecules (e.g. biofuels and hydrogen). Renewable energy share in global electricity generation should increase from 28.7% in 2021[8] to 90% in 2050[9].

Also, local sourcing will provide industries with a more stable supply of resources. Recent events, such as the pandemic, show the fragility of the global supply chain. This has increased the importance of local sourcing, and, additionally, higher accountability for CO2 emissions, waste, and labour involved[10]. The creation of shorter supply chains requires an ecosystem of locally produced resources. This will decrease the pressure on natural resources and the environment. Also, the valorisation of waste can add economic value[11].

Furthermore, circularity is a key objective to maintain access to the (scarce) natural resources that are necessary for the production of food and (renewable) energy. Transforming food waste into valuable products (such as biofuels) could lift the pressure on limited resources. For instance, 17% of global food production ends up as waste[12], accounting for 8-10% of global GHG emissions[13]. On the other hand, by-products of both conventional and renewable energy production can be returned to the food value chain (e.g. fertiliser, animal feed protein).

Joining forces: a few examples



As we have seen above, the Food and Energy industry objectives are aligned and their value chains are connected. Let us now consider them as part of an integrated ecosystem. The following examples will show that by supporting each other, both industries can achieve their individual goals in their journey to becoming more sustainable.

Example 1: Biogas from cattle manure

The production of food on an industrial scale has resulted in intensive breeding farms, producing meat and dairy as well as animal waste (approx. 16 – 20 MMT per year)[14] on a large scale. Currently, methane emissions from livestock account for 44% of global methane emissions[15]. Methane is a strong GHG with a CO2 equivalent of 25. One opportunity to create value out of animal waste is by converting manure and wastewater into biogas. The technology for this process is called Anaerobic Digestion. It involves a digester that converts the collected manure into biogas[16]. Biogas can be used for the same applications that run on natural gas combustion[17]. The re-use of animal waste in the food industry decreases GHG emissions, as it replaces natural gas use. It provides more energy security and can be an additional source of income for farmers. Also, it enhances the circularity and energy independence of the global food system.

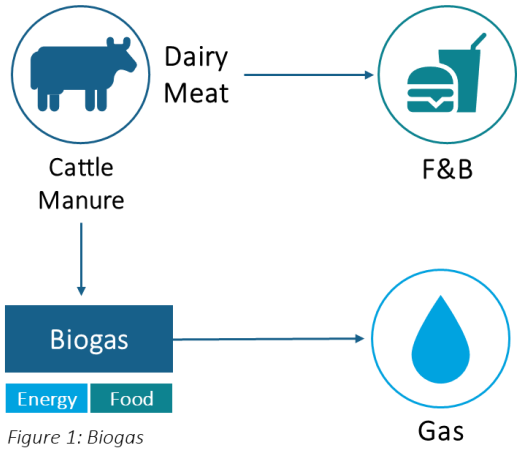


Figure 1: Biogas

Example 2: Animal feed protein out of biofuel (ethanol)

The transportation industry needs to decarbonise to achieve global goals (i.e., cut emissions by 60% in 2050 as compared to 1990 in the EU[18]). In addition to technologies such as electrification, renewable fuels can play a vital part in redesigning energy use in the transportation system. For instance, ethanol, which is a blend-in fuel that can be blended with regular gasoline, can lead to a 44%-52% decrease of GHG emissions as compared to regular gasoline[19]. Additionally, ethanol can be used to produce "Ethanol-to-Jet", a Sustainable Aviation Fuel, which can help to realise decarbonisation in the aviation industry. It is produced out of cereal field crops and sugar cane. The main feedstock is corn, with an estimated share of 60%[20]. During the production process of corn, approx. 30% of corn is transformed into ethanol. The remaining 70% is not wasted but consists of around 2% of Distillers Corn Oil (DCO) and around 30% of Distiller Dried Grains with Solubles (DDGS), which is a high-protein substance[21]. Recent studies have found that DDGS can be used as a substitute for soybean meal in animal feed[22]. In Europe, 29% of soybean proteins are imported (mostly from Brazil). DDGS could lower dependency on foreign producers and could reduce global transportation GHG emissions[23].

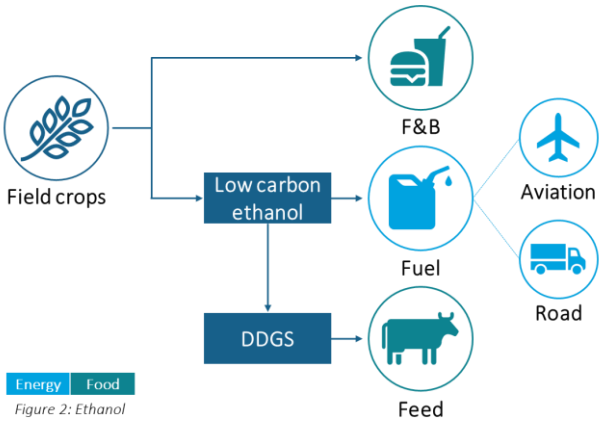


Figure 2: Ethanol

Example 3: Increasing utilisation of farmland for biofuels

A third of our planet's land is severely degraded and fertile soil is being lost at the rate of 24 bn tonnes a year. This is mainly due to the expansion of (industrial) farming[24]. If we do not act now, the Food and Energy industry will both face even more scarcity of resources. A recent example shows that a joint venture[25] between a large global energy an agricultural company has resulted in the development of novel plant genetics for oil seed cover crops and other oil seed species. Cover crops are planted between main crop growing seasons. Farmers plant them to successfully grow future food and feed crops – for instance, cover crops help with soil erosion, improve soil health, crowd out weeds, and increase biodiversity. From the newly developed oil seed cover crops and species, oil and meal can be extracted for future processing into products such as animal feed and biofuels. The agricultural company contributes its expertise in research, technology, production and processing of the feedstock, whereas the energy company adds value in the conversion process into biofuels and bringing additional value per acre to farmers. The production of domestically sourced sustainable biofuel feedstock will reduce carbon emissions and increase utilisation of farmland. It will also create potential for social and environmental co-benefits, such as more diversified income streams for farmers and a reduction of soil erosion.

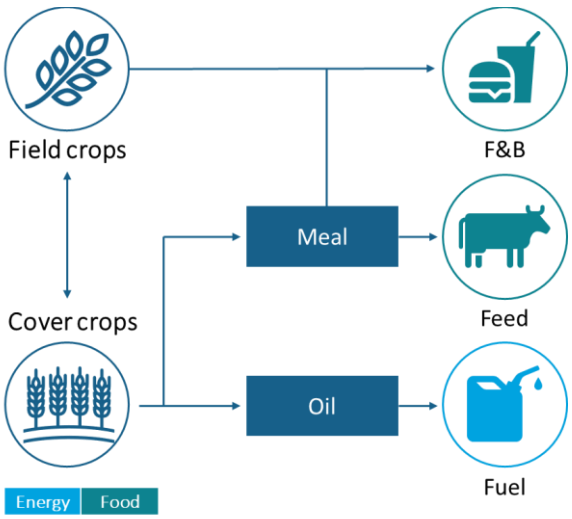


Figure 3: Increasing farmland utilisation

Are you ready?

The examples above show promising synergies. They offer the opportunity to allocate resources more efficiently and to fulfil common objectives. Together, the Food and Energy industries can achieve their sustainability goals more rapidly and/or at a larger scale than on their own. This would require more system collaboration, transparency and innovation so companies in both sectors can leverage an integrated ecosystem, searching for solutions that support each other. So... are you ready to join forces?

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Reference list

[1] Kharas, H. W. F. (2022, December 22). Tracking emissions by country and sector. Brookings. https://www.brookings.edu/blog/future-development/2022/11/29/tracking-emissions-by-country-and-sector/

[2] Jagt, R. (2022, December 5). Decarbonizing the food system: Time is running out! Deloitte Netherlands. https://www2.deloitte.com/nl/nl/pages/consumer/articles/decarbonizing-the-food-system-time-is-running-out.html

[3] Staff, C. B. (2022, November 11). Analysis: Global CO2 emissions from fossil fuels hit record high in 2022. Carbon Brief. https://www. (n.d.). IEA. https://www.iea.org/reports/renewable-electricity

[4] United Nations. (n.d.). Renewablcarbonbrief.org/analysis-global-co2-emissions-from-fossil-fuels-hit-record-high-in-2022/

[5] United Nations. (n.d.). Population. https://www.un.org/en/global-issues/population

[6] Deloitte Netherlands. (2023). Pathways to food decarbonization. https://www.deloitte.com/content/dam/assets-shared/legacy/docs/perspectives/2022/gx-food.pdf

[7] Weber, M. G. M. (2021, October 6). S&P Global Commodity Insights. https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/oil/100621-global-energy-demand-to-grow-47-by-2050-with-oil-still-top-source-us-eia

[8] Farm to Fork Strategy. (n.d.). Food Safety. https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en

[9] Renewable Electricity – Analysis. e energy – powering a safer future. https://www.un.org/en/climatechange/raising-ambition/renewable-energy

[10] We need a local food chain, now more than ever. (2022, September 13). Better Origin. https://betterorigin.co.uk/2021/04/the-future-of-food-is-local/

[11] Kügerl, M. T., Hitch, M., & Gugerell, K. (2023). Responsible sourcing for energy transitions: Discussing academic narratives of responsible sourcing through the lens of natural resources justice. Journal of environmental management, 326, 116711.

[12] United Nations. (n.d.). Food Loss and Waste Reduction. https://www.un.org/en/observances/end-food-waste-day

[13] The Circularity Gap Report. (2023). Circle Economy. CGR 2023 (circularity-gap.world)

[14] Animal Waste. (n.d.). ScienceDirect. https://www.sciencedirect.com/topics/earth-and-planetary-sciences/animal-waste

[15] Key facts and findings. (n.d.). Food and Agriculture Organization of the United Nations. https://www.fao.org/news/story/en/item/197623/icode/

[16] Anaerobic System Design and Technology. (2022, June 14). US EPA. https://www.epa.gov/agstar/anaerobic-system-design-and-technology

[17] Biogas Uses. (n.d.). https://biogas.ifas.ufl.edu/uses.asp

[18] Greenhouse gas emissions from transport in Europe. (2022, October 26). European Environment Agency. https://www.eea.europa.eu/ims/greenhouse-gas-emissions-from-transport

[19] Alternative Fuels Data Center: Maps and Data - Global Ethanol Production by Country or Region. (n.d.). Office of Energy Efficiency & Renewable Energy. https://afdc.energy.gov/data/10331

[20] Hoang, T., & Nghiem, N. P. (2021). Recent Developments and Current Status of Commercial Production of Fuel Ethanol. Fermentation, 7(4), 314. https://doi.org/10.3390/fermentation7040314

[21] USDA ERS - Dried Distillers Grains (DDGs) Have Emerged as a Key Ethanol Coproduct. (n.d.). https://www.ers.usda.gov/amber-waves/2019/october/dried-distillers-grains-ddgs-have-emerged-as-a-key-ethanol-coproduct/

[22] Chen, J., Niu, X., Li, F., Li, F., & Guo, L. (2021). Replacing soybean meal with distillers dried grains with solubles plus rumen-protected lysine and methionine: effects on growth performance, nutrients digestion, rumen fermentation, and serum parameters in hu sheep. Animals, 11(8), 2428.

[23] Mapping the European Soy Supply Chain. (n.d.). WWF. https://www.wwf.eu/?6137466/Mapping-the-European-Soy-Supply-Chain

[24] Declining agricultural land. (n.d.). The Encyclopedia of World Problems. http://encyclopedia.uia.org/en/problem/132940#:~:text=A%20third%20of%20the%20planet's,to%20Combat%20Desertification%2C%202017.

[25] S&W Seed Company. (2023, February 7). Shell and S&W Enter Joint Venture to Develop and Produce Sustainable Biofuel Feedstocks. https://www.prnewswire.com/news-releases/shell-and-sw-enter-joint-venture-to-develop-and-produce-sustainable-biofuel-feedstocks-301740143.html

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