Strategies, technologies and policies recommendations aimed at a more sustainable food and beverage sector in Argentina

Arena, A.P., Cliope Group "Energy, environment, and sustainable development". National Technological University (Argentina); Civit, B.M., Cliope Group "Energy, environment, and sustainable development". National Technological University (Argentina); Curadelli, S., Cliope Group "Energy, environment, and sustainable development". National Technological University (Argentina); Mele, F., National University of Tucumán (Argentina); Piastrellini, R., Cliope Group "Energy, environment, and sustainable development". National Technological University (Argentina); Rotolo, G., National Institute of Agricultural Technology (Argentina); Schein, L., National University of Luján (Argentina)

Abstract

A first pilot of the application of the SCP HAT methodology held in Argentina in 2020 and 2021, showed that the Food and Beverage (F&B) is one of the most vulnerable sectors in the country. The results obtained of Life Cycle Analyses performed on different products of this sector provides an insight on the environmental hotspots occurring along the productive chains of this sector, considering their core processes, supply chains and the cross-cutting issues (packaging, transportation, energy, etc.). Also contains sector-specific improvement opportunities, potential barriers to their implementation, and policy recommendations that stem from the results and the stakeholder's consultations.

Introduction

The food and beverage sector not only must play a leading role in the pursuit of the goal of ending hunger in the world, but also in ensuring sustainable conditions for the future. In this sector, SDG 12 becomes essential for decoupling the required increasing provision of food from resource consumption and environmental degradation.

In February 2019, the Life Cycle Initiative announced the launch of the Hotspot Analysis Tool for Sustainable Consumption and Production (the SCP-HAT). Together with the One Planet Network and the International Resource Panel, the Life Cycle Initiative commissioned this project and the tool is finally ready to be used. With the help of implementing partners, WU Vienna and CSIRO, as well as support from KGM & Associates, an intuitive and online tool is ready to help countries identify hotspot areas.

The food system embraces a wide diversity of products which are produced using very different inputs and processes, in a complex system which relates many other sectors of the economy (electricity Hotspots of the Food and Beverage Sector in Argentina, production, mining activities for inputs production, agriculture processes, transportation, packaging, fuels production, etc.). This represent a huge amount of substances being released into the environment and resources being consumed, thus producing a variety of environmental impacts to model.

34 F&B products including 3 different packaging alternatives for beverages were analysed. They were organized in the following categories:

Category	**Considered products**
Cereals	Maize, Corn, Wheat
Meat	Beef, Pork
Fruits	Oranges, Lemon, Pears, Apples
Vegetables	Tomato, Tomato puree
Milk and dairy	Milk, semi-hard cheese
Oilseeds	Soybean oil, sunflower oil, peanut
Tubers	Potato
Beverages	Bottled water, Wine
Other products	Tea, Yerba mate, Sugar, Honey
Transversal processes	Packaging (glass, board, PET and R-PET); electricity, transportation

Main findings

A Life Cycle Assessment approach was followed, including all stages up to the products' transportation inside the country and an estimation of the losses and wastes during production and consumption. CML 2001 (Guinée, et al., 2001) and its 13 impact categories were considered to assess the impacts of each product, but the main focus was on Global Warming Potential (GWP).

Recurring hotspots of the F&B products identified in this project are those related to the farm activities (agriculture and/or breeding); to the use of fossil energy in field labors, industrial processing and transportation; and to the electricity consumption. Two consultations events were performed, with the participation of stakeholders from several sectors (primary production, industry, academia, government and civil society). The first one was a one-day workshop with 110 participants held in August 2020, to engage them into the process and to communicate and validate the preliminary results.

The second consultation event, with the participation of 118 attendees, consisted in 6 virtual sector-specific workshops held during three consecutive days (February 8th, 9th and 10th 2021). Each day a different set of products was addressed, at two different times: 10 AM and 6 PM, thus enhancing the participation of interested parties. In this second event an increase in the participation from technological institutions and industry and a diminution of the share from academic institutions was found.

The participants' affiliations in these two consultations events were distributed as shown in Figure 1.

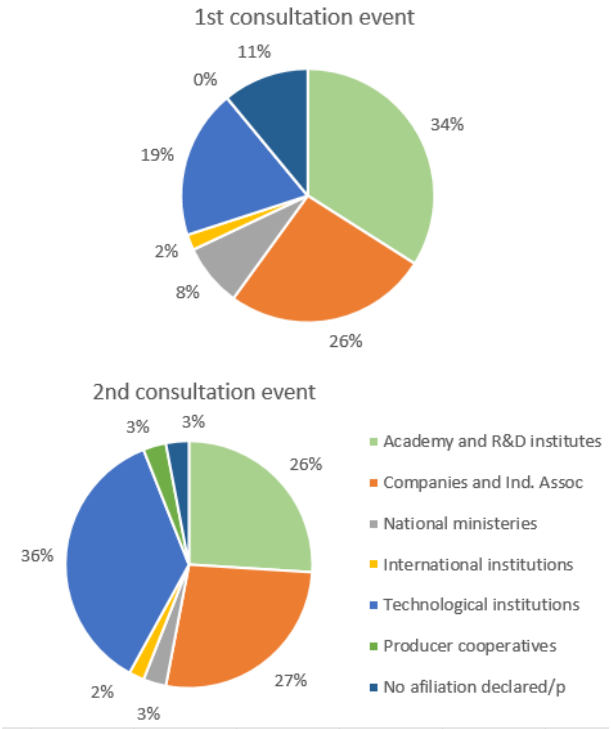

Figure 1.- Distribution of participants according to their affiliation in the consultations events

The detailed description of the identified hotspots for each of the considered products, together with the related improvement opportunities, barriers and policy recommendations can be consulted at https://forms.gle/r8HGp4LY93uTC6pW6.

Identified Hotspots

A synthesis of the principal hotspots identified, in general terms, are:

	**Primary production**: production and application of fertilizers and pest control products are a common hotspot in this stage of agri-food products, mainly due to the emissions associated to manufacture and transport of fertilizers and agrochemical, and their emissions during and after application. Another relevant issue is the impact due to the use of Diesel in the agricultural machinery, including harvesting equipment.
	**Processing and manufacture**: the main hotspots in this stage is the use of fossil fuel and electricity, due to the high share of fossil sources on the Argentinean electricity matrix. The law known as "National Support for the Use of Renewable Sources of Energy" requires a share of renewable sources in the electricity consumption, but the target was not reached so far. When the products are packed, the impact of the packaging material has an important influence in their eco-profiles.
	**Distribution**: transport from field to the industrial facilities, and internal transportation from industry (or field) to deliveries and retails is an important hotspot, due to the use of fossil fuels. Even though a national law for the promotion of biofuels mandates a blend of biofuels/fossil fuels, it is observed that the established percentage is not always complied with and are very low itself.
	**Consumption**: Considering the amount of food consumed in Argentina, and the GHG emitted by the production of that food, it turns out

	that meat has the biggest share of GHG emissions among all the considered products, followed by cheese, pork, milk and vegetable oils. It is very important to pay attention to food losses and waste (FL&W), which represents 11 % of the total GHG emissions of food production.
	**End of life**: the main hotspot is related to logistic and low percentage of recovered material for recycling. Results show important improvements when wastes are turned into resources (e.g. through Refuse, Reduce, Reuse, Repurpose, Recycle).

Figure 2 shows the food products that contribute the most to GWP (Kg CO2-year), and the impact associated with FW&L associated with the considered products.

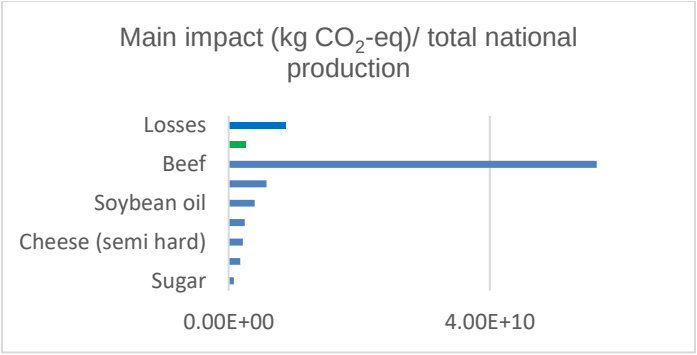

Figure 2. Ranking of the F&B products included in this study that contribute most to the GWP (kg CO2eq-year), when their total annual production is considered. Also the GWP impact associated with their total food losses is shown. Only the products included in this study are reported.

Policy recommendations / conclusions

The outcomes derived from the SCP hotspots analysis encouraged the search for improvement opportunities along the productive chains of the considered products.

In particular, sub-sector policy recommendations have been identified according to the categories in which the products included in this project were grouped. Meat production ranks first in terms of GWP potential, followed by grain production and vegetable oil production.

Specific policy recommendations for these cases can be synthetized as follows:

	Encourage precision feeding in cattle farming (use fine straws of millet, sorghum, and corn instead of thick straws of rice, wheat, and barley; add corn, legumes, starch or soy silage as a supplement; reduce fibrous feeds). ✓ **Direct benefits**: • Improved digestibility of the diet. • Improved productivity of animals. ✓ **Environmental implications**: • Savings in GHG emissions. Manure management by controlling temperature and providing appropriate facilities. ✓ **Direct Benefits:** • Avoid runoff • Livestock hygiene ✓ **Environmental implications:** • Reducing GHG emissions • Reducing eutrophication effect Implementation of precision livestock practices, integrating animal health, genetics, feeding, animal behavior monitoring and use of resources. ✓ **Direct Benefits** • Resource management • Increase livestock productivity ✓ **Environmental implication** • Reducing CH4 emissions • Reducing N emissions
	Promote crop rotation including service crops (oats, barley, rye, vicia) in the soy, wheat and corn fields of the Pampas region. ✓ **Direct benefits**: ▪ Improved soil nutrient supply. ▪ Protection against water erosion. ▪ Improved water infiltration. ✓ **Environmental implications:**

	• Savings in GHG emissions. • Improved potential for biotic production. • Savings in polluting emissions to the ground and water courses. Promote institutional strengthening for the training of human resources in the design of Good Agricultural Practices projects, specific for the citrus region of the NWA and NEA, and the pears and apples-growing region of the North Patagonian Valleys. ✓ **Direct benefits:** • Reduce the use of agrochemicals through the application of preventive, observational, intervention and control methods. ✓ **Environmental implications:** • Savings in GHG emissions. • Savings in polluting emissions to the ground and water courses.

For the rest of the products considered in this project, the most recurrent recommendations arising from the results of the study and stakeholder consultations include aspects such as the promotion of renewable energies, the adoption of circular economy strategies, the reduction of taxes for the acquisition of precision technology, and others that are summarized in the following table:

	Maintain the promotion of production and use of biofuels. Promote technologies for the production and use of biogas. Stimulate the conversion of waste biomass to energy. Strengthen bioenergy policies at the national, regional and provincial levels.
	Promote sectoral energy efficiency policies. Stimulate the generation of renewable energy in industry. Advance towards de-carbonization of the Argentinean energy matrix.
	Promote self-generation and cogeneration. Implement tax incentives to sell surplus self-generated energy.
	Promote public campaigns to inform society and encourage the change of habits in consumption, towards more sustainable food and beverage alternatives. Support capacity building actions aimed at reducing food losses in households. Promote energy conservation strategies for food storage and cooking at homes.
	Promote institutional strengthening for training programs on the design of Good Farming Practices projects. Conduct capacity building programs on responsible production and consumption.
	Stimulate the adoption of Good Efficient Driving Practices in the road freight transportation sector. Promote the adoption of information systems in the management systems of freight transportation.
	Develop affordable harvesting equipment aimed at improving the production and income conditions of small producers. Promote the development and adoption of Natural Resource Management technologies and practices. Support for the development of Precision agricultural and Livestock technologies and practices.
	Encourage the use of recycled material through legislation, favoring the adoption of a vision of circular economy. Promote the improvement of the working conditions and the

	formalization of all stages in the recycling chain. Encourage lines of credit for circular economy initiatives. Improve the integration of livestock with the circular economy (e.g. by transforming manure and other waste into biogas for energy and organic fertilizers).
	Promote accessible lines of financing for projects aimed at reducing the carbon footprint of food products. Provide fiscal incentives for producers who incorporate technological innovations, or strategies, technologies and equipment in the primary or industrial sector aimed at increasing production efficiency.

Working group

The project was led by the CLIOPE group, from the National Technological University, and the working group was integrated by professionals from the following institutions: National Institute of Agricultural Technology; National University of Luján; National University of Tucumán. The project was funded by UNEP, and it was implemented by Fundación UTRM, with the support from GIZ.

References

Guinée, et al., 2001. Handbook on life cycle assessment. Operational guide to the ISO standards. I: LCA in perspective. IIa: Guide. IIb: Operational annex. III: Scientific background. Kluwer Academic Publishers, ISBN 1-4020-0228-9.