SAC CONSULTING
Part of Scotland's Rural College (SRUC)

ENVIRONMENTAL IMPACTS OF PACKAGING

Overall environmental benefits of switching to more sustainable packaging and packaging strategies are extremely important. Replacing or eliminating harmful materials is an improvement for human health and the environment. Creating innovative solutions for reusable packaging and properly collecting packaging waste is valuable to avoid littering and disposing of things in landfills. Nonetheless, there is a double-edged sword when changing to what appears to be more environmentally friendly solutions.

PLASTICS

One of the most used materials for packaging in the food and drink industry is plastic and at the same time is the most problematic one for sustainability. Most plastics used today are **virgin plastics** made from non-renewable sources. These plastics have a significant carbon footprint, accounting for 3.4% of global Greenhouse Gas (**GHG**) emissions throughout their lifecycle, particularly due to the resource-intensive production process.

Bioplastics account for a small fraction of the plastics market, with less than one per cent of the plastics produced annually and with a forecasted increase of 2% by 2026. The most widely used bioplastics are **biodegradable PBAT**, **PBS** and **bio-based PA**. Altogether, virgin plastics and bioplastics represent the primary market and plastics made from recycled materials constitute secondary plastics.

For **bio-based plastics**, one of the main concerns is land use competition to produce feedstocks for bio-based plastics production. Bio-based feedstocks can be made from a wide variety of renewable materials such as carbohydrate-rich plants and tubers, inedible plants, and organic waste.

Estimations for land use competition differ depending on the type of bio-based feedstock, production scales and geography. Some studies suggest a reduction in Greenhouse Gas (**GHG**) emissions when replacing fossil-based plastics with ones made from renewable feedstocks, but these and the sustainability performance of bioplastics varies across regions, scenarios and types of feedstocks, or they will change when accounting for land-use change emissions. Then in cases where bio-based feedstocks contribute to land use change or other resource depletion, they will have a greater environmental impact than other plastics options.

PAPER, PAPERBOARD AND PULP-BASED PACKAGING

Although paper is widely used and suggested to replace cups and bags for bakery products or e-commerce packaging and others, when considering the whole life cycle it uses considerable amounts of water, from growing trees to intensive resource use at production level. This type of packaging takes around 3 more times the amount of energy to produce –considering the use of virgin materials, and more energy to recycle than plastics if it is assumed it ends up being recycled and not thrown into landfill. However, when compared to traditional fossil-based plastics, it has greater advantages when it comes to raw material extraction, biodegradability and cost. Using **recycled paper-based** materials in production makes the process more energy efficient than using raw materials.

GLASS

Glass is **fully recyclable** and can be used multiple times. However, contaminated glass with food complicates the recycling process. It is estimated that glass containers have a greater impact on the environment than plastic containers throughout their life cycle. Production and manufacturing of glass emit more heavy metals and require energy-intense pieces of equipment. Using glass will likely increase fuel consumption during transportation than using lightweight materials, hence increasing its carbon footprint.

METAL PACKAGING

Metal packaging such as steel cans, cannot be compostable but they are **recyclable** and can be recycled multiple times. Designed to be disassembled at their end-of-life, this material can contribute to reducing resource use and raw material extraction. However, current recycling rates of aluminium and steel packaging are low, which means raw material extraction is still necessary. Extracting raw materials for aluminium production has consequences for land use (mining) and negatively affects human health and the environment– toxins are emitted in the production process and incorporated into the environment through air, water and soils and have been linked to pollution in agricultural soils, fisheries and human health harms.

It is also vital to consider packaging functionality and how different types of materials are better choices due to their inherent properties to protect food and prevent food waste - also a main environmental concern. **Plastic** is widely used for its malleable properties, low economic cost, low weight and space-saving qualities for storage and distribution, and benefits for food safety and shelf-life due to high barrier properties that preserve

freshness. **Glass** provides solid protection, it is impermeable and non-leaching, i.e., it will not react with products contained within nor will it modify their flavour or texture. **Metals** are impermeable to air and water providing longer shelf life, extended protection against external damage and minimal losses throughout the supply chain. **Paperboard** and **pulp-based** are lightweight materials that tend to be highly biodegradable, flexible, and cost-effective and could be used either as primary or secondary packaging.

Choosing **sustainable packaging** alternatives is challenging in sectors like Food and Drink. The ideal substitutes need to meet the requirements of the industry and comply with environmental regulations that make the products safe for human consumption. There is no one-solution-fits-all when choosing a packaging option for a specific product.

Our team has expertise in **resource efficiency**, **Circular Economy**, **carbon assessments** and **sustainability** and can apply this to food and drink businesses all over Scotland. Visit our website to know more about how we can help in your sustainable packaging strategy, brand design and development.