



INTESA SANPAOLO
INNOVATION CENTER

INDUSTRY TRENDS REPORT **AGRICULTURE, FOOD & BEVERAGE**

*SAFETY AND SUSTAINABILITY IN THE
FOOD VALUE CHAIN*





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EXECUTIVE SUMMARY

Over the course of the 2020, COVID-19 moved from being “just” a health crisis to a health and economic crisis. In the Food and Beverage industry, consumer behaviour, sales channels and supply chains were affected equally with the pandemic sharpening the industry’s (and regulators’) minds on the ways in which we **package** food and dispose of **waste**. The renewed focus on key issues such as sustainability, safety and security also extended across the Food and Beverage market encompassing **agricultural practices** at one extreme and packaged and **processed foods** at the other.

Food **packaging** has grown from conventional materials such as glass and metal to include technologically advanced flexible and rigid solutions. Globally, the market was valued at \$115.9b in 2019 and is developing at 1.2% with players across the board wrestling with the related requirements of reducing weight, increasing durability and – as a result of COVID-19 – serving e-retailers.

Here, as in the other industries, environmental concerns are prompting a search for sustainable alternatives to single-use plastic packaging in particular. A return to glass and metals might provide a partial solution but bioplastics are thought to be the most viable short- to mid-term option. Bio-based plastics are derived either fully or partially from organic polymers which stem from starch, fibres, plants and animal proteins and are attracting the attention of researchers, start-ups and major chemical companies all of which recognise that they have the potential to provide ecological packaging solutions.

Waste dumped into landfills or oceans is one of the major contributors to greenhouse gas emissions as well as soil and water pollution. Moving to a circular economy presents an opportunity to address this challenge and, in parallel, generate markets valued at more than \$1 trillion globally.

A truly sustainable future requires a new and holistic approach to waste management with current trends including a focus on digitisation, zero-waste, waste-to-energy, EV batteries, plastics and fast fashion. It is food waste, however, that makes up 44% of waste volumes and is one of the biggest problems facing society today. Local, national

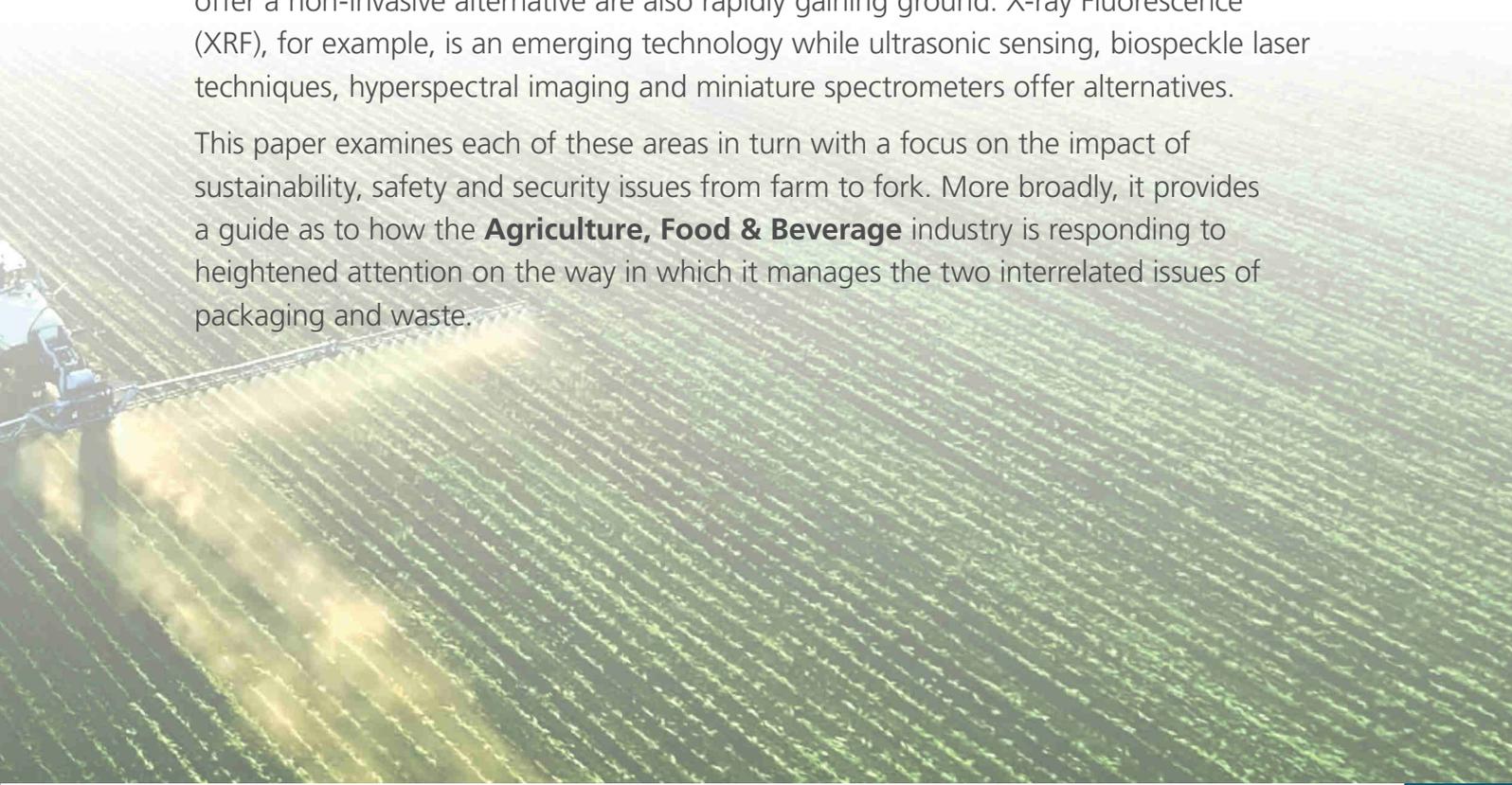
and international authorities are responding with a range of strategies while many companies are in turn looking to develop ways of harnessing food and farm residues to develop valuable products such as building materials, bioplastics, textile fibres and biofertilisers.

Indeed, the crop chemicals market is another space that is being shaped by concerns over the environment. The European pesticides and fertilisers sector remains dominated by synthetic solutions but regulatory support and increasing consumer awareness of the benefits of organic farming are driving the emergence of green **agricultural practices**. Bioherbicides are eco-friendly weed management solutions which stem from plants or microbes and are available in dry, liquid and paste form while biofertilisers draw on amino acids, seaweed and plant extracts to stimulate and support crop growth.

Overall, the global packaged and **processed food** and beverage market was valued at \$3,500 billion and is expected to grow by at least 2.5% in 2021 to \$3,587 billion. Here too, it is end-users that are increasingly looking for sustainable goods with the expectation of full visibility and transparency an expression of the continued focus on quality. Frost & Sullivan's finds that much of the innovation in respect of security in the sector is currently focused on detecting pathogens and toxins and checking freshness and ripeness using tests such as DNA assays.

In addition to chemical methods, new "physical" food inspection techniques which offer a non-invasive alternative are also rapidly gaining ground. X-ray Fluorescence (XRF), for example, is an emerging technology while ultrasonic sensing, biospeckle laser techniques, hyperspectral imaging and miniature spectrometers offer alternatives.

This paper examines each of these areas in turn with a focus on the impact of sustainability, safety and security issues from farm to fork. More broadly, it provides a guide as to how the **Agriculture, Food & Beverage** industry is responding to heightened attention on the way in which it manages the two interrelated issues of packaging and waste.



A woman wearing a red cap and a green apron is shown in a warehouse setting, focused on packing oranges into white crates. The background is filled with rows of similar crates, creating a sense of a large-scale operation. The lighting is soft, highlighting the woman and the vibrant orange color of the fruit.

PACKAGING

Food packaging has grown from conventional materials such as glass and metal to also encompass technologically advanced flexible and rigid solutions

Glass packaging typically includes bottles and jars whilst **metal** covers items such as drink cans, food cans and caps and closures. Many of these solutions still play an active and important role in the conservation, transportation and consumption of Foods and Beverages (F&B) but the market now also extends to:

- **Flexible** packaging such as brick liquid cartons, flexible plastics, composite films, gable top liquid cartons, paper-based containers, composite liquid cartons and stand-up pouches
- **Rigid** plastics including High-Density Polyethylene (HDPE) and Polyethylene Terephthalate (PET) bottles as well as jars and caps and closures

Globally, the market was valued at \$115.9b in 2019 and is developing at 1.2%

Packaging prices and therefore revenues are expected to increase modestly to 2030 but unit shipments, measured in terms of weight, are forecast to decrease in the short term.

Suppliers include diversified chemical companies as well as packaging specialists such as AR Packaging, Coveris, DS Smith, RPC and Smurfit Kappa

AR Packaging (Lund, Sweden) offers flexible and rigid plastic packaging. The company has three business segments one of which is focused on food. Its solutions include trays, cups, clamshells, cartons and boxes. The company currently employs about 3,200 people across this and its Branded Products and Healthcare & Beauty Packaging groups.

Coveris (Vienna, Austria) provides flexible and rigid plastic packaging. Founded in 2013, the company is a leading player. Its product portfolio includes paperboard, plastic bags and films, laminates and coatings. From an application point of view, Coveris covers packaging for pet food, cheese and dairy products, dry goods and beverages. With its corporate office in Austria, the company has a strong UK presence via eleven different sites.

DS Smith (London, United Kingdom) develops paper and plastic packaging. Its solutions encompass cardboard packaging used for transporting produce and other consumer goods and heavy-duty cardboard for protecting fragile products. The company has an exclusive partnership with Amazon as its sole provider of cardboard packaging in the UK. DS Smith plastics business manufactures products for packaging and dispensing liquids. The company operates from more than 70 plants that are found across Europe and the US.

RPC Group (Rushden, United Kingdom) supplies rigid plastics, a segment where it is Europe's largest vendor. The company mainly offers containers that are used for a variety of applications including bottles, tubs, cups, coffee capsules, pots and lids. RPC also manufactures disposable plastic products. Moreover, the company provides customers with options to add colours and labels to its products. In March 2019, RPC agreed to be acquired by Berry Global for circa \$6.5 billion.

Smurfit Kappa (Dublin, Ireland) focuses on flexible packaging. The company is also a global leader in paper-based packaging solutions. It is one of the world's top producers of corrugated boxes, graphic board and container board with 370 production sites across 35 countries in Europe and the Americas. In Europe, Smurfit Kappa manufactures containerboard and converts it to corrugated containers. In the Americas, it is involved in paper and pulp processing including forestry, paper, corrugated and folding carton activities. Founded in 1934, the company is listed on the London Stock Exchange.

Players across the board are addressing the related requirements of reducing weight, serving e-retailers and increasing durability

Overall packaging sales volumes are expected to decrease in the short term as manufacturers seek to use lighter materials. This is driven by the need to reduce transport costs and promote sustainability.

In contrast, the growing demand for F&B from e-commerce platforms is expected to boost shipments. With more food items being packaged and delivered to homes and businesses the use of materials will increase, especially in the long term.

To meet the demand for packaging which is both lightweight and durable, technological improvements in processing and additives will continue. This will support premium pricing and revenue growth despite flat volume trends.

Rigid plastic is and will remain the largest segment with a 41% share in 2019

Depending on its formulation, this can replace glass and metals, offering comparable protection and presentation as well as increased versatility

Like flexible packaging, rigid plastic is not only lightweight but can also prevent products from suffering physical damage. It also provides greater processability, convenience and design freedom when compared to metal and glass packaging.

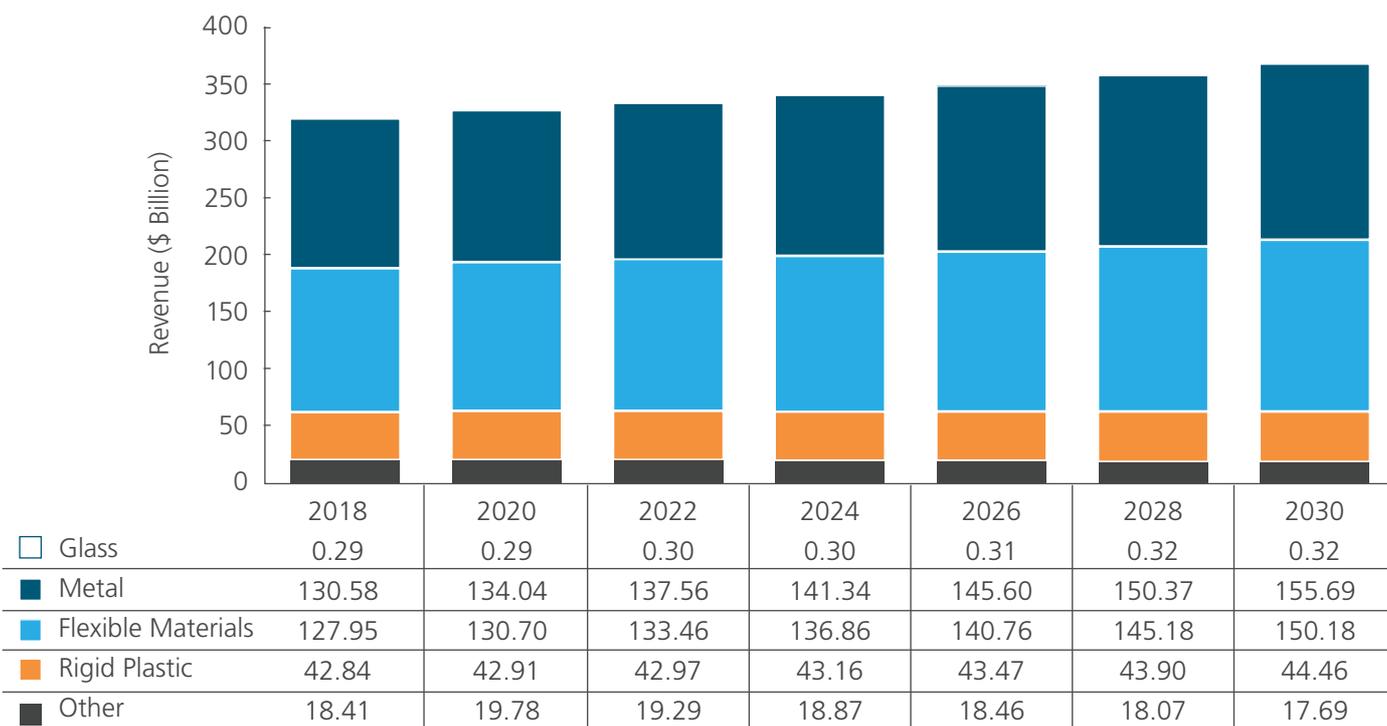
Other advantages of rigid plastic include the fact that printing can be integrated into its production process.

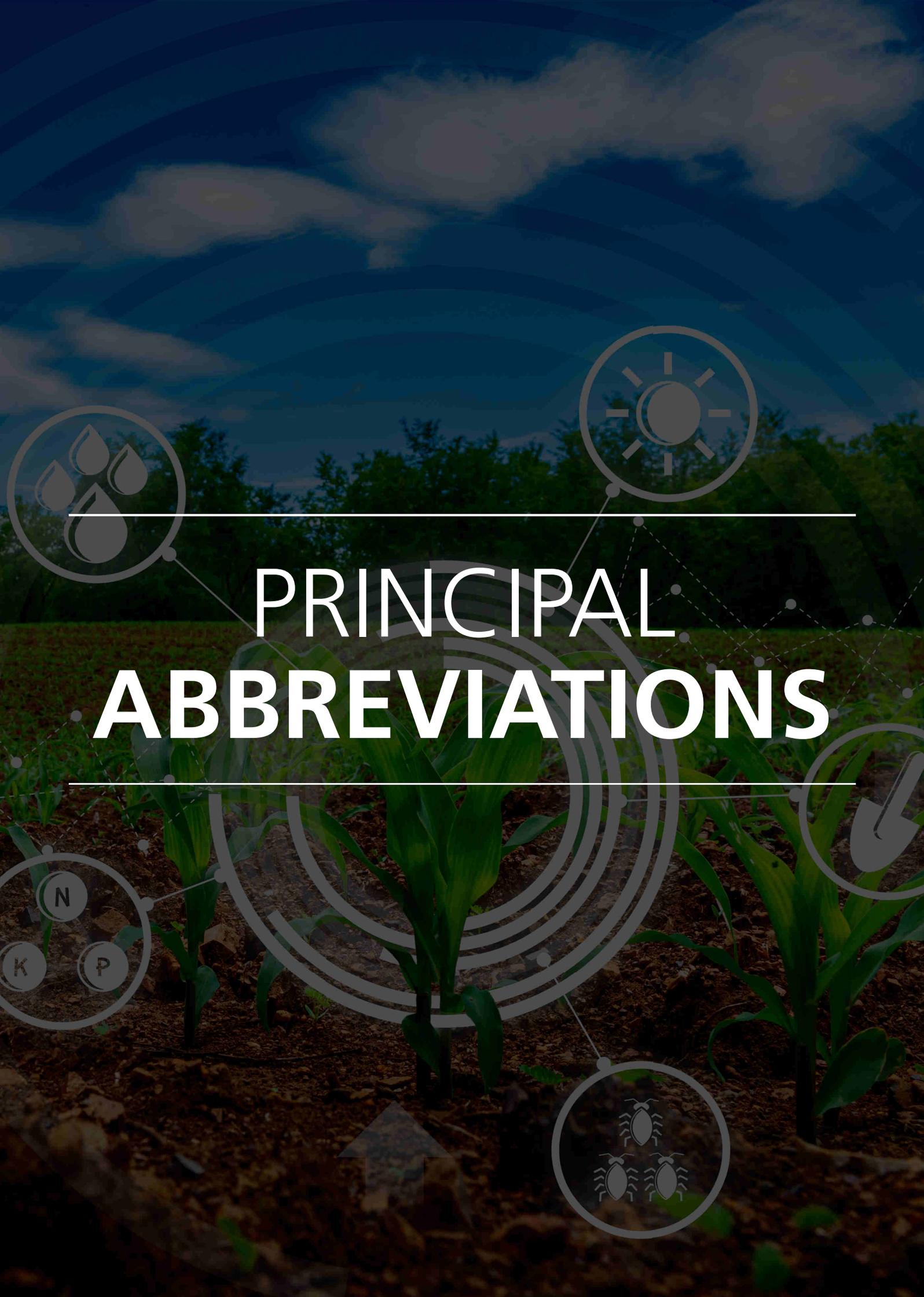
The properties of rigid plastics vary significantly and can be tuned for specific applications and products based on their composition and the additives used.

Key characteristics and variables include its density; surface characteristics (appearance and robustness); chemical resistance; optical properties (transparency and colour); strength (strength/weight ratio, stiffness and impact resistance); processing characteristics (working temperatures and melt viscosity and, of course, its overall cost.

However, here – as in the other segments – environmental concerns are prompting a search for alternatives to single-use plastic

FOOD AND BEVERAGE PACKAGING REVENUE FORECAST BY SEGMENT, GLOBAL, 2015-2030





The background features a photograph of a cornfield with young plants. Overlaid on this are several semi-transparent icons: a sun in a circle at the top right, a water drop in a circle at the top left, a shovel in a circle on the right, and three beetles in a circle at the bottom right. A network of dashed lines and dots connects these icons. In the bottom left, there are three small circles containing the letters 'N', 'K', and 'P'. A large, faint circular graphic with concentric lines is centered behind the text.

PRINCIPAL ABBREVIATIONS

AI	<i>Artificial Intelligence</i>	MOA	<i>Mode Of Action</i>
B	<i>Billion</i>	MSW	<i>Municipal Solid Waste</i>
C&D	<i>Construction & Demolition</i>	NFC	<i>Near Field Communication</i>
CAGR	<i>Compound Average Growth Rate</i>	NIR	<i>Near-Infrared</i>
CFU	<i>Colony-Forming Unit</i>	PCL	<i>Polycaprolactone</i>
CO2	<i>Carbon Dioxide</i>	PET	<i>Polyethylene Terephthalate</i>
DNA	<i>Deoxyribonucleic Acid</i>	PHA	<i>Polyhydroxyalkanoate</i>
EAS	<i>Electronic Article Surveillance</i>	PHB	<i>Polyhydroxybutyrate</i>
EBIC	<i>European Biostimulants Industry Council</i>	PLA	<i>Polylactic Acid</i>
ED-XRF	<i>Energy Dispersive X-ray Fluorescence</i>	PP	<i>Polypropylene</i>
EG	<i>Ethylene Glycol</i>	PSA	<i>Pressure-Sensitive Adhesives</i>
EV	<i>Electric Vehicle</i>	PVOH	<i>Polyvinyl Alcohol</i>
F&B	<i>Food & Beverage</i>	QR	<i>Quick Response</i>
FDA	<i>Food and Drug Administration</i>	R&D	<i>Research & Development</i>
FDCA	<i>Furandicarboxylic Acid</i>	RFID	<i>Radio Frequency Identification</i>
FSC	<i>Forest Stewardship Council</i>	RNA	<i>Ribonucleic Acid</i>
G	<i>Gram</i>	ROI	<i>Return On Investment</i>
GM	<i>Genetically Modified</i>	RRNA	<i>Ribosomal Ribonucleic Acid</i>
GMO	<i>Genetically Modified Organism</i>	SDG	<i>Sustainable Development Goal</i>
HDPE	<i>High-Density Polyethylene</i>	SERS	<i>Surface Enhanced Raman Spectroscopy</i>
HORECA	<i>Hotel/Restaurant/Catering</i>	T	<i>Trillion</i>
HRP	<i>Horseradish Peroxidase</i>	TXRF	<i>Total Reflection X-ray Fluorescence</i>
IWM	<i>Integrated Weed Management</i>	UK	<i>United Kingdom</i>
M	<i>Million</i>	US	<i>United States</i>
ML	<i>Machine Learning</i>	WEEE	<i>Waste Electrical and Electronic Equipment</i>
MM	<i>Millimetre</i>	XRF	<i>X-ray Fluorescence</i>

ABOUT INTESA SANPAOLO INNOVATION CENTER:

Intesa Sanpaolo Innovation Center is the company of Intesa Sanpaolo Group dedicated to innovation: it explores and learns new business and research models and acts as a stimulus and engine for the new economy in Italy. The company invests in applied research projects and high potential start-ups, to foster the competitiveness of the Group and its customers and accelerate the development of the circular economy in Italy.

Based in the Turin skyscraper designed by Renzo Piano, with its national and international network of hubs and laboratories, the Innovation Center is an enabler of relations with other stakeholders of the innovation ecosystem - such as tech companies, start-ups, incubators, research centres and universities - and a promoter of new forms of entrepreneurship in accessing venture capital. Intesa Sanpaolo Innovation Center focuses mainly on circular economy, development of the most promising start-ups, venture capital investments of the management company Neva SGR and applied research

For further detail on Intesa Sanpaolo Innovation Center products and services, please contact businessdevelopment@intesasanpaoloinnovationcenter.com

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LIVIO VANINETTI

Director of Frost & Sullivan's Italian operations;
livio.vaninetti@frost.com

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