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Innovations in Food Packaging in India

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India is one of the world's major food processing countries, with a projected $535 billion in output by 2025–2026. Specifically, the 14.8% annual growth rate of the Indian food and beverage packaging market is expected to reach $86 billion by 2029. Due to its perishable nature, a number of environmental conditions, including moisture, oxidation, thermal degradation, and microbiological contamination, contribute significantly to food loss that happens along the supply chain. This problem becomes increasingly apparent as the population of cities grows, emphasizing the necessity for effective food packaging to facilitate the transportation, storage, and consumption of food items.

Among all other businesses, the food and beverage sector is one of the biggest users of sustainable packaging. Creating and utilizing packaging materials with the least possible negative environmental impact over the course of their lives is known as sustainable packaging. It entails cutting waste, minimizing the carbon footprint caused by product packaging, transportation, and disposal, and utilizing renewable and eco-friendly materials. Protecting the product while reducing the package's environmental impact is the main objective of sustainable packaging.

Innovation in Packaging

Packaging innovation in the food processing business has been amazing. The market for environmentally friendly food packaging is divided into segments according to material choice, use, kind, and method. Among the materials are glass, metal, bioplastics, paper and paperboard, and others. Applications include dairy products, convenience foods, meat, fish, poultry, fruits, and vegetables, as well as confections and bakeries. The methods used include multipurpose packaging, molded packaging, and active packaging.

Biodegradable Packaging

The use of materials that are biodegradable, recyclable, or compostable, and designs that are efficient, reusable, or refillable are indicators of a shift toward green packaging at each level. The following are some new developments in biodegradable packaging:

1. **Corn Plastic:** Using PLA, an industrial resin, corn kernels are used to make a biodegradable plastic.
2. **Bamboo:** is one of the plants that grows the fastest, which makes it a great substitute for paper and plastic in eco-friendly silverware such as straws, cups, knives, forks, and spoons.
3. **Wood and Plant Fibers:** Paper and biodegradable packaging materials are made from cellulose derived from plant matter and wood pulp, which is readily recycled into new paper goods.
4. **Mushroom:** Mycelium of mushroom, the thread-like roots of mushrooms and other fungus, is combined with seed husks to produce a sustainable packaging material that can replace polystyrene or styrofoam.

Research is also being done on creating cutting-edge technologies that will offer novel answers to long-standing problems

1. **The Internet of Things, or IoT**, has the potential to greatly increase supply chain transparency. Proper inventory management and real-time tracking are essential for guaranteeing food freshness and prompt delivery.
2. **AI-powered forecasting:** By analyzing large datasets, AI improves the precision of demand estimates.
3. **Blockchain:** It's imperative to guarantee security and transparency in the procurement and distribution of food. Blockchain gives consumers access to reliable records, which is a huge benefit for packaging industry professionals.

Government Initiatives

The Government of India has taken a number of actions to simplify business and investment in the food processing and packaging sector, given the industry's enormous potential. Prominent programs like the Extended Producer Responsibility (EPR) framework and the Plastic trash Management Rules are essential in encouraging recycling and trash management, as well as holding manufacturers accountable for their packaging waste.

- **The Food Safety and Standards (Packaging) Regulations, 2018,** which specify general and particular requirements for food packaging to guarantee materials used for packaging are in compliance with various national and international standards, have been notified by the Food Safety and Standards Authority of India (FSSAI). Among the regulatory actions the Food and Beverage Industry has made to lessen its plastic footprint are:

1. Permitting the packing of water in several food-grade materials such as paper, glass, and metal alloys.
2. Establishing regulations for the use of bamboo as a material in food contact.
3. Permitting, subject to restrictions, the supply of drinking water in reusable glass bottles with paper seals for captive use on hotel property.

Furthermore, the Ministry of Food Processing Industries (MoFPI) has launched a number of initiatives

- **The Pradhan Mantri Kisan SAMPADA Yojana (PMKSY)** is a comprehensive program designed to improve supply chain management from farm to retail and modernize infrastructure, hence stimulating the food processing industry. It consists of multiple component schemes, including Creation of Infrastructure for Agro Processing Cluster (APC), Integrated Cold Chain and Value Addition Infrastructure, and Creation/Expansion of Food Processing and Preservation Capacities (CEFPPC), among others, that offer credit-linked financial assistance in the form of grants to entrepreneurs for the establishment of food processing projects throughout the nation. By 2025–2026, it is anticipated that the PMKSY plan will have leveraged investments of INR 11,095.93 Cr, helping 28,49,945 farmers and creating 5,44,432 direct and indirect jobs nationwide.
- **The PM Formalization of Micro Food Processing Enterprises (PMFME):** Scheme has been launched with an outlay of INR 10,000 Cr for a period of five years, from 2020-21 to 2024-25. It offers financial, technical, and business assistance for establishing or upgrading micro food processing enterprises. So far, a total of 43014 micro food processing enterprises have been sanctioned for assistance in the country.
- **The Production Linked Incentive Scheme for Food Processing Industry (PLISFPI**), with an outlay of INR 10,900 Cr, has been implemented from 2021-22 to 2026-27 for enhancing India's manufacturing capabilities. The scheme aids in enhancing industry capacity, incentivizing strong Indian brand growth, and increasing the global presence of Indian food brands. As on 11 August 2023, a total investment of INR 7800.53 Cr has been committed in projects located across the country under the scheme.
- The Made in India campaign places a high premium on the food processing industry. The Ministry of Food Processing Industry is putting plans into place to build the infrastructure needed by the food processing industries in order to draw investments. This entails

encouraging the development of Mega Food Parks in agriculturally productive regions and supplying basic amenities like sewage, electricity, water, and roads, as well as processing facilities like packing, pulping, cold storage, dry storage, and logistics.

- Businesses are using R&D, improving technologies, and developing effective disposal strategies to get into this market. FiloBev, a food-grade board that is 100% recyclable, has been introduced by ITC Limited. By 2025, Nestle wants to reach a recycling rate of more than 95% and make all of its plastic packaging reusable. Effective July 1, 2022, the Indian government has designated and outlawed single-use plastic products that are low-utility and have a high risk for littering.
- The Extended Producers Responsibility guidelines require sustainable plastic packaging to lessen its environmental impact. They also present a framework to support the circular economy of plastic packaging waste, encourage the creation of new plastic substitutes, and outline the next steps that businesses can take to transition to sustainable plastic packaging. India has a favorable environment for investments in the sustainable food packaging industry, thanks to the government's support of laws and compliance rules.
- Sustainability concerns and global consumer preferences are evolving quickly. According to a 2020 global poll, a sizable majority of consumers—roughly 79%—are making adjustments to their purchasing decisions in light of considerations like social responsibility, inclusivity, and environmental impact. Furthermore, the study indicates that a considerable proportion of consumers—that is, 53% of all consumers and 57% of consumers aged 18 to 24—tend to favor lesser-known brands that demonstrate sustainable practices. Furthermore, more than half of customers—52 percent—state that they have an emotional bond with brands or companies that they consider to be sustainable.
- It was discovered, specifically for India, that 66% of the Indian respondents had shifted to lesser-known firms whose goods or business methods they believe to be more environmentally friendly. This highlights the growing importance of environmentally friendly packaging as well as the significant influence that sustainability has on customer choice.

Conclusion

Sustainable packaging is crucial to reducing the damaging impacts of packaging materials on the environment in today's eco-aware society. By using recyclable, compostable, or biodegradable materials, it drastically minimizes waste and promotes a circular economy. Furthermore, since materials like biodegradable plastics take less energy and water to produce, sustainable packaging reduces its carbon footprint. This lessens the effects of climate change. Adopting sustainable packaging techniques also increases customer loyalty since customers are more inclined to support companies that share their environmental ideals. India has made great progress in addressing environmental issues, especially in the area of sustainable packaging solutions. This includes encouraging the use of reusable containers, establishing a strong recycling system, and utilizing biodegradable materials. By 2030, India wants to cut its estimated carbon emissions by one billion tonnes and its economy's carbon intensity by 45%. By 2070, the nation hopes to have zero net emissions. A significant decrease in food waste can be attained by encouraging cooperation between the government, companies, and consumers, opening the door for a sustainable India.

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