

Economy of Upcycled Food Sector: Global and Indian Perspective

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ABSTRACT

The upcycled food industry is emerging as a sustainable solution to global food waste, transforming unused by-products into valuable, eco-friendly food ingredients. India, with its vast agricultural base and increasing awareness of sustainability, holds strong potential in this sector. While North America currently leads the market, India's growing focus on ESG goals, supportive startup ecosystem, and availability of raw materials position it for rapid growth. Tamil Nadu, in particular, shows high promise due to its robust agri-processing industry and innovation-driven startups. However, the sector still faces challenges such as varying raw material quality, limited consumer awareness, and the absence of clear regulations. With new policies from FSSAI, rising investments, and increased consumer interest in sustainable food choices, India is steadily moving toward a circular economy. The upcycled food market thus represents both an economic opportunity and a crucial step toward a more sustainable food system.

INTRODUCTION

India is showing a rising interest in upcycled foods as awareness about food loss and waste continues to grow. With plenty of agricultural by-products available

and consumers becoming more conscious of sustainable choices, the country has strong potential in this emerging field. Upcycled foods are products made from ingredients like

food waste, by-products, or scraps that would normally be thrown away. The idea is to reduce food waste by turning items such as fruit peels, vegetable rinds, and spent grains into healthy value-added products (Reddy *et.al.*, 2024). While this concept is gaining global traction, the demand for upcycled food is especially high in North America, where consumers are increasingly choosing environmentally friendly and sustainable food options.

Global Upcycled Food Products Market Overview (2024–2032)

The global market for upcycled food products foods made from by-products like fruit and vegetable peels, spent grains, and other leftovers from food processing was valued at about USD 38.95 billion in 2024. It's expected to grow to USD 41.71 billion in 2025 and reach nearly USD 68.56 billion by 2032, with an annual growth rate of around 7.36% from 2025 to 2032 (Enlighten report, 2025). In 2024, North America dominated the market, holding about 55.84% of the total share. This is largely because consumers there are more aware of sustainability and food waste issues, and many established companies are already producing upcycled food products. Among the various sources of food waste, fruit and vegetable waste made up the largest share in 2024 since these materials are easy to collect and can be turned into products like snacks, baked items, and sweets. The market's growth is mainly driven by increasing global concern over food waste, rising demand for eco-friendly and ethically made foods, and advances in upcycling technologies such as fermentation and extraction. However, the industry still faces challenges many consumers are not yet familiar with the concept of upcycled food, and there's inconsistent access to high-quality waste materials, which can make production difficult.

Exploring the Present and Future of the Upcycled Food Ingredient Market

The upcycled food ingredient market is growing because companies want to use resources wisely and lower costs. Studies show that this market is expected to grow by about 9.8 percent each year between 2025 and 2032. Upcycled ingredients are made from leftover or surplus food that would usually go to waste. These materials are turned into healthy, eco-friendly ingredients used in many food and beverage products. This process helps cut down on food waste, supports sustainability, and encourages a circular economy where nothing goes unused. As more people prefer environmentally friendly and healthy foods, the demand for upcycled ingredients is increasing. This market is making a real difference by addressing global issues like food waste and environmental harm. with more investment, new product ideas, and growing consumer interest, the upcycled food ingredient market has a bright future and is becoming an important part of the sustainable food system.

Consumer perception and the emergence of upcycled food in commercial markets:

Consumers play a very important role in how well upcycled food products are accepted in the market. Upcycled foods are made from ingredients that would normally go to waste, and they help support a more sustainable, circular food system. However, people's willingness to buy them depends a lot on how they *feel* about these products. Studies in five European countries show that people often view upcycled foods positively when the idea is explained clearly, they associate them with innovation, reducing food waste, and protecting the environment. But at the same time, some people worry about the taste, quality, or the idea that these foods come from waste. Good communication makes a big difference. When companies highlight the

environmental benefits like being climate-friendly or saving resources people are more open to trying upcycled foods. But if the message is confusing or unclear, consumers may form negative opinions (Aschemann.*et.al.*,2023). Demographics also matter. Younger and more educated people tend to accept upcycled foods more easily, while older consumers or those unfamiliar with the concept may hesitate or feel uncertain about trying them. On the business side, many brands are now adopting circular models, using things like imperfect fruits or food by-products to make new, value-added products. This approach fits perfectly with the rising demand for eco-friendly and sustainable options. Still, challenges exist many consumers don't fully understand what upcycled foods are, and some worry about safety or taste. Clear labelling and honest storytelling are important to build trust. As the market for upcycled foods grows, companies will need to address these concerns and adapt their messages to different consumer groups to unlock the full potential of this sustainable food trend.

India Perspective

The upcycled food industry in India is growing fast as more people become aware of sustainability, companies focus on ESG (Environmental, Social, and Governance) goals, and investors recognize its potential. India holds a special advantage. it produces a large amount of agricultural by-products like fruit pomace, oilseed cakes, and cereal brans, while also becoming a strong market for eco-friendly and sustainable food products .The Food Safety and Standards Authority of India (FSSAI) has made progress in improving food safety and packaging rules, but there's still no specific policy for upcycled foods, which creates some uncertainty for businesses in this area .Despite that, there are big opportunities. India's vast supply of agricultural and food processing waste can be transformed into

valuable ingredients, animal feed, or sustainable food Products. However, the industry faces a few major challenges. the quality of raw materials can vary, consumers are still hesitant or unsure about upcycled foods, and there's a lack of clear standards and regulations. Additionally, India needs better processing facilities and cold-chain infrastructure to make large-scale upcycling successful.

Regional analysis — Tamil Nadu

Tamil Nadu has great potential for growth in the upcycled food sector because of its strong agricultural base and well-developed food processing industry. The state produces plenty of by-products from crops like rice, millets, sugarcane, coconuts, bananas, and cashews providing a steady supply of raw materials for upcycling. By-products such as cashew apples, rice and millet bran, and coconut or banana waste can be turned into value-added products like flours, drinks, and Fiber rich ingredients. Tamil Nadu also has a very supportive startup ecosystem. Programs like StartupTN and TANSEED promote innovation in circular and sustainable food systems, and many eco-friendly food startups in the state are already finding success .Cities like Chennai, Coimbatore, and Madurai are becoming strong markets for both business-to-business (B2B) and premium consumer (B2C) products, especially among people who care about sustainability and the environment .However, there are still some challenges such as organizing by-product collection, ensuring consistent quality control, bringing clearer FSSAI regulations, and improving processing and logistics infrastructure to support the industry's growth.

Recent news & developments in India and Tamil Nadu

India's upcycled food sector is gaining strong momentum with several exciting new



developments. For example, Delhi-based startup Wastelink raised ₹27 crore (\$3 million) in Series A funding in August 2025 to expand its operations that turn surplus food into animal feed a clear sign of growing investor confidence in this space. The Food Safety and Standards Authority of India (FSSAI) has also introduced important new rules, such as mandatory quarterly reporting of expired or rejected food and allowing limited use of recycled PET in packaging. These updates mark real progress toward better traceability and a circular food system. Across Asia, companies are launching creative upcycled products like okara-based meat substitutes and drinks made from cocoa shells great examples that India can learn from and adapt. at the same time, more policy and research attention is being given to commercialization and certification challenges, helping shape future regulations and attract more funding. Meanwhile, Tamil Nadu's startup ecosystem is becoming increasingly visible, with many sustainable food startups winning awards and receiving incubator support. This creates new opportunities for collaboration, investment, and skill development within the state's growing circular food economy.

Growth Drivers of upcycled food market

As more people shift toward vegan and plant-based diets, the demand for upcycled food products made from leftovers or by-products like waste bread or fruit peels is growing fast. Consumers are becoming more interested in foods that are not only healthy but also eco-friendly and help reduce waste. Big food companies are also getting involved in this movement. For example, Toast Ale in the UK has reused 2.9 million slices of surplus bread to make beer, showing how food waste can be turned into something valuable and sustainable. Governments around the world are supporting these efforts too. The USDA's National Institute of Food and Agriculture (NIFA), for instance, has invested USD 123.5

million in projects aimed at cutting down food loss, redistributing extra food, and encouraging food recovery programs. Overall, these initiatives show a growing global push toward reducing food waste and building a circular, sustainable food system that benefits both people and the planet.

Opportunities

India has huge potential in the upcycled food sector because of its strong agricultural foundation and increasing focus on sustainability. There are many exciting opportunities such as creating new food ingredients and snacks from by-products like fruit peels, bran, and spent grains, and helping rural entrepreneurs and small businesses (MSMEs) turn local waste into valuable, market-ready products. The upcycled food market can also connect with India's growing food processing and export industries, offering unique Indian ingredients to niche international markets. By integrating waste utilization into circular farming systems like turning crop residues into bio-fertilizer or biogas India can move closer to building a sustainable, zero-waste agricultural ecosystem. India also has the potential to become a global leader in waste-to-food technologies and scalable processing solutions that fit small-farm systems. To make this happen, supportive government policies, investment incentives, and consumer awareness campaigns will play a major role in driving growth and increasing public acceptance of upcycled foods.

CONCLUSION:

The upcycled food market holds significant promise as a sustainable solution to global food waste challenges. India, with its vast agricultural base and increasing awareness of environmental issues, is emerging as an important player in this sector. The transformation of agricultural by-products and food processing residues into valuable food

ingredients not only supports resource efficiency but also aligns with global sustainability and circular economy goals. Although the market currently faces challenges such as inconsistent raw material quality, limited consumer acceptance, and an evolving regulatory framework, these obstacles present opportunities for innovation, investment, and policy development. With rising interest from startups, investors, and government bodies, India is poised to experience accelerated growth in the upcycled food segment. Tamil Nadu, in particular, stands out as a regional leader due to its strong agri-processing ecosystem, supportive startup programs, and availability of diverse feedstocks. Strengthening infrastructure, improving quality control, and developing dedicated regulations can further enhance this momentum. In conclusion, the upcycled food industry in India represents not just a market opportunity but a transformative step toward sustainable food systems, waste reduction, and inclusive economic growth.

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