EDHEC BUSINESS SCHOOL

Creative Dock

Sustainable Pathways for Healthy and Accessible Nutrition

A Future Foresight Study

Contents

We need to **plant the seed** for a sustainable food system, today.

Before the agricultural revolution, some 12,000 years ago, humans would spend 80-90% of their time searching for, gathering, and hunting for food. Today, most of us enjoy a highly capable global food supply system that provides whatever we desire, all year round. Yet, there are three key issues that require our attention:

1. Hunger and the curse of underdevelopment. Despite the UN's goal to end hunger by 2030, globally, 1 in 11 people face hunger daily, with 1 in 5 affected in Africa. And while the UN World Food Programme aids 152 million people, 20–30% of children in parts of Africa, Asia, and the Americas suffer severe malnutrition, hindering their physical and cognitive development for life.

2. The growing CO2 footprint. Delicious and nutritious, the kiwi fruit from New Zealand generates a third of its weight in CO2 by the time it reaches our plates in Europe. This is just one small illustration of how food supply systems contribute 26% of global greenhouse gas emissions, expected to rise to 30% by 2050. Much of these emissions is linked to livestock, which today represents 94% of non-human mammal biomass, outweighing wild animals by a staggering ratio of 15 to 1.

This imbalance underscores a pressing responsibility to mitigate the environmental impact of livestock farming, such as the Danish livestock emissions tax, introduced in 2024. Similarly, the EU implemented a supply chain transparency law, reflecting efforts to tackle food production's climate impact and hold industry accountable.

3. The double burden of malnutrition. One in three people faces malnutrition due to insufficient vitamins, minerals, fiber, and micronutrients, contributing to hypertension, diabetes, and cardiovascular disease—the top diet-related causes of early death. For those affected, these conditions lead to reduced well-being, decreased productivity, and a diminished quality of life.

Our ancient ancestors' rare access to calorie-dense foods ingrained a craving for them, which through our genetic inheritance, persists today. Today, 1 in 4 people suffer from obesity, which in turn reduces life expectancy, burdens health systems, and contributes an estimated $20 trillion in global external costs, over twice the direct cost of food consumption.

This report is part of EDHEC's program aimed to promote new business models and drive industry transformation in order to achieve zero hunger and ensure universal access to healthy nutrition. The shifts outlined in this report powerfully illustrate potential pathways towards a sustainable food system. The key is collaboration across the value chain, out-of-the-box and creative thinking, and bridging the divide between the agro-food industry, education systems, and preventive healthcare systems.

We are looking forward to building the sustainable food system that we all need, together.

Professor René Rohrbeck
Professor of Strategy
EDHEC, UNESCO Chair, EDHEC FIT Chair

The **future of food** is not just business, but personal.

In my years working closely with clients at some of the largest multinationals in the FMCG and F&B sectors, I've seen firsthand how innovation isn't just a buzzword—it's the industry's secret weapon in transforming challenges into (dare I say it?) delicious opportunities.

In all seriousness: the most rewarding aspect of my work at Creative Dock and in corporate innovation and venture building is witnessing and fostering action, guided by insights from a report such as this—in short, actually building businesses, products, and services. It's so rewarding to help clients take those brilliant concepts scrawled on a post-it note or napkin and turn them into reality—and just maybe, something that will transform a company and industry.

Perhaps more than many industries, the global food industry faces a breadth of undeniable, global, and acute challenges: from navigating regulatory complexities to securing supply chains. It's an industry with particular and profound changes afoot (afood?) in our era marked by rapid shifts in lifestyle, technology, and our understanding of what it means to be healthy and to live well.

These topics are not just business, but personal: after all, food is so visceral and essential to us as humans and to life itself. What we consume is more than just fuel: it's a conversation starter around the dinner table (and conference table); discussions that are often the foundation from which we can spark collective action leading to a healthier, more sustainable world.

So, whether you are reading this report or discussing it around a table, let's challenge ourselves to continue to innovate boldly and keep the dialogue flowing. Keep a napkin or post-it ready, as you might just find the catalyst for the next big idea in the pages that follow.

Here's to a healthier, happier future with exciting opportunities ahead.

Jesper Niemann
Director, Foresight Innovation & Venturing
Creative Dock

From Farm to Future

Introduction

The Evolution of Sustainable, Accessible, and Resilient Food Systems

The global food industry stands at a pivotal crossroads. With the world's population projected to reach nearly 10 billion by 2050, feeding everyone sustainably has become one of humanity's greatest challenges. The World Economic Forum underscores this urgency, highlighting that by 2030, the global middle class could grow to nearly 5 billion people, significantly increasing demand for food—especially resource-intensive products like meat and dairy. This scenario demands transformative changes in how we produce, distribute, and consume food to meet rising demands without further straining our planet's resources.

The stakes are high and multifaceted. Projections indicate that global demand for crop calories will increase by 35-65% by 2050. Achieving this would require doubling agricultural production from current levels—a daunting task given existing challenges. Meanwhile, nearly 800 million people are undernourished, 2 billion experience micronutrient deficiencies, and another 2 billion are overweight or obese. This highlights significant challenges and inefficiencies within our global food systems that need to be addressed, impacting nations across all stages of development.

Poor nutrition isn't just a personal health issue; it's a societal and economic burden. In the European Union, healthcare costs associated with unhealthy diets exceed €115 billion annually. These figures reveal an urgent need to overhaul our approach to food and nutrition, addressing not just the quantity but also the quality and accessibility of what we eat.

Amidst these challenges, there is a beacon of optimism. Today's consumers are more informed and health-conscious than ever before. They are driving a shift toward transparency, sustainability, and ethical practices, reshaping market expectations and demanding change. The increasing appetite for clean-label products, personalized nutrition, and eco-friendly sourcing signals a collective desire to align consumption with values that support both personal health and planetary well-being.

Technological innovations offer powerful tools to meet these evolving demands. From precision agriculture that optimizes resource use to lab-grown foods that promise sustainable protein sources, technology is revolutionizing every aspect of the food industry. Blockchain-enabled traceability enhances supply chain transparency, while digital platforms provide convenience and personalization. These advancements empower businesses to optimize processes, reduce waste, and build trust with consumers.

Evolving regulations worldwide are catalyzing change. Governments are implementing stricter sustainability standards, holding companies accountable and pushing them toward innovation. Companies that embrace these regulatory shifts are positioning themselves at the forefront of the industry, turning compliance into a catalyst for growth and creativity.

> "The food industry is at the heart of solutions for global health, climate, and social challenges. By **fixing food**, we tackle **root causes**."
>
> Gunhild A. Stordalen, Founder, EAT.

By proactively adopting sustainable practices and innovative solutions, businesses can gain a competitive edge through improved efficiency, enhanced consumer trust, and more resilient supply chains. Leveraging these changes allows companies to mitigate risks and make significant contributions to global health and environmental goals, driving meaningful progress in the food industry.

In this Report

This report delves into three interconnected Big Shifts that are defining the future of food and nutrition. These shifts represent the fundamental changes needed to address the most pressing challenges in the food industry and capitalize on emerging opportunities. By exploring these shifts, we aim to provide a comprehensive understanding of the key drivers and underlying trends reshaping the sector.

The forward-looking perspective offers stakeholders in the food and nutrition sector a roadmap to identify when and where to take action, prioritize investments, and prepare for both the challenges and opportunities on the horizon.

1. The Consumer Shift

Evolving consumer expectations around health, transparency, and sustainability are reshaping product demand. Consumers now expect food to contribute to their overall wellness while aligning with their environmental and ethical values. This shift compels companies to offer products that are not only nutritious but also responsibly produced and transparently marketed.

2. The Technological Shift

Technological advancements are transforming the food industry at an unprecedented pace. Innovations such as precision agriculture, blockchain-enabled transparency, and digital platforms are essential for building adaptive, efficient, and sustainable food systems. These technologies provide solutions to optimize production, enhance supply chain integrity, and meet personalized consumer needs.

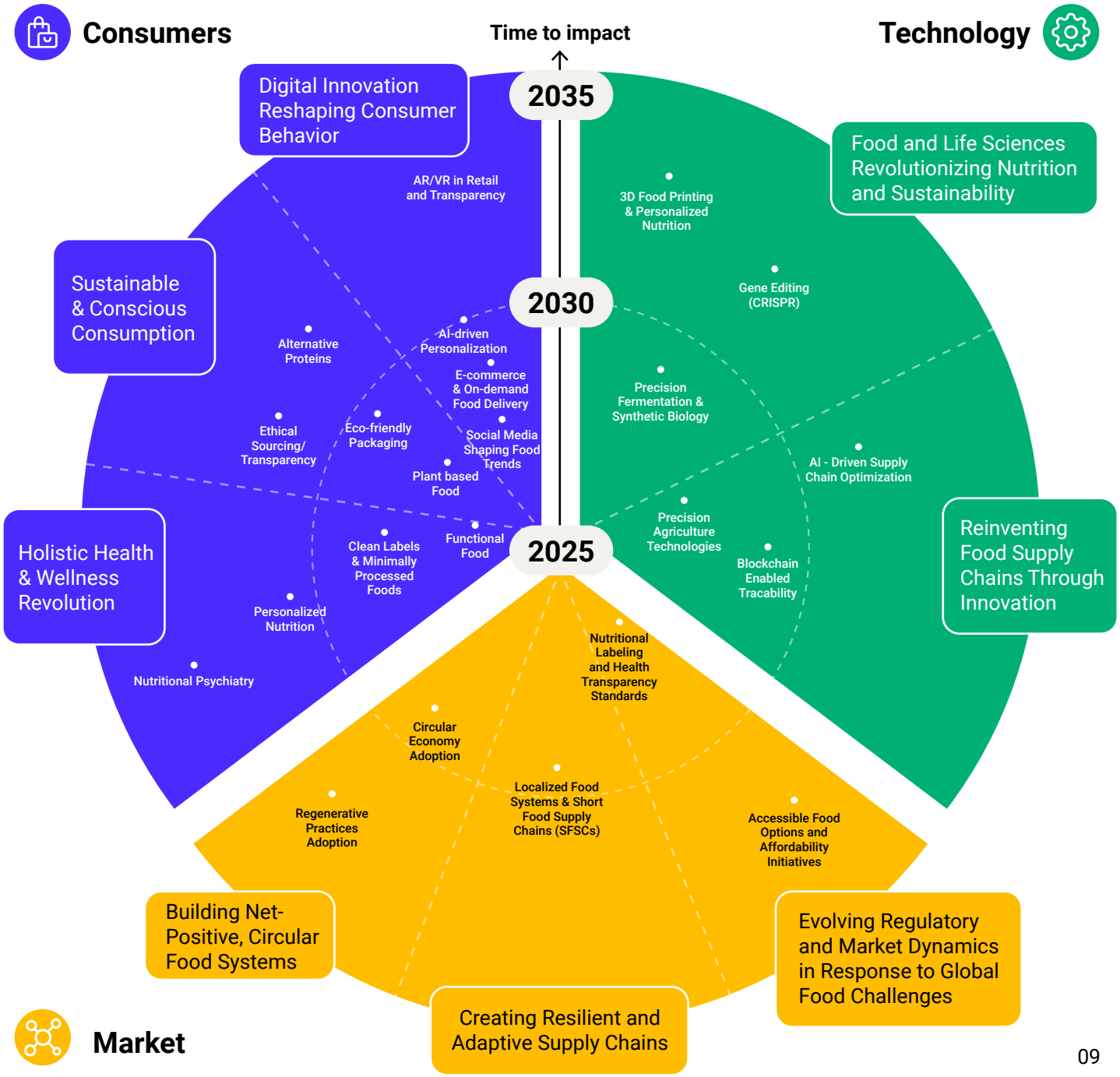
3. The Market and Regulatory Shift

External forces—including stricter regulations, evolving market dynamics, and a transition toward circular economies and regenerative agriculture—are reshaping competition and collaboration within the industry. Companies that adapt to these changes are better positioned to lead in an increasingly complex and sustainability-driven market landscape.

Big Shifts in Food and Nutrition Trend Radar

These Big Shifts are mapped within a trend radar, illustrating how major trends are expected to unfold over time. The radar displays the time to impact for various trends across the shifts, helping stakeholders understand when these changes may become significant. By "significant," we mean the point at which a trend becomes influential enough to noticeably affect industry practices, consumer behaviors, regulatory landscapes, or market dynamics. It signifies when a trend shifts from emerging to a pivotal force, emphasizing the need for organizations to anticipate and prepare in advance to stay competitive.

In the report, we explore how these trends may further develop through different tipping points by 2035, providing insights into future projections. This framework assists stakeholders in prioritizing initiatives, addressing emerging challenges, and identifying opportunities within a rapidly evolving food system.



The report also provides actionable insights and recommendations to guide stakeholders toward sustainable pathways.

By understanding the implications of the Big Shifts, stakeholders can adapt strategies that not only enhance competitiveness but also contribute to a more sustainable and equitable food system. Through these strategic insights, leaders are equipped to navigate changing market conditions, regulatory landscapes, and consumer expectations.

This comprehensive guide is designed for businesses, policymakers, and other stakeholders committed to driving meaningful progress in the food industry. By embracing sustainable growth pathways and proactively responding to the Big Shifts outlined in this report, organizations can drive long-term value while addressing some of the world's most pressing health, environmental, and social issues. This collective journey requires commitment, innovation, and collaboration from all industry players.

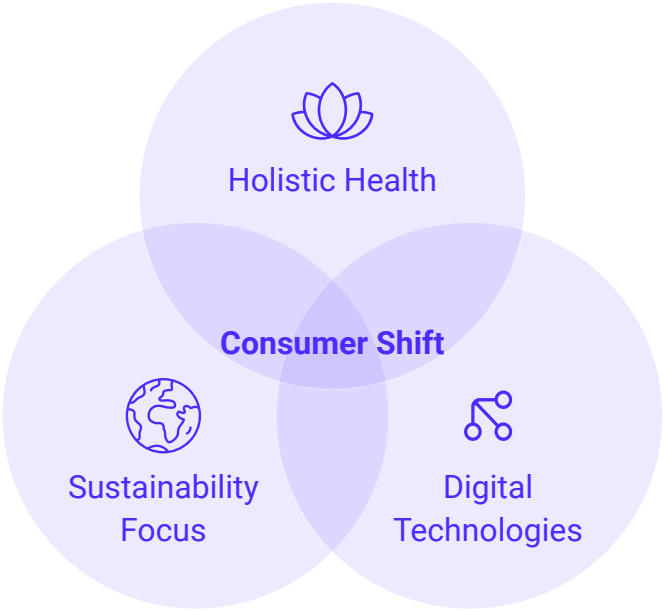
In the next chapter, we begin by exploring The Consumer Shift, examining how evolving consumer expectations around health, transparency, and sustainability are reshaping product demand. Understanding and adapting to these shifts is crucial for any organization aiming to succeed in the future food landscape.

Consumer Shift

Embracing a New Era of Food and Nutrition

Embracing a New Era of Food and Nutrition

The food and nutrition landscape is undergoing a significant shift, driven by consumers who are increasingly mindful of their health, the environment, and the role of technology in their daily lives. This transformation is influencing how food is sourced, produced, and consumed, as food moves beyond a basic necessity to a cornerstone of well-being and environmental stewardship. Three key drivers are reshaping the future of the industry:



1

The Holistic Health & Wellness Revolution

Consumers are turning to food as a pathway to overall wellness, encompassing physical, mental, and emotional health. This shift is fueling the rise of functional foods, personalized nutrition, and mindful eating, with a focus on building long-term health rather than seeking quick fixes.

2

Sustainable and Conscious Consumption

Today's consumers are increasingly committed to sustainability, seeking products that support their health while reducing environmental impact. The growing demand for plant-based alternatives, sustainably sourced ingredients, and zero-waste initiatives reflects a strong preference for transparent and eco-conscious food systems.

3

Digital Innovation Reshaping Consumer Behavior

Technology is redefining convenience and personalization in food consumption. From AI-driven recommendations to on-demand delivery, digital platforms have made instant access and tailored food experiences a new norm. Social media also plays a pivotal role, shaping trends and consumer choices at unprecedented speed, turning social engagement into immediate demand and shifting market dynamics.

These drivers indicate a profound systemic change within the food and nutrition market, requiring brands to adapt, innovate, and proactively align with evolving consumer expectations. The following sections will explore how each driver is shaping the industry's future trajectory.

61%

of consumers agree environmental issues are adversely impacting their health, making sustainable living a necessity, not just a trend.
(NielsenIQ, 2024)

75%

of consumers are likely to try viral food or beverage trends they discover on social media.
(Matter, 2024)

82% of U.S. consumers

73% of UK consumers

87% of Chinese consumers

consider wellness a key priority in their lives.
(McKinsey, 2024)

"Change is undeniably in the air regarding how consumers perceive food and health. Colruyt Group, a Belgian retail giant, recently introduced **microbiome-friendly products** as part of a bold, nutrition-based approach to health—**reflecting** the **industry's shift** toward viewing **food** as a **foundation for well-being."**

Marta Klejman, Klejman Fermentistas

The Holistic Health & Wellness Revolution

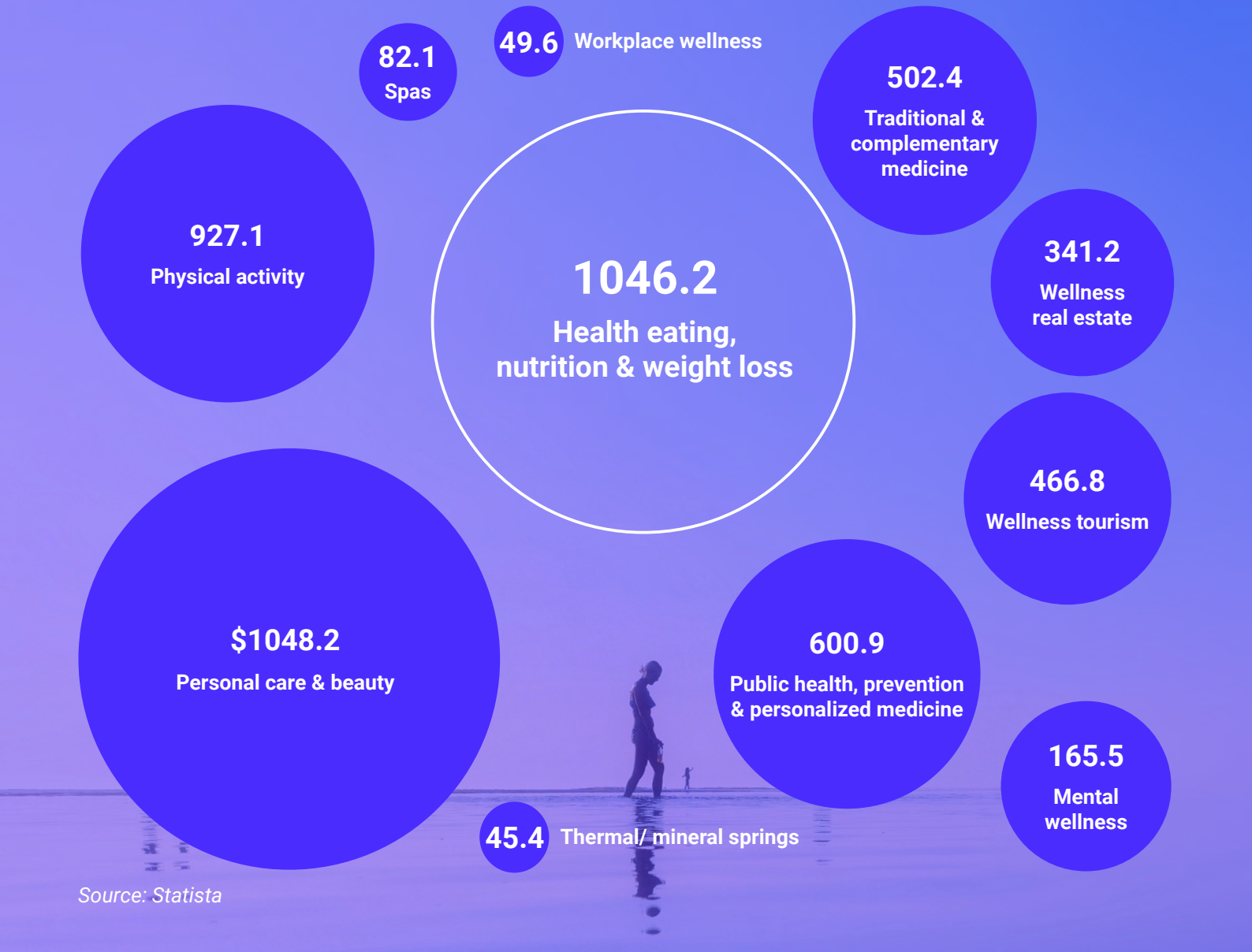
KEY DRIVER 1

Consumers' perspectives on health are evolving, with physical, mental, and emotional well-being converging into a broader movement toward holistic wellness. Food is no longer seen as just sustenance but as a core component of overall well-being. Today, consumers increasingly view nutrition as a way to maintain physical health, while also supporting mental clarity and emotional balance. This shift is driving a stronger focus on functional foods, high-quality ingredients, and the psychological benefits of a balanced diet.

This trend is evident in the global wellness market, which reached $5.6 trillion in 2022. Segments such as "Healthy Eating, Nutrition & Weight Loss" accounted for $1 trillion of this, underscoring nutrition's growing importance within the broader wellness ecosystem. With the market expected to grow to $8.5 trillion by 2027, it is clear that wellness-oriented products and services will continue expanding rapidly. (Statista, 2022, Global Wellness Institute, 2022)

Market size of the wellness industry worldwide in 2022, by segment

(in billion U.S. dollars)



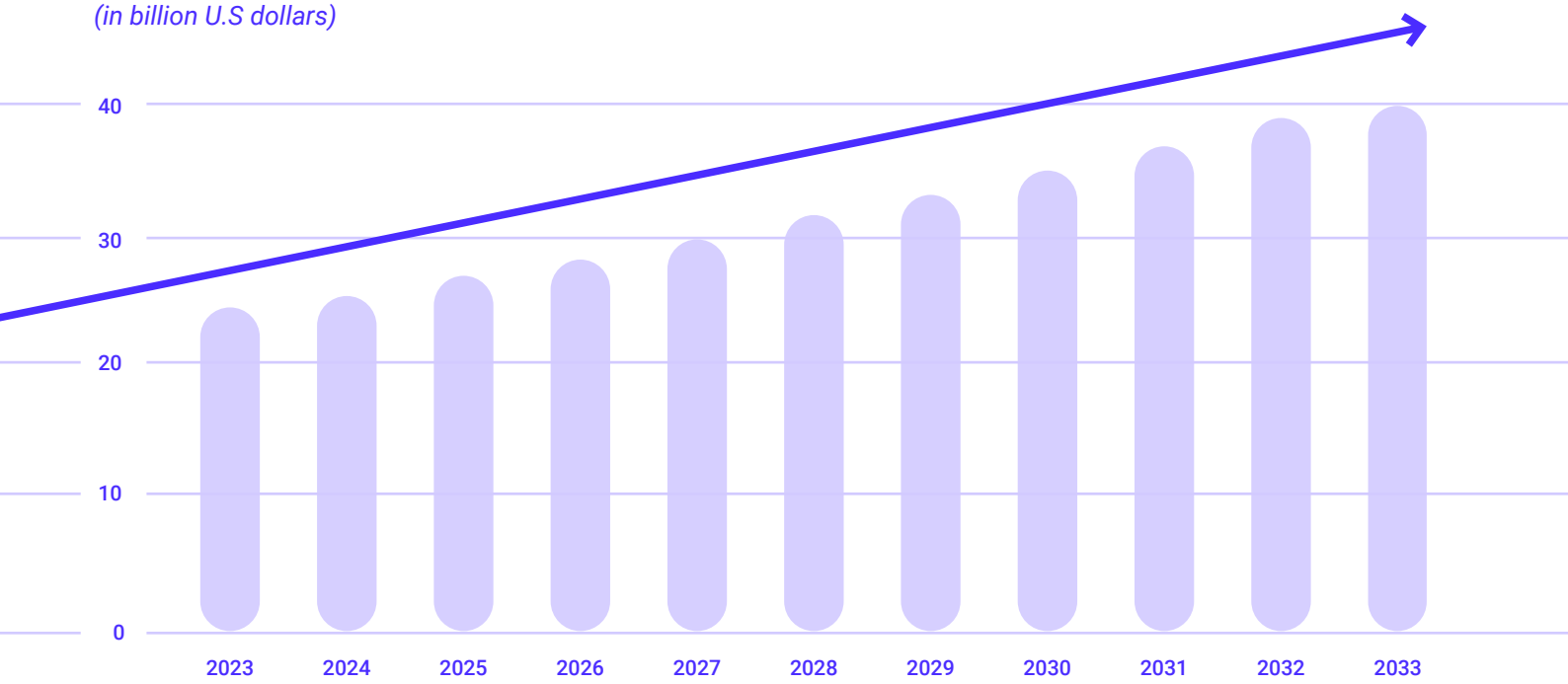
Source: Statista

The Functional Food Revolution: Nutrition with a Purpose

Integral to this movement is the rising demand for functional foods—products that go beyond basic nutrition to offer additional health benefits, such as supporting digestive health, boosting immunity, or enhancing mental clarity. The global functional food market is projected to reach $316.1 billion by 2030, growing at a CAGR of 6.2% (McKinsey & Well Company 2023), as consumers increasingly seek out foods that actively contribute to their well-being.

Functional and natural health food market value worldwide from 2023 to 2033

(in billion U.S dollars)



Source: Statista

YFood

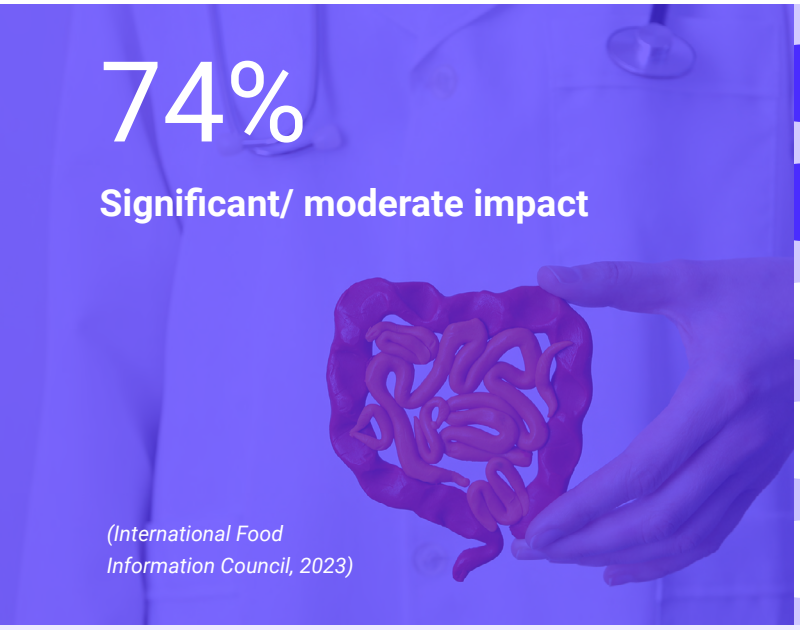
Functional Food for Modern Lifestyles

YFood has emerged as a leader in the functional food market, focusing on convenient, health-conscious meal solutions. Originally designed as a meal replacement, YFood's ready-to-drink meals combine macronutrients, vitamins, and minerals to meet the growing consumer demand for balanced nutrition on the go. In 2022, YFood achieved a turnover of €120 million and expanded into over 15 European countries, including the UK, France, and the Netherlands. Backed by strong social media engagement and a partnership with Nestlé, YFood reflects the increasing consumer focus on digestive health, natural ingredients, and personalized nutrition, positioning itself at the forefront of the "food as medicine" movement. (Just Drinks, 2023)

YFood's emphasis on digestive health, natural ingredients, and personalized nutrition places it **at the forefront** of the growing **"food as medicine"** movement.

Nutritional Psychiatry: The Emerging Link Between Diet and Mental Health

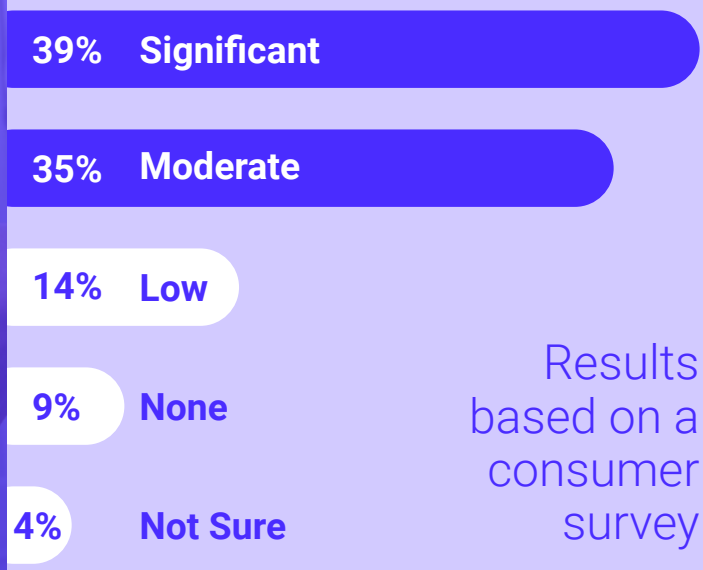
Impact of food and beverage consumed on mental and emotional well-being



74%

Significant/ moderate impact

(International Food Information Council, 2023)



Results based on a consumer survey

"Professor Jeroen Raes, a leading microbiologist, delivered conclusive proof that people who experience depression **lack two specific bacterial strains** in their intestinal flora. His groundbreaking research is a huge milestone in advancing our understanding of the **mind-gut connection**, showing how **our gut health can significantly impact mental well-being.**"

Marta Klejman, Klejman Fermentistas

The connection between food and mental well-being is also gaining prominence, driven by the emerging field of nutritional psychiatry. A study revealed that 74% of consumers believe that the food and beverages they consume have a significant or moderate impact on their mental and emotional health (International Food Information Council, 2023). Nutrient-rich foods—such as those containing omega-3 fatty acids, antioxidants, and probiotics—are being embraced for their potential to enhance brain function and mood. As this link between diet and emotional well-being becomes more mainstream, consumers are increasingly seeking foods that promote cognitive clarity, emotional balance, and stress relief.

The rise of mindful eating is also reinforcing a trend toward self-awareness in dietary habits. Consumers are becoming more attentive to how food makes them feel—both physically and emotionally. This shift has sparked interest in mood-boosting ingredients like adaptogens (e.g., ashwagandha, reishi) known for their stress-relieving properties, as well as foods rich in tryptophan, an amino acid that supports serotonin production and helps enhance mood.

REBBL

Harnessing the Power of Adaptogens in Beverages

REBBL has pioneered a line of adaptogen-infused beverages designed to promote mental clarity, immune resilience, and stress management.

Known for their innovative flavors like Ashwagandha Chai and Reishi Chocolate, REBBL's drinks are crafted with potent adaptogenic herbs, including:

Ashwagandha
Revered for its **stress-reducing effects** and ability to **enhance cognitive performance.**

Reishi Mushroom
Traditionally valued for **supporting immune** function and **boosting vitality.**

Maca Root
An energizing herb known to **improve stamina,** endurance, and **overall resilience**.

With these unique offerings, REBBL exemplifies how adaptogenic ingredients can create functional beverages that cater to modern wellness needs.

Clean Labels, Real Ingredients: The Push Toward Minimal Processing

In addition, there is growing scrutiny of food quality and processing. Consumers are increasingly rejecting ultra-processed foods (UPFs), which are often laden with additives, preservatives, and unhealthy fats, due to their association with health risks like obesity and heart disease. Instead, they are favoring minimally processed foods that retain their nutritional value and feature shorter, more recognizable ingredient lists. In fact, 91% of consumers now read food labels, with 64% prioritizing ingredient information. This has led to the rise of “clean label” products, with a strong preference for those free from preservatives (43%) and artificial flavors/colors (39%) (Taste Tomorrow 2022).

Brands are adapting by simplifying ingredient lists and emphasizing transparency. For example, That’s It snack bars focus on using five or fewer ingredients, some with just two, while Rugani Juice in South Africa uses innovative processing to produce single-ingredient juices without additives.

Personalized Nutrition: Tailoring Diets with AI-Driven Precision

At the same time, advances in personalized nutrition are reshaping how individuals manage their health. AI-driven platforms like DayTwo and InsideTracker use personal health data—such as blood glucose levels, genetic information, and microbiome analysis—to offer tailored dietary recommendations. These platforms allow consumers to make data-driven decisions about their diets, offering personalized solutions that align with their unique health needs. The focus is shifting from calorie counting to optimizing key health markers such as cholesterol, blood sugar, and mental clarity through precise, individualized food choices.

MyFitnessPal

From Calorie Counting to Comprehensive Wellness

MyFitnessPal has evolved from a basic calorie-counting app into a comprehensive wellness platform with over **200 million registered users** worldwide. It now offers tools to track diet, exercise, sleep, stress, and mindfulness. The app also provides insights into food quality, helping users distinguish between whole and ultra-processed foods.

By leveraging AI to deliver personalized recommendations, MyFitnessPal **reflects the growing consumer demand** for more **holistic, data-driven approaches** to managing health and wellness.

Sustainable & Conscious Consumption

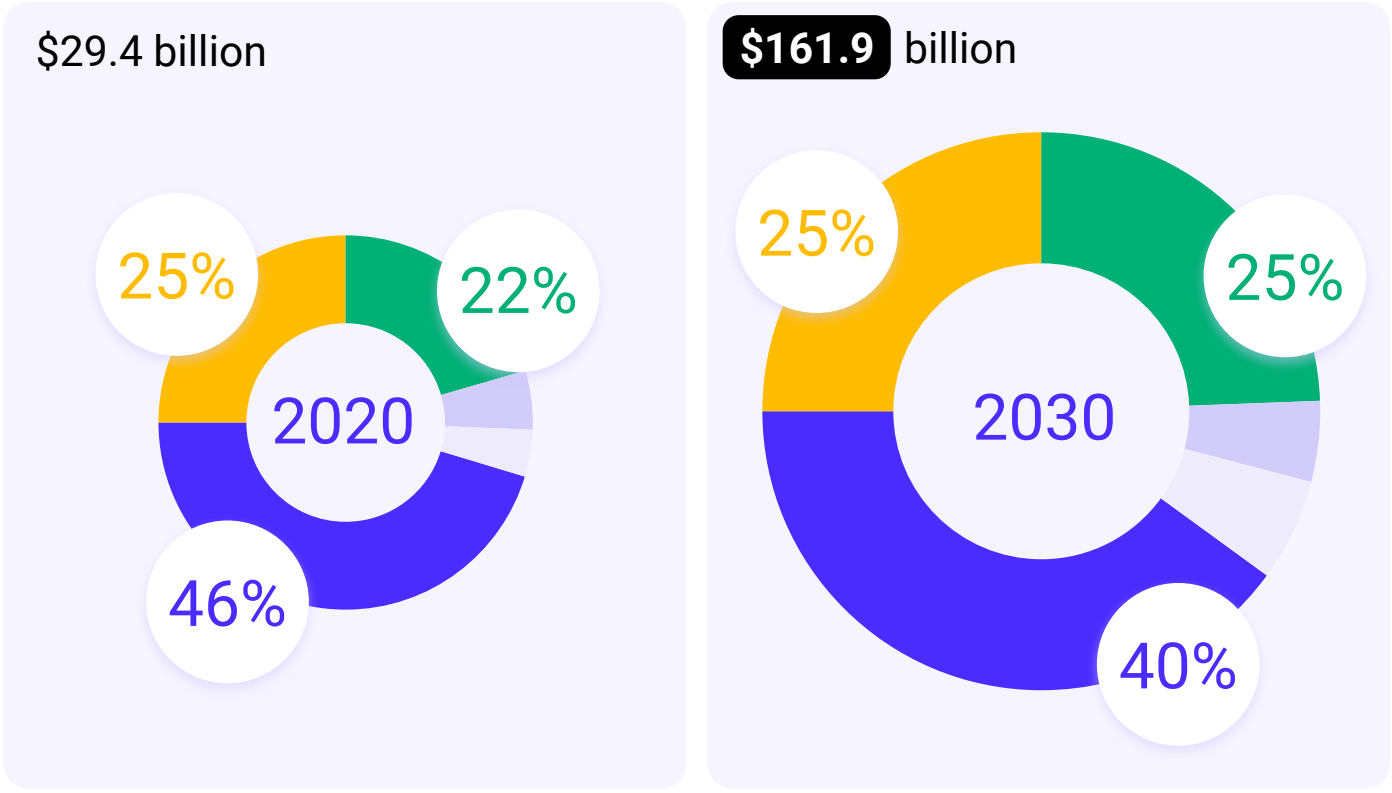
KEY DRIVER 2

Growing consumer awareness of environmental issues is reshaping food choices and positioning sustainability as a key driver in the food market. As concerns about climate change, resource depletion, and ethical considerations increase, individuals are seeking foods that support both their health and the environment. This shift reflects a broader approach to consumption, where the environmental impact of food production is as crucial as its taste and nutritional value.

Plant-Based Diets Reducing the Environmental Footprint

At the forefront of this movement is the growing preference for plant-based diets, driven by the understanding that plant-based foods generally require fewer resources and generate lower greenhouse gas emissions than animal-based products. According to the United Nations Food and Agriculture Organization, livestock farming contributes approximately 14.5% of global greenhouse gas emissions, a figure comparable to the entire transportation sector. Additionally, producing 1 kilogram of beef requires around 15,000 liters of water, while 1 kilogram of tofu needs just 2,000 liters. These stark differences underscore the role of plant-based alternatives in conserving resources, especially as water scarcity becomes an increasingly pressing issue in many regions.

Global Plant Based Food Market — Sales



(Bloomberg, 2021)

The global plant-based food market is projected to grow from $29.4 billion in 2020 to $161.9 billion by 2030, a fivefold increase, reflecting strong demand for sustainable food options. While North America currently leads in plant-based food sales, Asia Pacific is expected to witness significant growth, capturing a larger market share by 2030. (Bloomberg, 2021)

"We need to **embrace plant-based** & cultured innovations. By putting itself at the forefront of cultivated meat research and innovation, **the EU** could really **shape the direction of the sector** and maximize its public benefits."

Alex Holst, Senior Policy Manager, Good Food Institute Europe

Alternative Proteins

Reinventing Protein Production

Beyond plant-based diets, alternative proteins are transforming the future of sustainable food production. Lab-grown meat, insect protein, and algae-based foods offer high-quality protein with a much lower environmental impact compared to traditional livestock farming.

Innovafeed

Pioneering Insect Protein

Innovafeed is revolutionizing the insect-based protein industry, using black soldier fly larvae to produce sustainable protein for animal feed, aquaculture, and human consumption. The company's processes are highly resource-efficient, using minimal land and water while generating significantly fewer emissions compared to traditional livestock farming. With the expansion of its Insect Innovation Center in North America in 2024, Innovafeed is scaling its sustainable protein solutions to meet rising demand.

Global meat market sales forecast

(Bloomberg, 2021)

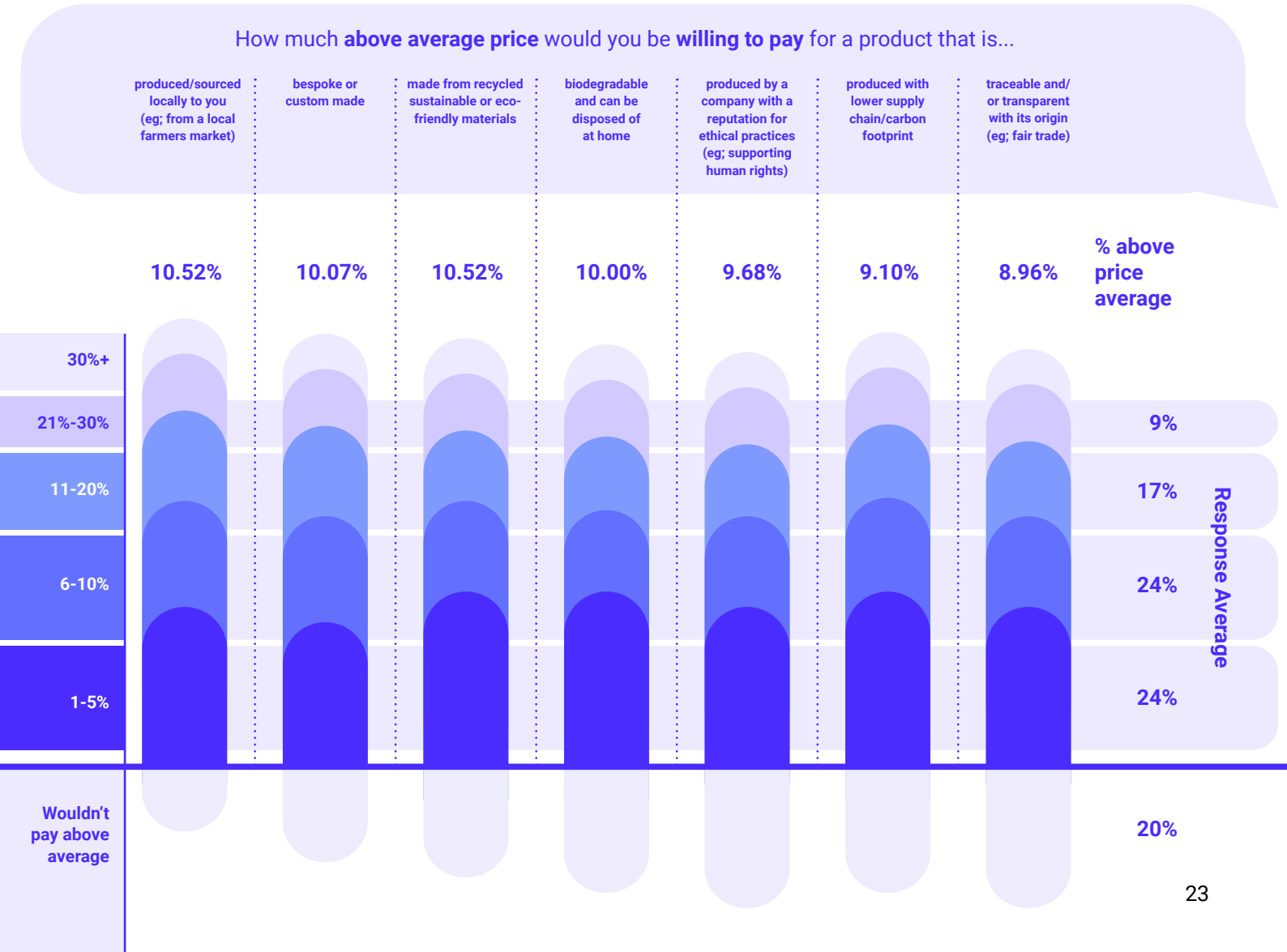
Projections for the global meat market suggest that by 2040, plant-based and cultured meats will constitute a significant portion of the market. While conventional meat will still hold the majority share, its dominance is expected to decline, with plant-based meat gaining traction by 2035 and cultured meat emerging as a key player by 2040.

Quest for Sustainable Practices: Aligning Values with Choices

Sustainable food choices also encompass ethical sourcing. Consumers increasingly favor products that are locally produced, organic, or certified by standards like Fair Trade or Rainforest Alliance. Recent surveys show that **40%** of consumers are willing to pay over 10% more for locally sourced products, while **25%** are willing to pay a premium for goods from companies with strong ethical practices (PwC, 2024). This growing demand for transparency highlights the importance of accountability in food sourcing.

Consumers care about sustainability — and **are willing to pay more** for it

(PWC,2024)



Minimizing food waste has become a critical component of sustainable consumption. Nearly one-third of all food produced globally is lost or wasted, a staggering figure that has spurred consumer demand for waste-reducing solutions (The United Nations Environment Programme 2024). Companies are responding by offering innovative solutions, such as repurposing imperfect fruits and vegetables into new products or packaging to prevent waste.

UNLIMEAT

Upcycling for Sustainability

UNLIMEAT demonstrates innovation in sustainability by upcycling discarded vegetables and grains into plant-based meat products. This process minimizes the environmental impact of traditional meat production and prevents edible food from contributing to landfill waste. UNLIMEAT's commitment to using whole ingredients and avoiding artificial additives resonates with consumer demand for transparency and environmental responsibility, driving commercial success in major U.S. retailers like GIANT and Sprouts.

Their expansion into major U.S. retailers like GIANT, MARTIN'S, and Sprouts **demonstrates that sustainable practices can coexist with commercial success,** setting a positive precedent for the industry.

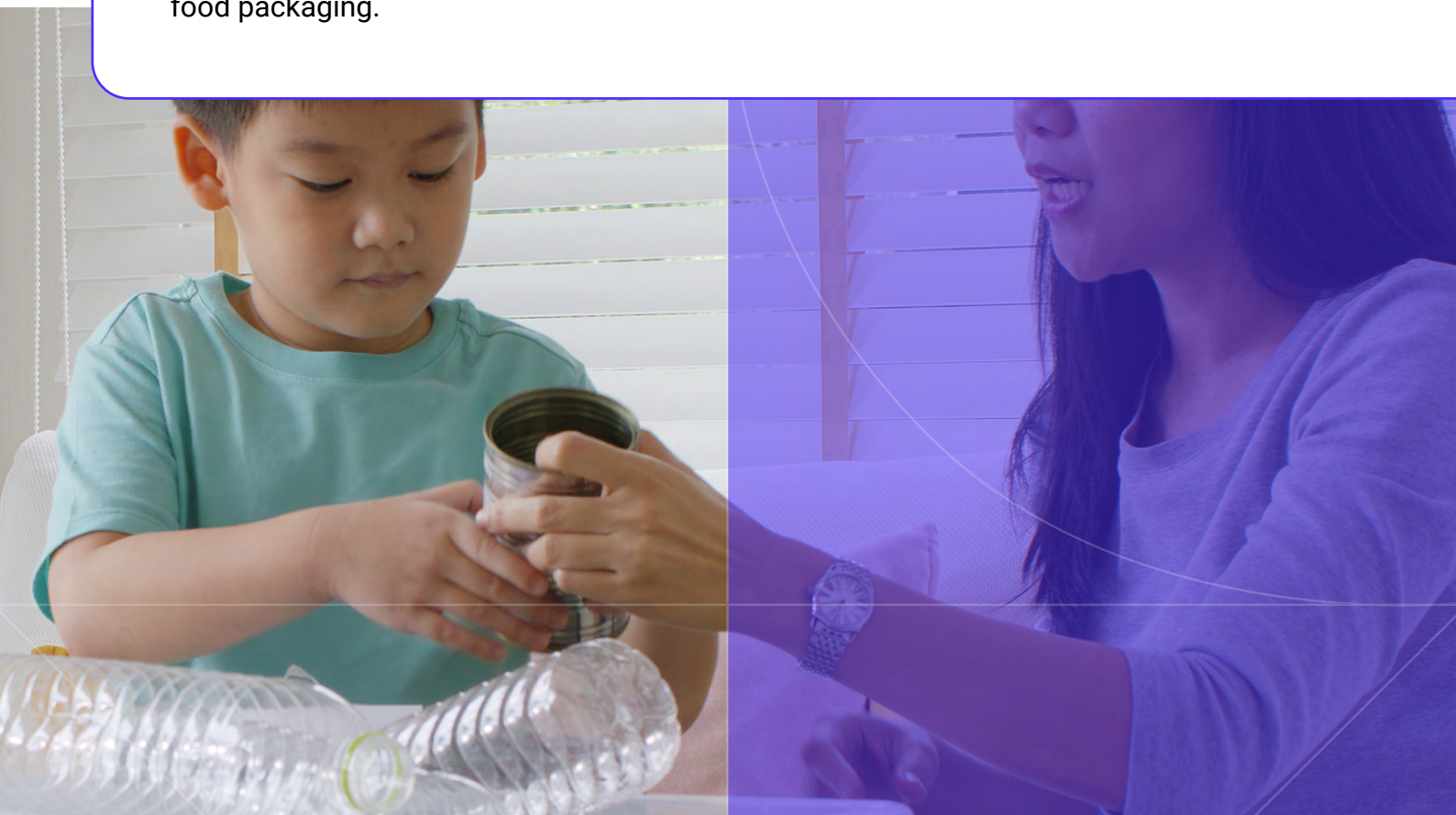
As the demand for sustainable packaging intensifies, companies are developing innovative, eco-friendly options. Yet, the cost remains a significant challenge, with biodegradable plastics currently costing 20-30% more than traditional materials. Encouragingly, advancements in technology are expected to narrow this cost gap by 2030, making these options increasingly viable. This shift is bolstered by research indicating that 74% of consumers across the U.S., Europe, and South America are willing to pay more for sustainable packaging, a trend that could help drive economies of scale and lower prices in the long term. (Trivium Packaging)

Companies are actively exploring sustainable alternatives that cater to this growing demand. Notpla, for example, has developed seaweed-based packaging, a fully biodegradable solution trialed at major events like the London Marathon, where seaweed water sachets replaced single-use plastics. This approach reflects a broader industry shift toward scalable eco-friendly solutions that reduce plastic waste without compromising usability.

Driscoll's

Transitioning to Sustainable Packaging

Driscoll's, a global leader in berry production, is transitioning from plastic clamshells to paper-plastic hybrid packaging in Germany, aligning with growing consumer demand for eco-friendly alternatives. This strategic shift reflects the broader industry trend toward sustainable packaging and positions Driscoll's as a leader in reducing plastic waste in food packaging.



Digital Innovation Reshaping Consumer Behavior

KEY DRIVER 3

Technology is redefining how consumers interact with food, offering a more personalized, convenient, and seamless experience. Digital solutions, particularly AI and online platforms, are transforming food shopping from a simple transaction into a tailored experience. As consumer expectations rise, brands are responding with tech-driven access to products and services that anticipate individual needs.

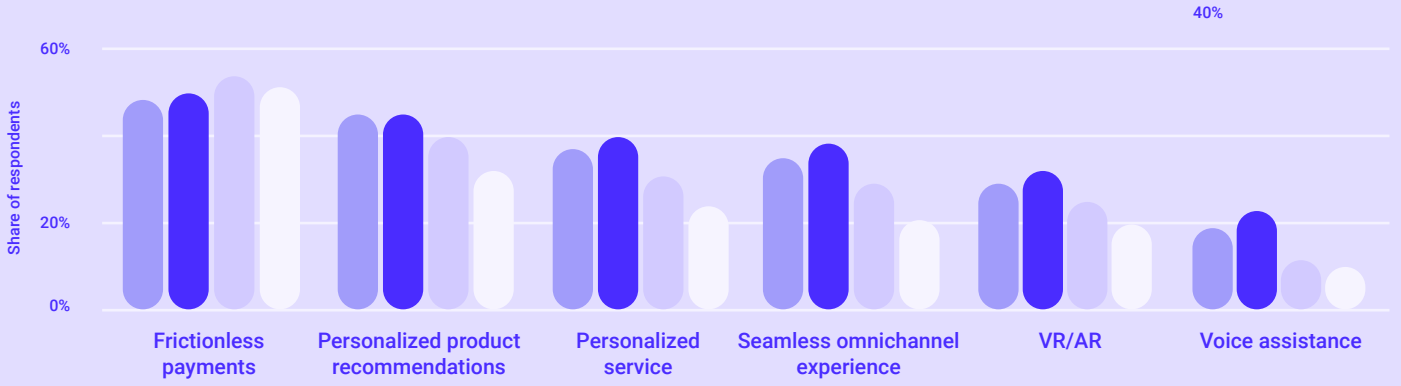
E-commerce and Personalization: Shaping the Modern Consumer Experience

One of the most notable shifts in the food industry is the growth of e-commerce and online grocery shopping. In 2023, U.S. eGrocery sales reached $95.8 billion, reflecting sustained growth even after the pandemic. (Mercatus, 2024) Platforms like Instacart, Amazon Fresh, and Uber Eats have revolutionized grocery shopping by offering a few-click solution with rapid delivery. This evolution reflects the growing consumer demand for digital convenience, with instant access to groceries becoming a baseline expectation.

Artificial intelligence (AI) is a key driver of this transformation. Retailers are increasingly leveraging AI to analyze consumer data, such as purchase history and dietary preferences, to offer personalized experiences. Personalization is in high demand, particularly among younger generations. A 2023 survey shows that over 40% of Gen Z and Millennials want personalized product recommendations as part of their e-commerce experiences. (Statista, 2024) Platforms like Kroger's 84.51° use AI to generate over 500 billion personalized product recommendations annually, offering tools like the "Start My Cart" feature to streamline shopping by pre-filling carts with frequently purchased items, reducing time spent on orders. (Forbes, 2024)

Share of shoppers wishing for selected e-commerce innovations worldwide in 2nd quarter 2023, by generational cohorts

Sources; Klarna; Nepa @ Statista 2024




Gen Z (18-26)


Millenials (27-42)


Gen X (43-58)


Baby boomers (59-77)

AI-powered solutions are also automating reordering processes through subscription services. Platforms like Amazon's "Subscribe & Save" use predictive algorithms to determine when consumers are likely to run low on essentials and automate the process, ensuring a hands-free shopping experience. This trend reflects the rising importance of personalized convenience, where consumers benefit from timely recommendations and automated restocking.

> "AI is transforming retail by allowing us to **gather precise data** on **consumer behavior**, enabling faster adaptation of products and services to **meet evolving demands** — this is a game-changer for the food industry."
>
> Alain Locqueneux, Senior Advisor, AgreeFood and Carbon Maps

The impact of technology isn't limited to online spaces. Physical stores are adopting digital tools like mobile apps, smart shopping carts, and self-checkout systems, creating an omnichannel experience where consumers can move effortlessly between online and offline environments. Many retailers are also using AI-powered features in-store, providing product suggestions and real-time deals based on consumers' shopping behaviors. These innovations blur the lines between digital and in-store experiences, fostering an environment where personalization is an expectation in every shopping context.

Starbucks has set a benchmark in **leveraging technology** to **enhance** consumer **experience** through its mobile app.

Starbucks Mobile App: Redefining Convenience and Personalization

Customers can order ahead, pay, and skip lines, receiving their customized beverages on their own schedule. Personalized promotions, rewards, and recommendations based on individual preferences have elevated customer engagement.

By the end of 2023, mobile app transactions accounted for 31% of total transactions at U.S. Starbucks stores, with nearly 60% of sales driven by the Starbucks Rewards program's 34.3 million active members. This rise in digital engagement illustrates how technology is reshaping not only convenience but also consumer loyalty and business growth. (Geekwire, 2024)

Social Media

Fueling Food Trends and Driving Consumer Choices

Social media is a powerful driver of consumer behavior, especially among younger generations. Platforms like Instagram, TikTok, and YouTube have become key avenues for discovering new products, recipes, and food trends, with influencers and user-generated content playing a pivotal role in shaping consumer choices. According to recent studies, 45% of Gen Z respondents identified TikTok and Instagram as their top platforms for influencing purchasing decisions, with YouTube (38%) and Facebook (24%) also contributing. (ICSC's, 2023). These platforms have not only transformed how brands engage with consumers but have also accelerated the spread of food trends, as viral content can reach global audiences almost instantly. Brands that stay agile and responsive to these trends can leverage social media as a crucial tool for staying competitive in today's fast-evolving food culture.

AR and VR in Retail

Bridging Physical and Digital Food Experiences

Emerging technologies like augmented reality (AR) and virtual reality (VR) are starting to reshape how consumers engage with products. Many food retailers and brands are experimenting with AR to offer interactive product experiences—such as scanning packaging to view product origins, ingredients, and sustainability credentials. Nestlé has explored AR packaging that brings a product's story to life, enhancing transparency and connection with eco-conscious consumers. These technologies are still evolving, but they hold immense potential to enrich the shopping experience by bridging the gap between physical and digital spaces, allowing for more informed and engaging consumer interactions.

Many food retailers and brands are experimenting with AR to **offer interactive product experiences**—such as scanning packaging to **view product origins, ingredients,** and **sustainability** credentials

Looking Ahead: The Consumer Shift by 2035

This section explores the evolution of key consumer trends in the most developed food and nutrition markets, projecting forward to 2035. Other markets are expected to follow but with a time delay. Using the S-curve model to illustrate four stages—Emerging, Growing, Maturing, and Saturating—we map how trends are anticipated to develop, guided by emerging signals in the industry. Each stage represents a unique focus area for companies, with tailored recommendations for strategic investment to support sustainable growth and competitiveness.

S-Curve Stages of Trend Development

Emerging: Trends at this stage are in their infancy, driven by innovators and early adopters. While consumer awareness is growing, the market remains niche, and widespread adoption is limited.

Growing: Awareness and adoption expand as these trends gain momentum with a broader consumer base. The market sees rapid growth, and industry practices begin to adapt accordingly.

Maturing: The trend reaches mainstream status, with widespread integration into daily life and broad consumer acceptance. Industry standards begin to form around the trend as it shapes consumer behavior.

Saturating: At this stage, growth slows as the trend reaches market saturation. Differentiation and innovation are essential to maintain interest and retain market position.

Recommended Actions:

Watch & Experiment

For emerging trends, monitor developments closely and consider small-scale pilot programs. Use this phase to test innovative concepts, understand demand, and fine-tune strategies for broader adoption.

Invest in & Differentiation

As trends grow, focus on building credibility and distinctiveness. Establish a trusted brand position by investing in compliance, quality, and recognition. This is essential to stand out as the market becomes more crowded.

Cultivate Loyalty & Niche Positioning

In maturing and saturated trends, deepen relationships with stakeholders and strengthen customer loyalty. For new entrants, consider unique, highly differentiated offerings to carve out a position in a competitive landscape.

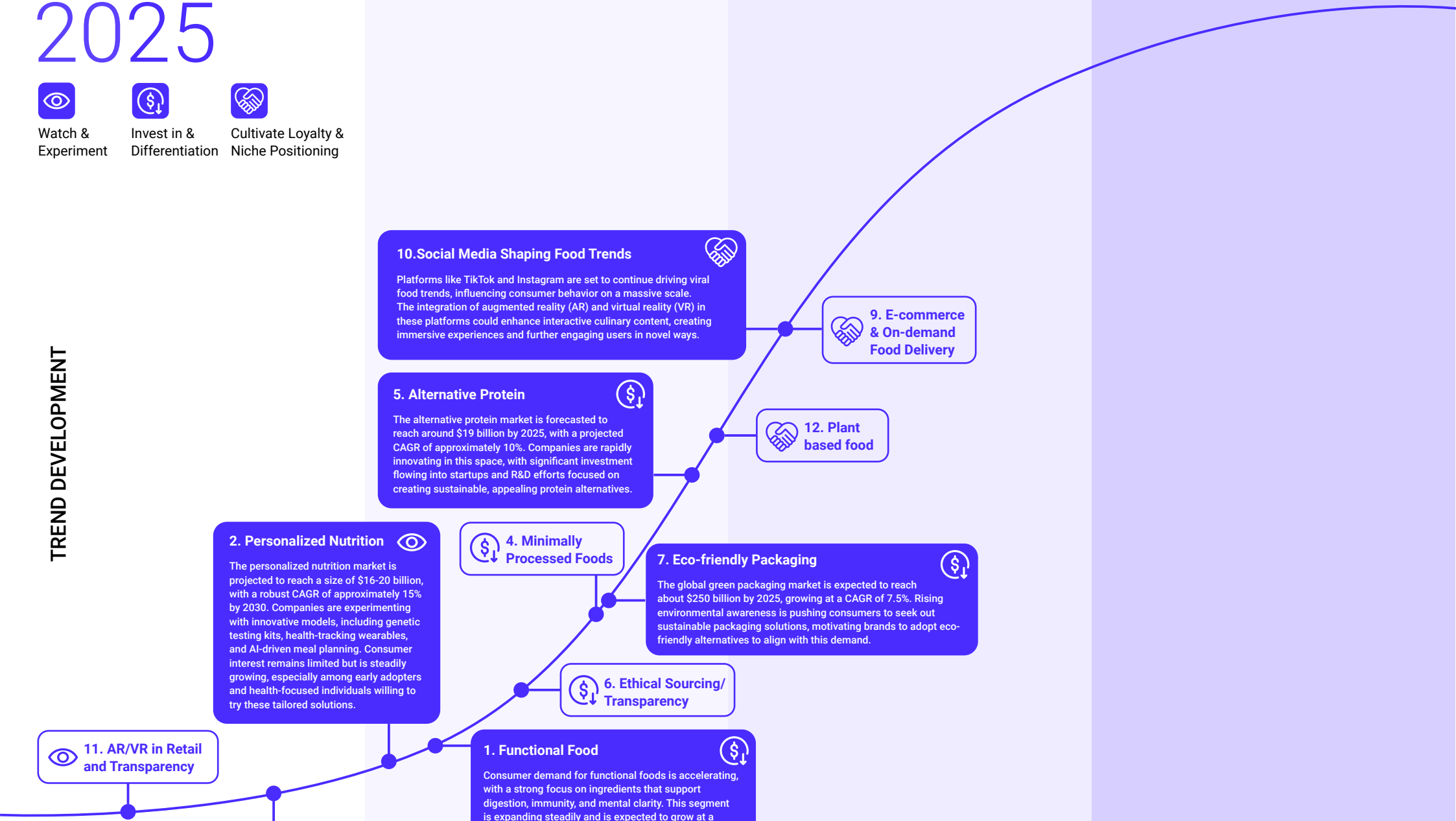
2025

Watch & Experiment

Invest in & Differentiation

Cultivate Loyalty & Niche Positioning

TREND DEVELOPMENT



10.Social Media Shaping Food Trends

Platforms like TikTok and Instagram are set to continue driving viral food trends, influencing consumer behavior on a massive scale. The integration of augmented reality (AR) and virtual reality (VR) in these platforms could enhance interactive culinary content, creating immersive experiences and further engaging users in novel ways.

9. E-commerce & On-demand Food Delivery

5. Alternative Protein

The alternative protein market is forecasted to reach around $19 billion by 2025, with a projected CAGR of approximately 10%. Companies are rapidly innovating in this space, with significant investment flowing into startups and R&D efforts focused on creating sustainable, appealing protein alternatives.

12. Plant based food

2. Personalized Nutrition

The personalized nutrition market is projected to reach a size of $16-20 billion, with a robust CAGR of approximately 15% by 2030. Companies are experimenting with innovative models, including genetic testing kits, health-tracking wearables, and AI-driven meal planning. Consumer interest remains limited but is steadily growing, especially among early adopters and health-focused individuals willing to try these tailored solutions.

4. Minimally Processed Foods

7. Eco-friendly Packaging

The global green packaging market is expected to reach about $250 billion by 2025, growing at a CAGR of 7.5%. Rising environmental awareness is pushing consumers to seek out sustainable packaging solutions, motivating brands to adopt eco-friendly alternatives to align with this demand.

6. Ethical Sourcing/ Transparency

11. AR/VR in Retail and Transparency

1. Functional Food

Consumer demand for functional foods is accelerating, with a strong focus on ingredients that support digestion, immunity, and mental clarity. This segment is expanding steadily and is expected to grow at a CAGR of 6.2% through 2030, driven by health-conscious consumers seeking proactive wellness solutions.

3. Nutritional Psychiatry

EMERGING

GROWING

MATURING

SATURATING

2030

Watch & Experiment

Invest in & Differentiation

Cultivate Loyalty & Niche Positioning

TREND DEVELOPMENT

12. Plant-Based Food

By 2030, plant-based options will be a regular part of consumers' diets, driven by health and ethical considerations as well as improved affordability, convenience, and taste parity with animal-based products. The plant-based market is expected to have doubled to around $100 billion since 2024, marking a significant shift toward sustainable and accessible alternatives.

9. E-commerce & On-demand Food Delivery

10. Social Media Shaping Food Trends

1. Functional Food

Functional foods are expected to be fully mainstream by 2030, with a projected market size of $316.1 billion. Enhanced regulatory standards will require scientifically validated health benefits, solidifying consumer trust and ensuring consistent product quality across the market.

4. Minimally Processed Foods

7. Eco-friendly Packaging

6. Ethical Sourcing/Transparency

By 2030, ethical sourcing practices will be a standard part of operations for most leading companies in the food and nutrition sector. A well-developed regulatory framework, with stricter global and local requirements, supports this shift, making transparency and ethical sourcing essential components of consumer trust.

5. Alternative protein

2. Personalized Nutrition

AI-driven personalized diets take off, with the market doubled to $23.3 billion since 2024 continues to grow. Consumers eagerly adopt wearable tech and health apps, while major players like Amway launch gene-based nutrition, making personalized diets mainstream.

11. AR/VR in Retail and Transparency

As technology costs decrease and accessibility improves, AR/VR adoption in retail is expected to be more widespread. Retailers will increasingly use these technologies to enhance customer experiences, creating virtual shopping environments and offering interactive product displays that provide deeper transparency into product origins and features.

3. Nutritional Psychiatry

Interest in mental wellness through nutrition continues to grow, supported by advancing scientific research and integration into healthcare. The market for nutrition focused on mental health is expanding, though challenges in regulation and credibility remain as the field seeks to establish solid standards and gain consumer trust.

EMERGING

GROWING

MATURING

SATURATING

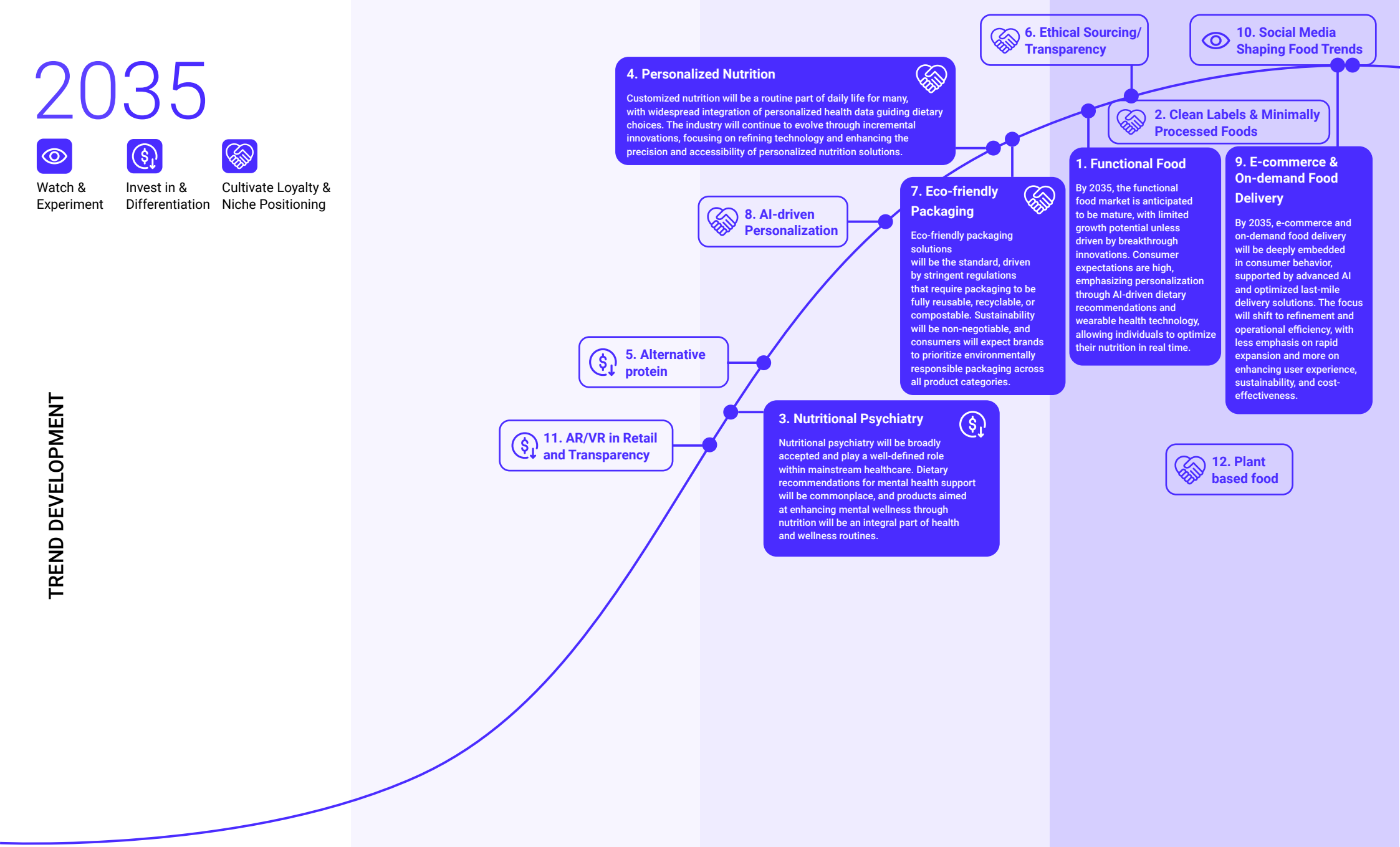
2035

Watch & Experiment

Invest in & Differentiation

Cultivate Loyalty & Niche Positioning

TREND DEVELOPMENT



4. Personalized Nutrition

Customized nutrition will be a routine part of daily life for many, with widespread integration of personalized health data guiding dietary choices. The industry will continue to evolve through incremental innovations, focusing on refining technology and enhancing the precision and accessibility of personalized nutrition solutions.

6. Ethical Sourcing/ Transparency

10. Social Media Shaping Food Trends

2. Clean Labels & Minimally Processed Foods

1. Functional Food

By 2035, the functional food market is anticipated to be mature, with limited growth potential unless driven by breakthrough innovations. Consumer expectations are high, emphasizing personalization through AI-driven dietary recommendations and wearable health technology, allowing individuals to optimize their nutrition in real time.

9. E-commerce & On-demand Food Delivery

By 2035, e-commerce and on-demand food delivery will be deeply embedded in consumer behavior, supported by advanced AI and optimized last-mile delivery solutions. The focus will shift to refinement and operational efficiency, with less emphasis on rapid expansion and more on enhancing user experience, sustainability, and cost-effectiveness.

8. AI-driven Personalization

7. Eco-friendly Packaging

Eco-friendly packaging solutions will be the standard, driven by stringent regulations that require packaging to be fully reusable, recyclable, or compostable. Sustainability will be non-negotiable, and consumers will expect brands to prioritize environmentally responsible packaging across all product categories.

5. Alternative protein

11. AR/VR in Retail and Transparency

3. Nutritional Psychiatry

Nutritional psychiatry will be broadly accepted and play a well-defined role within mainstream healthcare. Dietary recommendations for mental health support will be commonplace, and products aimed at enhancing mental wellness through nutrition will be an integral part of health and wellness routines.

12. Plant based food

EMERGING

GROWING

MATURING

SATURATING

Projected Consumer Landscape by 2035

The consumer food landscape will be defined by demands for health, sustainability, and transparency. Consumers will increasingly value food that promotes holistic wellness, blending physical, mental, and emotional health. AI-driven personalization will make customized nutrition accessible, allowing consumers to align their diets with real-time health insights and personal wellness goals.

Sustainability will be non-negotiable. Plant-based, zero-waste, and ethically sourced options will be standard, making eco-friendly choices seamless. Advanced labeling and AR/VR technologies will provide supply chain transparency, empowering consumers to make informed, responsible choices. As social platforms amplify mindful eating and sustainability trends, consumers will play a direct role in shaping the market, driving demand for values-aligned products.

The challenges of affordability and equitable access will persist, but the food industry will see significant strides in accessibility and affordability of health-supportive options. By 2035, the consumer landscape will reflect a blend of wellness, sustainability, and personalization, marking a transformative shift in how food contributes to individual and collective well-being. being and environmental stewardship.

Technological Shift

Innovation in Food Technologies & Supply Chain

Innovation in Food Technologies and Supply Chain

The food and nutrition industry is entering a new era, driven by rapid advancements in technology that are reshaping how food is produced, sourced, and delivered. These innovations—from cutting-edge life sciences to intelligent supply chain systems—are pushing the sector toward sustainability, efficiency, and resilience, meeting modern consumer demands and global challenges. Two primary drivers are leading this shift:

1

Food and Life Sciences Revolutionizing Nutrition and Sustainability

Breakthroughs in biotechnology, synthetic biology, and precision fermentation are enabling the development of highly nutritious, sustainable food products. Lab-grown meats, advanced plant-based proteins, and novel ingredients address global nutritional needs while reducing environmental impact. These advancements position food science at the forefront of creating sustainable diets that align with consumer and regulatory expectations.

2

Reinventing Food Supply Chains Through Innovation

Smart technologies like AI, blockchain, IoT, and robotics are transforming food production and distribution. Precision agriculture—powered by drones, satellite data, and machine learning—optimizes planting, irrigation, and harvesting for high yields with minimal environmental strain. AI-driven safety systems, along with smart packaging, ensure traceability and transparency, while autonomous electric transport enhances logistics' efficiency and sustainability.

Together, these technologies are driving a systemic shift, pushing the food and nutrition industry to embrace smarter, more sustainable solutions. In the following sections, we will explore how these innovations are transforming both food production and supply chains, shaping the future of the global food system.

80%

of food companies plan to invest in AI and machine learning technologies by **2025** to enhance supply chain efficiency and resilience.

(Food Engineering, 2022)

$31 bil

Blockchain technology is projected to save the global food industry up to **$31 billion by 2024** through improved transparency and reduced fraud.

(Juniper Research, 2023)

"Technology is reshaping our **natural resources into new textures** and forms, allowing us to create a vast variety of foods from a limited set of ingredients. This is **where innovation meets sustainability** in food production."

Prof. Dr. Kutter, VRInsight

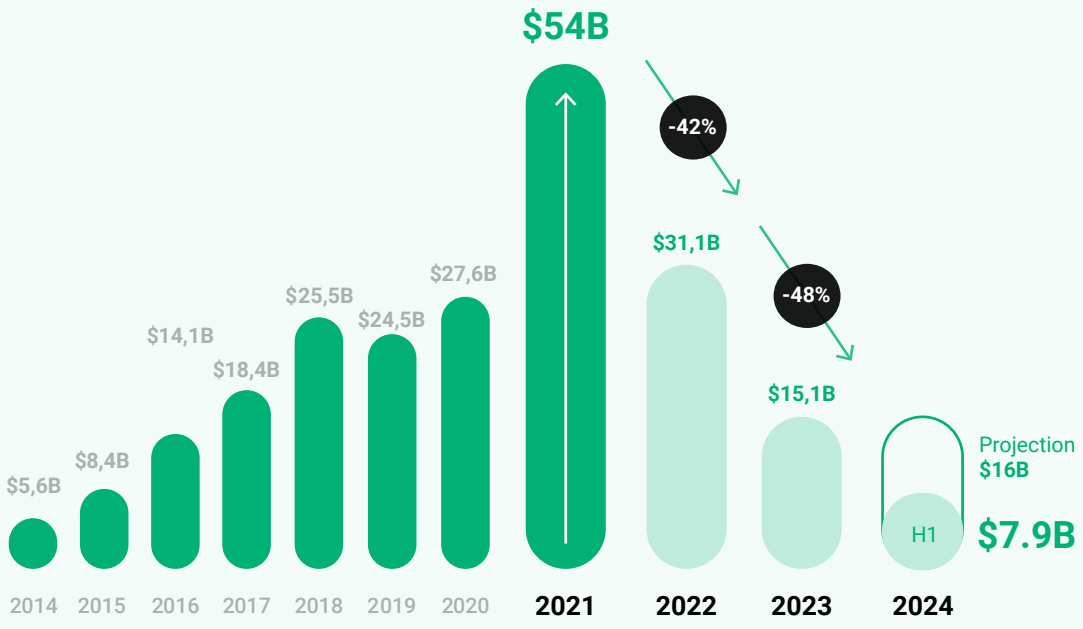
Food and Life Sciences Revolutionizing Nutrition and Sustainability

KEY DRIVER 1

The food manufacturing landscape is undergoing a transformative shift as advancements in life sciences redefine how food is developed, processed, and produced. From gene editing and synthetic biology to regenerative medicine and precision fermentation, these innovations enable new ways to enhance nutrition, address global health challenges, and improve sustainability. The global food technology market, valued at $181.3 billion in 2022, is projected to reach $405 billion by 2032, growing at a CAGR of 8%, underscoring the rapid pace of innovation (Global Market Insights, 2023).

However, despite the accelerating advancements, recent investment trends highlight a cautious approach. FoodTech investments saw a notable decline, dropping by 48% in 2023 to $15.1 billion from the 2021 peak of $54 billion. This trend reflects the need for resilient, long-term investments, though early data from 2024 suggests a rebound, with renewed interest in upstream AgTech and food science startups focused on sustainability and resilience (DigitalFoodLab, 2024).

Global investments in FoodTech Startups



(DigitalFoodLab, 2024)

Gene Editing and Climate-Resilient Crops

At the core of this transformation is gene editing technology, notably CRISPR-Cas9, which allows for precise modifications to crop genetics. Unlike traditional breeding, which can take years to yield desired traits, CRISPR enables targeted improvements in crops, such as enhancing nutrient content, increasing yield, and improving resistance to pests and diseases. For example, researchers are developing gene-edited tomatoes with higher levels of vitamin D to address deficiencies in populations with limited access to sunlight. Similarly, crops like wheat are being modified to better withstand climate stressors, boosting resilience and reducing reliance on pesticides. These advancements not only enhance the nutritional profile of crops but also promote climate-resilient agriculture with a lower environmental impact.

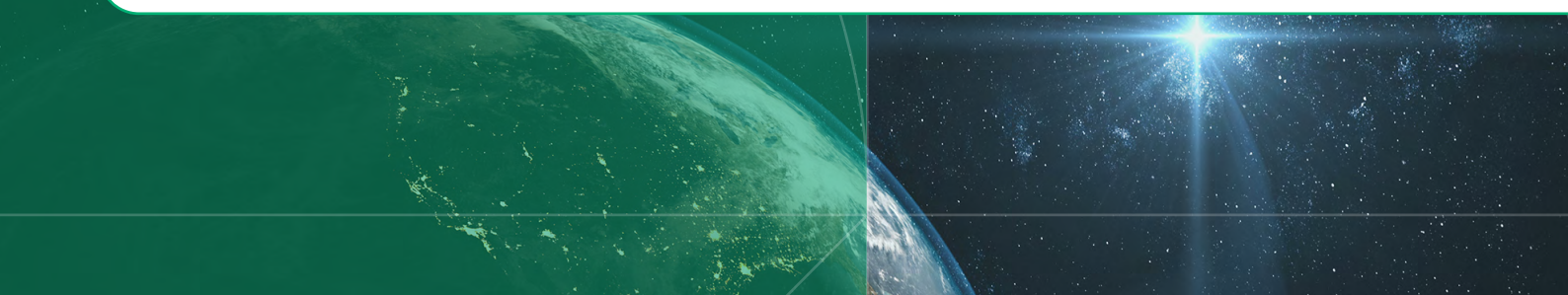
Synthetic Biology and Precision Fermentation for Sustainable Proteins

Similarly, synthetic biology is unlocking new ways to create bioengineered proteins and nutrients. Companies like Perfect Day use precision fermentation to produce animal-free dairy proteins, which taste and function like traditional dairy but with up to 99% less water usage and 97% fewer greenhouse gas emissions.

Similarly, precision fermentation enables the production of functional foods tailored to specific health needs. Clara Foods, for instance, is creating animal-free egg whites that maintain the same properties as traditional egg whites without the environmental impact. This technology opens doors to nutrient-enriched, sustainable alternatives, making food production more adaptable and efficient.

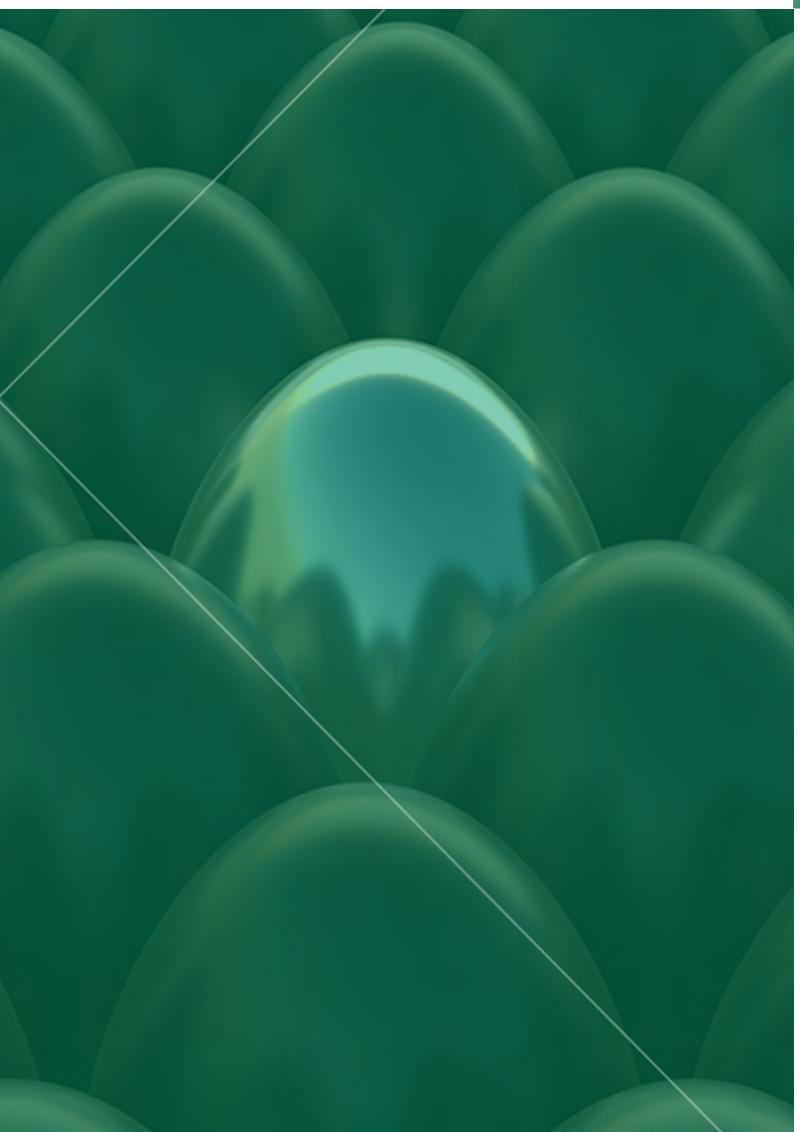
Air Protein: Creating Meat from Thin Air

Air Protein is at the forefront of sustainable food innovation, using cutting-edge fermentation technology to create protein directly from elements found in the air. Inspired by NASA's research on converting CO2 into food for astronauts, Air Protein combines carbon dioxide, oxygen, nitrogen, water, and minerals to produce a complete protein—no agricultural land or livestock required. This revolutionary approach offers a sustainable and scalable solution to meet global protein demand without the environmental drawbacks of traditional meat production.



Regenerative Medicine and Lab-Grown Meat

Regenerative medicine is beginning to intersect with the food sector. Tissue engineering technologies, originally developed for lab-grown organs, are being adapted to create lab-grown meat. While still in its early stages, the development of lab-grown organs and cultured tissue holds promise for future advancements in the food industry, with the potential to create sustainable meat alternatives that mimic the texture and nutritional profile of animal-based products.



Synergy of Synthetic Meat & Regenerative Medicine

The FAB4FUTURE project, led by the MERLN Institute for Technology-Inspired Regenerative Medicine, is breaking new ground by combining synthetic meat production with advancements in regenerative medicine. Supported by a €3 million Perspectief grant, the project aims to revolutionize two major societal challenges: cardiovascular disease and animal agriculture's environmental impact.

Novel Ingredients

Insects and Algae as Protein Sources

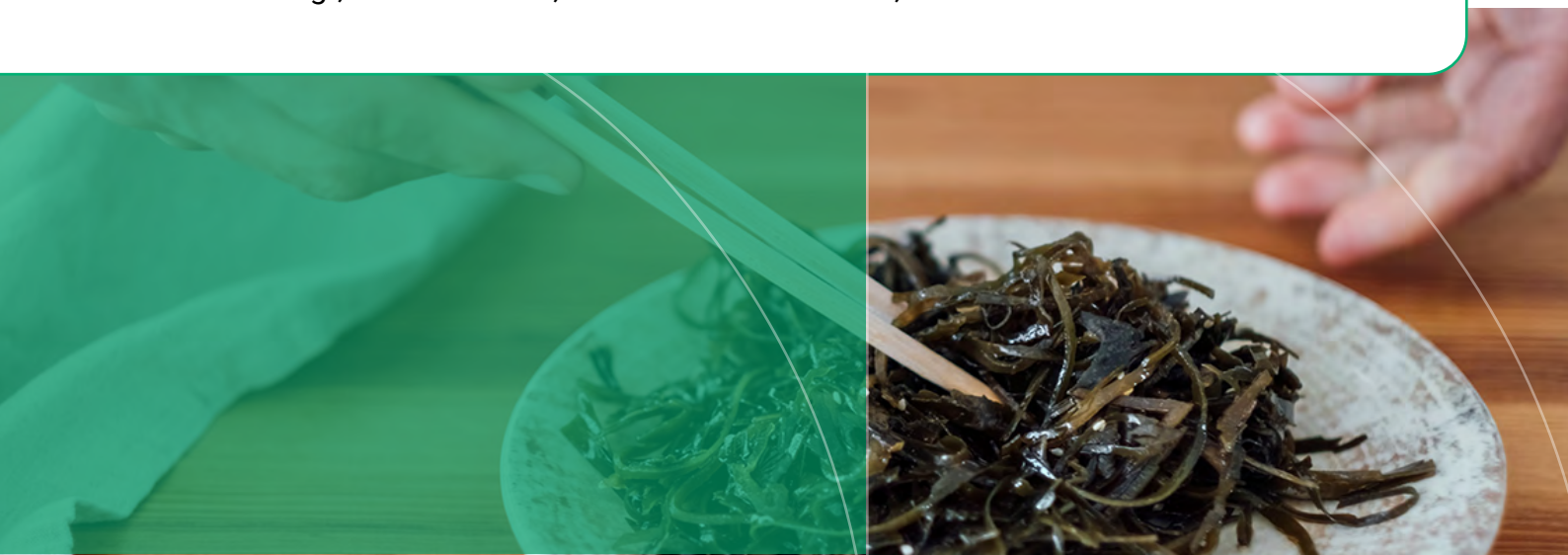
The exploration of novel ingredients is also gaining momentum. Edible insects and algae are emerging as nutrient-dense, sustainable protein sources. Black soldier fly larvae and crickets, for instance, offer protein levels comparable to beef but require far fewer resources to produce. Insect farming, for example, needs only a fraction of the water, land, and feed compared to conventional livestock. Companies like Entomo Farms are incorporating insect-based proteins into protein bars, snacks, and pasta, providing an eco-friendly source of nutrition. Algae-based ingredients, such as spirulina and chlorella, are also on the rise. Rich in omega-3 fatty acids, proteins, and antioxidants, algae can be cultivated in a variety of environments, using minimal water and land resources, making them a highly sustainable alternative to traditional crops.

3D Food Printing for Custom Nutrition

3D food printing is enabling personalized nutrition solutions by creating foods tailored to individual health needs. Companies like BeeHex use 3D printing technology to produce custom foods, such as nutrient-dense pizzas, potentially revolutionizing dietary options in settings like hospitals and care facilities, where nutrition can significantly impact recovery.

"**Seaweed** is super healthy: very rich in vitamin C, calcium, iodine, magnesium, phosphor, sodium, and potassium. It's also a great source of antioxidants. Aside from its **many health benefits**, its production **doesn't require agricultural farmland, fertilizers, or fresh water.**"

Donald Deschagt, Seaweed Chef, Le Homard et La Moule, Studio Zeewier

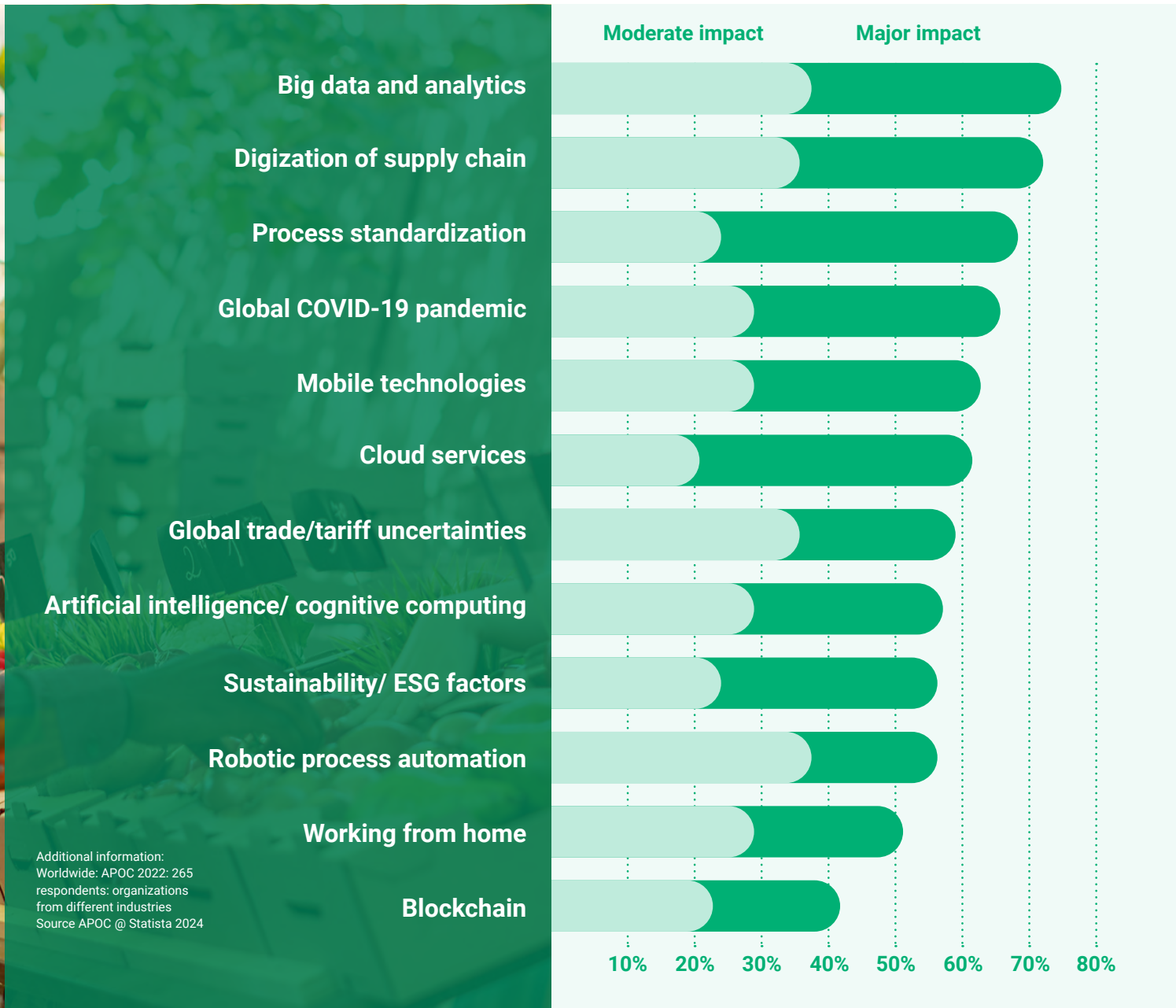


Reinventing Food Supply Chains Through Innovation

KEY DRIVER 2

The food supply chain and manufacturing processes are undergoing a profound transformation, driven by intelligent technologies that enhance efficiency, transparency, and resilience. According to a survey by APQC, big data and analytics, digitalization of the supply chain, and process standardization are anticipated to be the leading trends impacting supply chains by 2025. This shift toward more data-driven, automated, and agile supply chain management is crucial for addressing challenges posed by climate change, geopolitical tensions, and evolving consumer expectations.

Leading trends anticipated to impact supply chains by 2025



Additional information:
Worldwide: APOC 2022: 265 respondents: organizations from different industries
Source APOC @ Statista 2024

Technologies such as blockchain, the Internet of Things (IoT), artificial intelligence (AI), robotics, and energy-efficient practices are increasingly being adopted to build robust and adaptive supply chains capable of navigating disruptions. These innovations are redefining how food is tracked, managed, and produced, enabling the industry to adapt to challenges and meet the demands of a rapidly evolving market.

Blockchain for Transparency and Traceability

Blockchain technology is revolutionizing supply chain transparency by providing a decentralized and tamper-proof ledger that records every transaction and movement of food products. This level of traceability ensures that all stakeholders—from farmers to retailers—have access to reliable, real-time data. For instance, IBM Food Trust is collaborating with major retailers like Walmart to implement blockchain solutions that enable real-time tracking of food products from farm to fork. In a notable demonstration, Walmart traced the origin of sliced mangoes in just 2.2 seconds—a process that previously took nearly a week. Such transparency not only improves food safety by enabling swift responses to contamination but also builds consumer trust by providing detailed information about product origins and handling.

> "Siemens' Trusted Traceability is a **joint vision to achieve greater transparency** by digitally identifying and tracing the origin, history, production, distribution and application of a food product...**The more transparency** we can bring to the value chain, **the more possibilities** for **startups and SMEs** to create the right value propositions, not just for themselves, but for their communities."
>
> Henrik Stamm Kristensen, Blendhub

IoT for Real-Time Monitoring

Building upon blockchain's transparency, the integration of IoT devices into the supply chain offers unparalleled real-time monitoring capabilities. Sensors track critical parameters such as temperature, humidity, and location during transportation and storage, ensuring that perishable goods remain within optimal conditions, thus reducing spoilage and waste. IoT-enabled smart warehouses utilize automation to manage inventory with precision, improving order accuracy and reducing operational costs. For example, Maersk, a leading logistics company, uses IoT-enabled containers to monitor the temperature and humidity levels of shipped food products, ensuring quality is maintained throughout the journey. According to the Food and Agriculture Organization (FAO), these IoT systems contribute significantly to reducing food waste, which accounts for roughly one-third of global food production losses annually.

AI and Machine Learning for Demand Forecasting

The vast amount of data collected from IoT devices feeds into artificial intelligence (AI) and machine learning systems, which play pivotal roles in optimizing supply chain operations. The global AI in food and beverages market is expected to grow from USD 8 billion in 2023 to USD 214.62 billion by 2033, at a Compound Annual Growth Rate (CAGR) of 39%. This exponential growth underscores the significant role that AI is playing in revolutionizing the industry (Precedence Research, 2024). AI-driven analytics predict demand fluctuations, optimize routing, and manage inventory more effectively, leading to reduced waste and lower operational costs. For example, PepsiCo has been using AI-driven demand forecasting to optimize its inventory management, reducing waste and ensuring products remain available when needed, even during fluctuating demand. This approach has not only improved efficiency but also reduced costs associated with overproduction and storage.

Silal Fresh

Silal Fresh implemented a blockchain system that allows customers to scan QR codes on products to see the item's entire journey. By adopting blockchain technology, Silal Fresh integrated a comprehensive traceability system into their operations. This system, which includes consumer apps and a web-based dashboard, records every touchpoint of their products in a blockchain ledger.

Robotics and Automation in Manufacturing

Robotics and automation streamline food production, enhancing both speed and precision on the manufacturing line. Autonomous robots handle tasks such as sorting, packaging, and palletizing with exceptional accuracy, significantly reducing labor costs and increasing throughput. Ocado, an online supermarket, operates one of the world's most advanced robotic warehouses, where over 1,000 robots navigate a grid system to pick and pack groceries with unparalleled efficiency. This automation ensures consistent product quality, minimizes human error, and allows manufacturers to scale production rapidly to meet rising global demands. Robotics not only improve operational efficiency but also make the industry more adaptable to labor shortages and fluctuations in demand.

Energy-Efficient Manufacturing Practices

Amid these technological advancements, energy-efficient manufacturing processes are becoming increasingly important as the food industry seeks to minimize its environmental footprint. Innovations such as renewable energy integration—using solar panels, wind turbines, and waste-to-energy systems—are helping companies transition away from fossil fuels. For example, Danone has invested in renewable energy solutions across its production facilities, achieving 100% renewable electricity in several key markets. Additionally, waste heat recovery systems capture and reuse energy that would otherwise be lost, enhancing overall energy efficiency.

Nestlé

Leading the Charge with Industry 4.0

By integrating smart factories equipped with robotics, AI-driven analytics, and energy-efficient technologies, Nestlé optimizes manufacturing efficiency and product quality. The company's investment in intelligent technologies aligns with the broader industry trend, as evidenced by the forecasted growth in the global food supply chain market, which is expected to increase by USD 59.51 billion between 2023 and 2028, growing at a CAGR of 7.86%. This growth is driven by the integration of advanced technologies to enhance efficiency and transparency. (Technavio, 2024)

Nestlé, one of the world's largest food manufacturers, has **embraced Industry 4.0 applications** to **revolutionize** its **production** processes.

(Yahoo Finance, 2024)

Looking Ahead: The Technological Shifts by 2035

This section examines the evolution of transformative technologies in the food and nutrition industry, projecting forward to 2035. Using an S-curve model with four stages—Emerging, Growing, Maturing, and Saturating—we map how these technologies are expected to develop and reshape the industry. Each stage represents an opportunity for companies to strategically invest in innovation, scalability, and resilience.

S-Curve Stages of Technological Development

Emerging: Early-stage technologies are in development, primarily driven by innovators and early adopters. At this stage, the potential is high, but commercial applications remain limited, and widespread adoption is still a future goal.

Growing: As these technologies advance, adoption widens across the industry. The focus shifts to scalability, as companies build infrastructure and optimize operations to meet increasing demand and regulatory requirements.

Maturing: Technologies reach mainstream integration, becoming essential tools that transform industry practices and consumer interactions. Standardization and regulation become critical as these innovations establish themselves as industry norms.

Saturating: Technological advancements reach a peak, with broad adoption across the market. Innovation focuses on enhancing existing technologies and refining applications to maintain relevance in an increasingly tech-saturated landscape.

Recommended Actions:

Monitor and Experiement

In the emerging phase, monitor developments closely and consider pilot projects to validate the potential of new technologies. Use this phase to explore technical feasibility, identify initial use cases, and assess scalability.

Scale and Optimize

As technologies grow, invest in building scalable, resilient systems. Focus on operational efficiency, compliance, and establishing a trusted reputation in the market. Differentiation through tech-driven value will be essential as adoption spreads.

Enhance and Diversify

In maturing and saturated markets, deepen your technological capabilities, exploring specialized applications or complementary technologies. Unique, highly differentiated offerings and enhanced user experiences will be crucial for maintaining a competitive edge.

2025

Monitor and Experiment

Scale and Optimize

Enhance and Diversify

TREND DEVELOPMENT

3.Gene Editing (CRISPR)

The global CRISPR and Cas genes market, valued at $2.57 billion in 2022, is expected to grow at a CAGR of 17.15% through 2030, with agricultural applications seeing the fastest growth at 21.13%. In the EU, ongoing legislative debates may lead to a relaxation of regulations, potentially accelerating the adoption of gene-editing technologies in food production and agriculture.

1.Precision Fermentation & Synthetic Biology

By 2025, precision fermentation and synthetic biology are in a robust growth phase, with the market projected to expand significantly, reaching $36.3 billion by 2030 from $1.6 billion in 2022. This rapid growth highlights strong industry and investor interest in alternative proteins and bioengineered ingredients as sustainable food solutions gain traction.

5.AI-Driven Supply Chain Optimization

The global market for AI in supply chains is anticipated to reach $10.1 billion by 2025, growing at a CAGR of 45.3% since 2020. AI-driven predictive analytics is becoming widely accepted across the industry, indicating early but strong development as companies leverage AI to improve efficiency, forecast demand, and streamline logistics.

6. Precision Agriculture Technologies

4. Blockchain-Enabled Traceability

2. 3D Food Printing

EMERGING

GROWING

MATURING

SATURATING

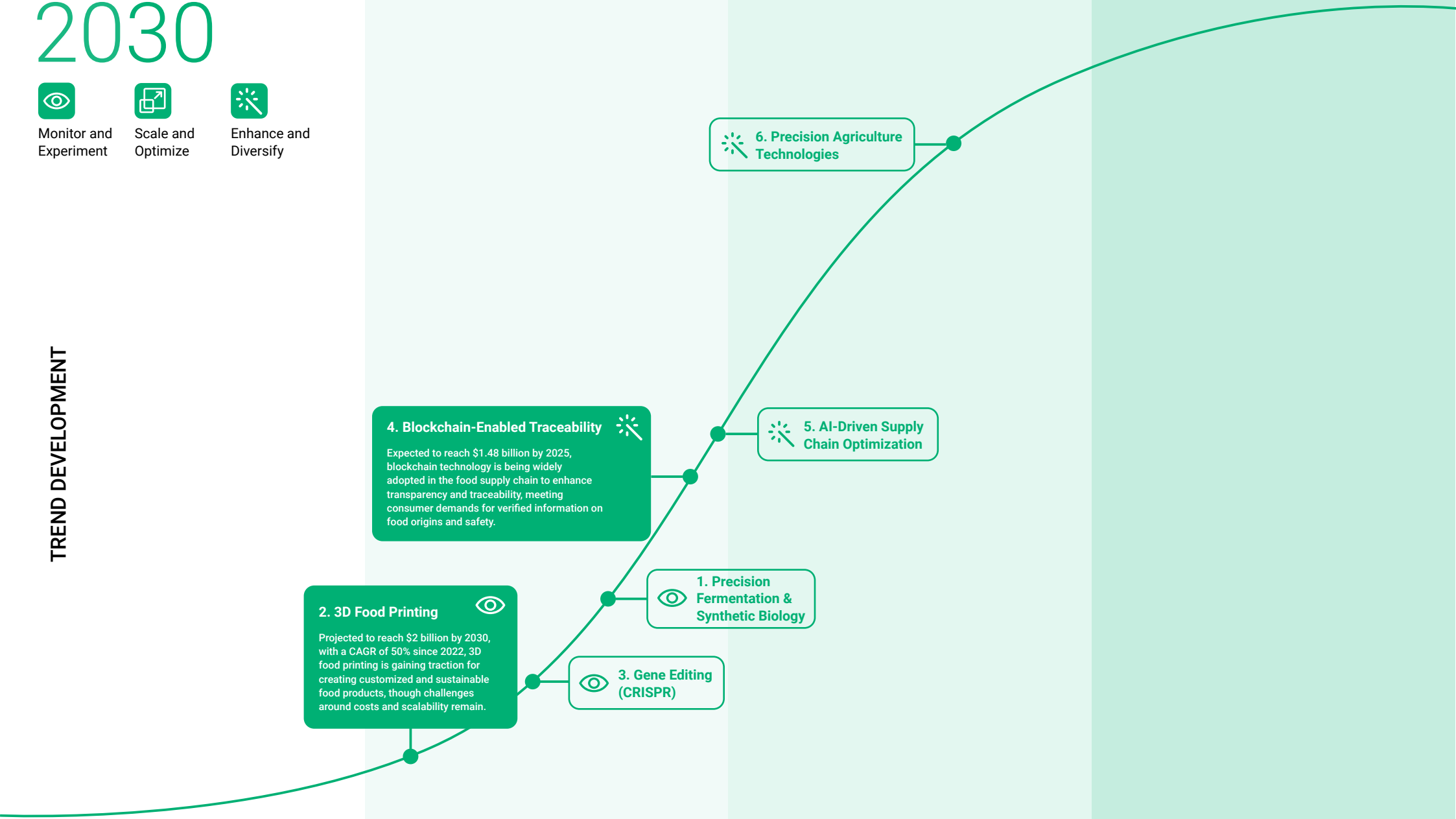
2030

Monitor and Experiment

Scale and Optimize

Enhance and Diversify

TREND DEVELOPMENT



EMERGING

GROWING

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SATURATING

2035

Monitor and Experiment

Scale and Optimize

Enhance and Diversify

TREND DEVELOPMENT

1. Precision Fermentation & Synthetic Biology: Growing to Maturing

By 2035, precision fermentation is expected to move from growth to early maturity, with the market potentially reaching $100 billion globally. Projections indicate that protein production could become ten times cheaper than traditional animal sources, nearing cost parity with sugar. This affordability shift could drive widespread industry adoption, though challenges around regulation, public acceptance, and scaling capacity remain.

2. 3D Food Printing

3. Gene Editing (CRISPR)

4. Blockchain-Enabled Traceability: Maturing Phase

The technology becomes a standard practice across supply chains, with most high-value foods traceable end-to-end, allowing consumers access to product origins and certifications.

5. AI-Driven Supply Chain Optimization: Maturing to Saturating Phase

AI optimizes real-time logistics and predictive demand analytics, valued at $48.99 billion, enabling food suppliers to adapt dynamically to disruptions and environmental challenges.

6. Precision Agriculture Technologies: Saturating Phase

Integrated with AI, precision farming reaches a $24 billion valuation, driving sustainable crop management and reducing environmental impacts, especially in water-scarce regions.

EMERGING

GROWING

MATURING

SATURATING

Projected Consumer Landscape by 2035

The food industry will be transformed by innovations that drive sustainability, precision, and transparency. Technologies such as synthetic biology and precision fermentation will make lab-grown proteins and bioengineered nutrients common, reducing reliance on traditional agriculture and supporting a more sustainable food system. 3D food printing will enable highly personalized nutrition, serving diverse needs from home kitchens to healthcare facilities.

Supply chains will be fully digitized and transparent. Blockchain and IoT will provide end-to-end traceability, while AI-driven analytics will optimize supply flows, anticipate disruptions, and minimize waste. Precision agriculture will allow farmers to optimize yields while conserving resources, establishing a resilient and efficient system that meets global demand with reduced environmental impact.

Consumers will benefit from personalized, data-driven food choices with detailed information on product origins, sustainability, and nutritional content. In this tech-enabled ecosystem, sustainable production, ethical practices, and customized nutrition converge, aligning the food system with health, environmental stewardship, and transparency.

Market Shifts

Embracing Sustainable and Resilient Practices in Food and Nutrition

Embracing Sustainable and Resilient Practices in Food and Nutrition

The global food industry faces an urgent imperative to adopt sustainable and resilient practices, driven by the mounting pressures of environmental, social, and economic challenges. Traditional food systems, often characterized by mass production, extensive transport, and high resource demands, are increasingly unsustainable. As a result, the industry is being redefined by the collective demands of regulators, consumers, and environmental advocates for a more adaptable, equitable, and sustainable approach to food and nutrition.

Recent crises—including the COVID-19 pandemic, geopolitical conflicts, and climate-driven disruptions—have exposed vulnerabilities within food supply chains and highlighted persistent issues of food insecurity and unequal access to nutrition. These challenges emphasize the need for a food system that can withstand shocks, adapt to changing conditions, and deliver positive outcomes for society and the environment.

1

Building Net-Positive, Circular Food Systems

Sustainability efforts are evolving beyond simply reducing negative impacts to creating regenerative, net-positive systems. Companies are under pressure to adopt ethical sourcing, minimize food waste, and integrate circular economy principles that rejuvenate natural resources. Regulatory shifts, particularly in regions like the European Union, are making sustainability a standard requirement, pushing companies toward models that prioritize ecosystem restoration.

2

Creating Resilient and Adaptive Supply Chains

Recent supply chain disruptions have underscored the risks of unsustainable practices, revealing systemic vulnerabilities. Moving forward, companies must shift toward resilient, localized, and flexible supply chains that can weather future shocks and comply with emerging regulations. Balancing global operations with local adaptability will be essential to create supply chains capable of responding to environmental and market dynamics.

3

Evolving Regulatory and Market Dynamics in Response to Global Food Challenges

With tightening regulations, shifting consumer expectations, and rising competitive pressures, the food industry faces significant strategic challenges. Access to affordable, nutritious food remains inequitable, exacerbating health issues and healthcare costs. Companies that can navigate complex regulations, improve accessibility, and meet demand for transparency and sustainability will be well-positioned to thrive in this evolving landscape.

1/3

The global food system is responsible for about **one-third** of greenhouse gas emissions.
(World Bank, 2024)

870mil

Recovering just one-third of wasted food could feed **870 million people**
(World Food Program USA, 2024)

$15.2mil

spent on Food & Beverage lobbying in 2024
(OpenSecrets, 2024)

73%

of Chief Supply Chain Officers understand the strategic value of data and seek to integrate data from multiple sources to inform their decisions.
(IBM, 2022)

"For the first time in an environmental law, **the EU is setting targets to reduce packaging consumption,** regardless of the material used. We call on all industrial sectors, EU countries and consumers to **play their part** in the fight against excess packaging. The **ban on forever chemicals** in food packaging is a **great victory** for the health of European consumers."

Frédérique Ries, Rapporteur European Parliament (Renew BE)

Building Net-Positive, Circular Food Systems

KEY DRIVER 1

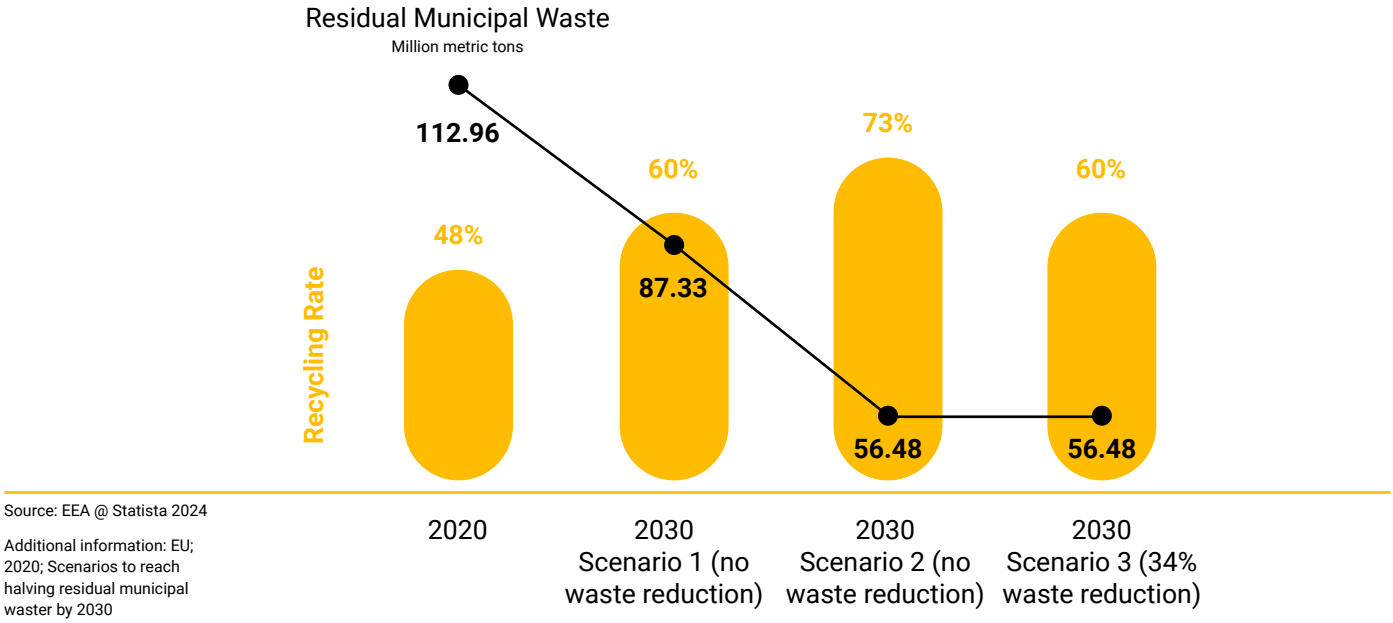
The food industry is entering a transformative era where building net-positive, circular food systems is not only essential but strategically advantageous. Faced with mounting regulatory demands, environmental advocacy, and consumers prioritizing sustainability, companies are shifting from traditional, linear production models to circular systems focused on regenerating natural resources, minimizing waste, and enhancing environmental stewardship. Moving beyond mere compliance, this shift represents an opportunity for companies to lead in a market that increasingly values eco-friendly, regenerative practices and net-positive impacts.

Regulatory Pressures Accelerating Circular Systems and Emissions Reductions

Regulatory frameworks are catalyzing sustainable practices, with the European Union's Packaging and Packaging Waste Directive mandating that all packaging be recyclable by 2030 and free of harmful substances. This regulatory push has spurred companies to adopt biodegradable packaging alternatives, like those made from agricultural waste or seaweed, which significantly reduce environmental impact. By 2030, these packaging waste reduction measures are projected to reduce greenhouse gas emissions by 23 million tonnes, cut water usage by 1.1 million cubic meters, and save the EU economy an estimated €6.4 billion in environmental costs.

Beyond packaging, the EU has set ambitious goals to decrease residual municipal waste and increase recycling rates across member states. By implementing innovative waste management systems, the EU aims to achieve recycling rates between 60% and 73% by 2030, providing an added incentive for businesses to innovate within sustainable frameworks. These combined efforts support both environmental goals and regulatory compliance, encouraging businesses to align their practices with a regenerative, net-positive approach.

Possible residual municipal **waste reduction target scenarios** in the European Union (EU-27) from 2020 to 2030



Source: EEA @ Statista 2024

Additional information: EU; 2020; Scenarios to reach halving residual municipal waster by 2030

Notpla

Pioneering Sustainable Packaging

Meeting strict regulatory standards while appealing to eco-conscious consumers, Notpla addresses plastic waste head-on by offering a sustainable, scalable alternative. In 2023, Notpla partnered with major food delivery platforms to introduce eco-friendly takeaway packaging, setting a new standard for sustainable packaging solutions and driving broader adoption of circular practices.

Notpla, a London-based startup, is **transforming** the **food packaging** industry with its **innovative seaweed-based** edible and **biodegradable packaging.**

Transforming Food Waste into Valuable Resources

Building a circular food system goes beyond packaging—it also addresses food waste, an area with considerable economic and environmental impact. According to the World Economic Forum, nearly one-third of all food is lost or wasted globally, raising the cost of fresh produce and limiting access to nutritious options, especially in low-income regions. By implementing circular economy principles, food waste can be minimized and repurposed into valuable resources. For example, Rubies in the Rubble repurposes surplus fruits and vegetables to create high-quality condiments, turning what would otherwise be waste into premium products. Too Good To Go, a popular app, connects consumers with discounted surplus food from restaurants and retailers, offering an accessible solution for reducing waste and increasing affordability.

Industry Leaders Setting Net-Positive Benchmarks

Leading corporations, such as Nestlé, are setting ambitious benchmarks for achieving net-positive impact and carbon neutrality by embedding regenerative practices throughout their supply chains. As part of its commitment to net-zero emissions by 2050, Nestlé collaborates with farmers to implement regenerative agriculture, including practices like cover cropping, reduced tillage, and agroforestry, which enhance soil health, biodiversity, and carbon sequestration. These practices not only lower the company's carbon footprint but also contribute positively to the environment by increasing ecosystem resilience and enriching soil. Nestlé's transition to recyclable paper packaging for its Smarties line demonstrates the impact of circular principles on a large scale, reducing approximately 250 tonnes of plastic waste annually. By prioritizing resource regeneration over simple waste reduction, Nestlé and other industry leaders illustrate how net-positive, circular approaches can improve environmental outcomes and set new standards in sustainable food systems.

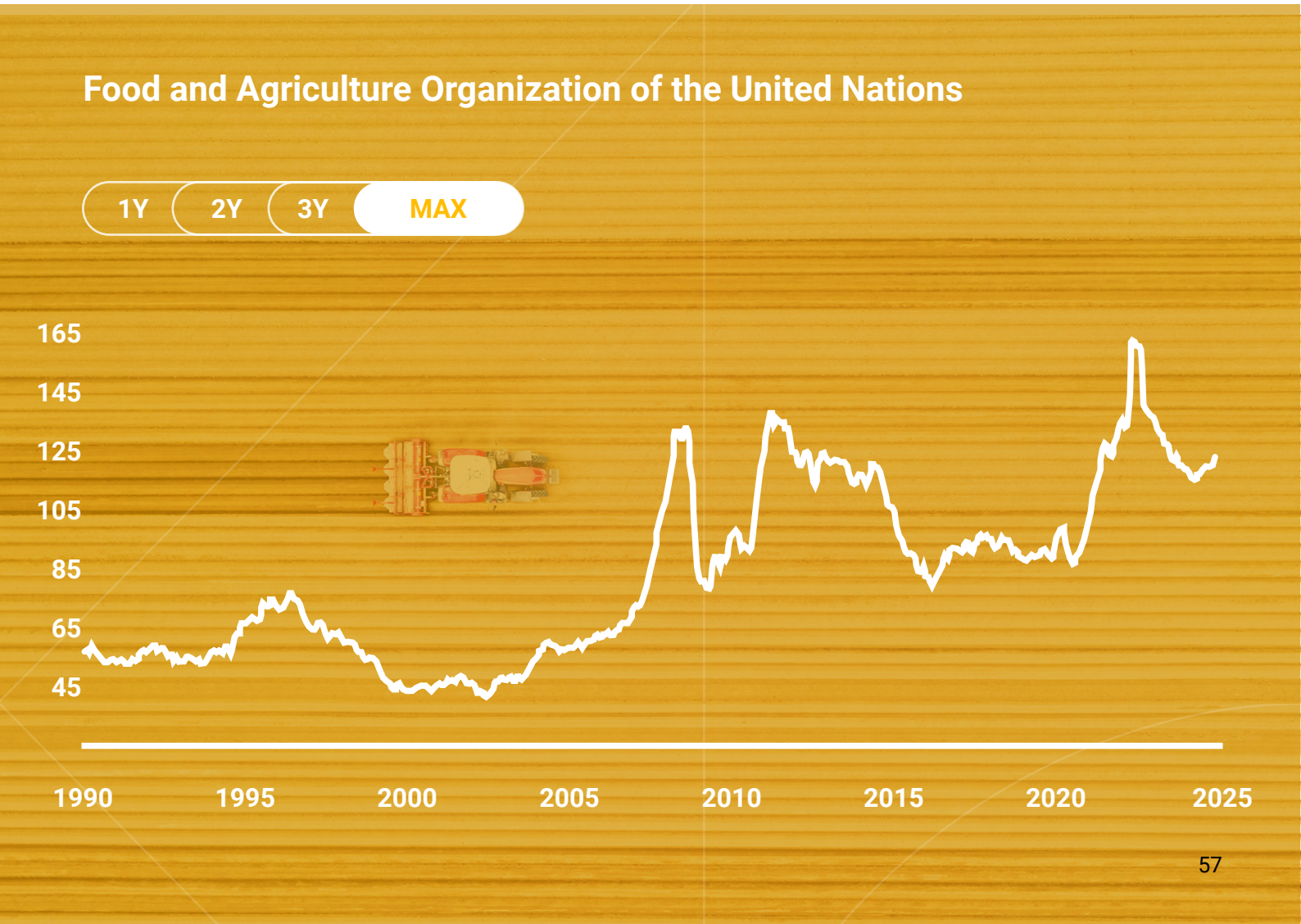
Resilient and Adaptive Supply Chains

KEY DRIVER 2

The global food landscape continues to face significant challenges due to persistent supply chain disruptions driven by factors like geopolitical tensions, fluctuating oil prices, export restrictions, and climate change. This volatility is felt acutely in food prices; for example, the FAO Food Price Index rose by 3% in September 2024—the largest jump since early 2022—underscoring the ongoing instability in the food market, especially in sugar, vegetable oils, and cereals, where price swings reflect deeper supply chain vulnerabilities.

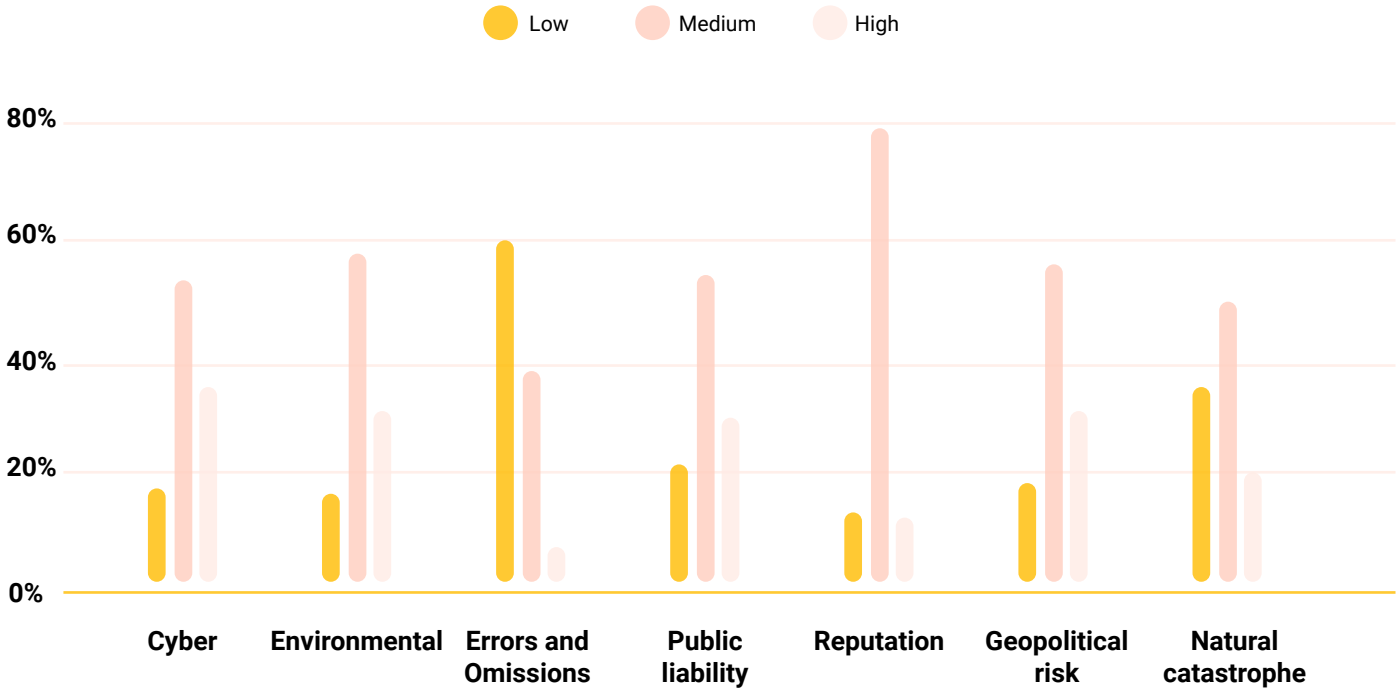
These disruptions highlight the critical need for resilient and adaptive supply chains that can absorb shocks while maintaining stability in a volatile global landscape. Recent events, from climate-related impacts on agriculture to geopolitical tensions limiting commodity access, demonstrate how vulnerable food systems remain. As companies and regulators respond, the focus is shifting toward supply chain structures that are localized, diversified, and technologically integrated to better withstand future disruptions and support long-term food security.

FAO Price Index



Question:

How would you describe the **potential impact** of the following risks on the **supply chain risks** faced by your organisation?



Localized Production and Diversified Sourcing as Core Strategies

Localized production and diversified sourcing are becoming essential strategies for addressing supply chain challenges. Short Food Supply Chains (SFSCs), which streamline processes and enhance transparency, are gaining traction as companies look to reduce reliance on lengthy, risk-prone global routes. For instance, in France, 21% of farmers have adopted SFSC models, fostering local resilience and reducing dependence on global networks. By moving production closer to consumers, these models help cut transportation emissions, reduce delays, and strengthen trust between producers and end consumers.

Blendhub's Multi-Localized Food Production

Blendhub offers a compelling example of **the move toward resilient, localized models.**

The company has developed a multi-localized food production network that places production facilities near end consumers, minimizing the need for long-distance transportation. During the pandemic, Blendhub's localized hubs allowed the company to maintain consistent production while global supply chains experienced severe disruptions, ensuring that essential food products continued reaching consumers.

By sourcing raw materials locally or regionally, Blendhub mitigates global supply chain risks, supports local economies, and reduces environmental impact. This model showcases how multi-localized production networks can help companies build secure, resilient food systems capable of navigating future uncertainties.

At the same time, diversifying sourcing—both regionally and across multiple suppliers—has emerged as a critical strategy for enhancing resilience. By spreading their supply sources across different regions, companies are better positioned to handle disruptions, whether caused by geopolitical tensions or environmental disasters. For example, the conflict between Ukraine and Russia, as well as export bans from major commodity exporters like India, have shown how quickly food security can be threatened by geopolitical decisions. Similarly, extreme climate events—such as the 2023 floods in Pakistan, which severely impacted rice production—highlight how fragile supply chains can become when exposed to climate-related shocks.

Diversified sourcing reduces the risk of bottlenecks and ensures a steady flow of critical materials, helping businesses navigate disruptions in one region without halting operations.

Adapting to Climate Risks and Investing in Climate-Resilient Practices

Additionally, resilience strategies are increasingly focusing on climate adaptation measures. These include investments in climate-smart agriculture, improving infrastructure to withstand extreme weather events, and using data-driven tools to forecast and manage risks more effectively. For instance, adopting climate-resilient agricultural systems that integrate innovations such as precision farming technologies—which optimize resource use through real-time data monitoring—and regenerative agricultural practices can significantly mitigate the impacts of climate volatility on food supply chains. Companies are also implementing advanced water management systems, such as sensor-based irrigation and water recycling techniques, to ensure efficient water use in regions affected by water scarcity, enhancing the resilience of agricultural operations in the face of climate change.

Technological Innovation as a Key Enabler

Emerging technologies are a cornerstone of modern supply chain resilience. Digital tools such as blockchain, AI-driven analytics, and IoT monitoring provide real-time visibility, enabling faster, more strategic responses to disruptions. Companies are leveraging these technologies to streamline operations, anticipate disruptions, and improve efficiency.

PepsiCo

Leveraging AI for Supply Chain Resilience

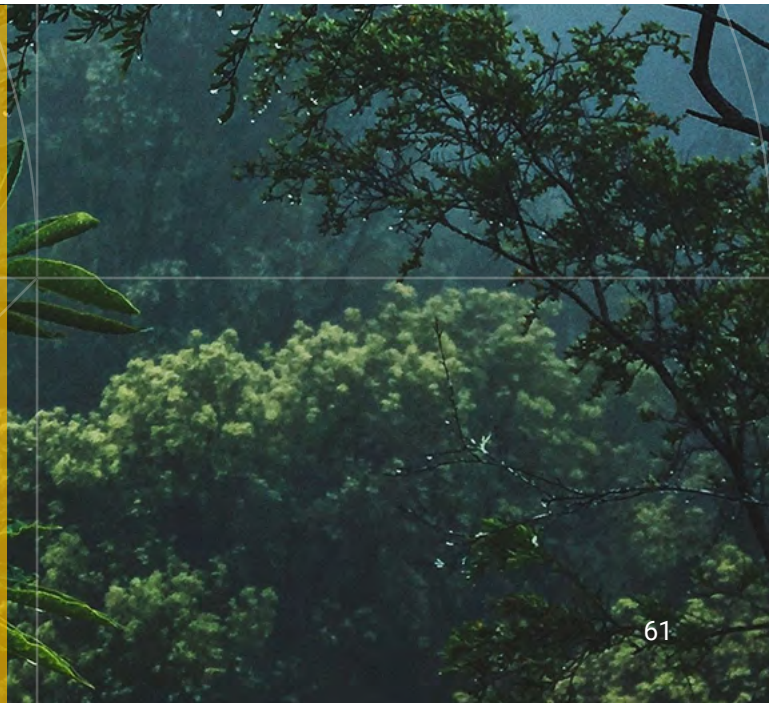
PepsiCo, a leader in food and beverages, has embedded artificial intelligence (AI) throughout its supply chain to improve efficiency, sustainability, and innovation. Partnering with KoiReader Technologies and the Stanford Institute for Human-Centered Artificial Intelligence (HAI), PepsiCo employs AI-driven solutions to enhance warehouse automation, predictive maintenance, and quality control. With near-perfect accuracy in label scanning and reduced distribution errors, PepsiCo's approach is setting a benchmark for AI in the food industry.

AI-driven analytics also support PepsiCo's sustainable farming initiatives, offering farmers insights for optimal planting, watering, and crop protection. This approach reduces resource use, minimizes environmental impact, and demonstrates the company's commitment to sustainable AI integration in supply chain management.

PepsiCo's approach highlights its commitment to a human-centric and sustainable AI strategy, setting a benchmark for integrating technology into supply chain management in the food industry.

Companies that prioritize building resilient and adaptive supply chains will be better positioned to navigate future uncertainties. This shift toward localized, flexible, and technologically integrated supply chain models is essential for maintaining food security, enhancing sustainability, and ensuring that consumers have access to affordable, nutritious food despite global disruptions. As the industry evolves, supply chain resilience will become a critical differentiator, enabling companies to adapt to challenges and thrive in an unpredictable world.

PepsiCo, a leader in food and beverages, has **embedded artificial intelligence** (AI) throughout its **supply chain** to **improve efficiency, sustainability,** and **innovation.**



Evolving Regulatory and Market Dynamics in Response to Global Food Challenges

KEY DRIVER 3

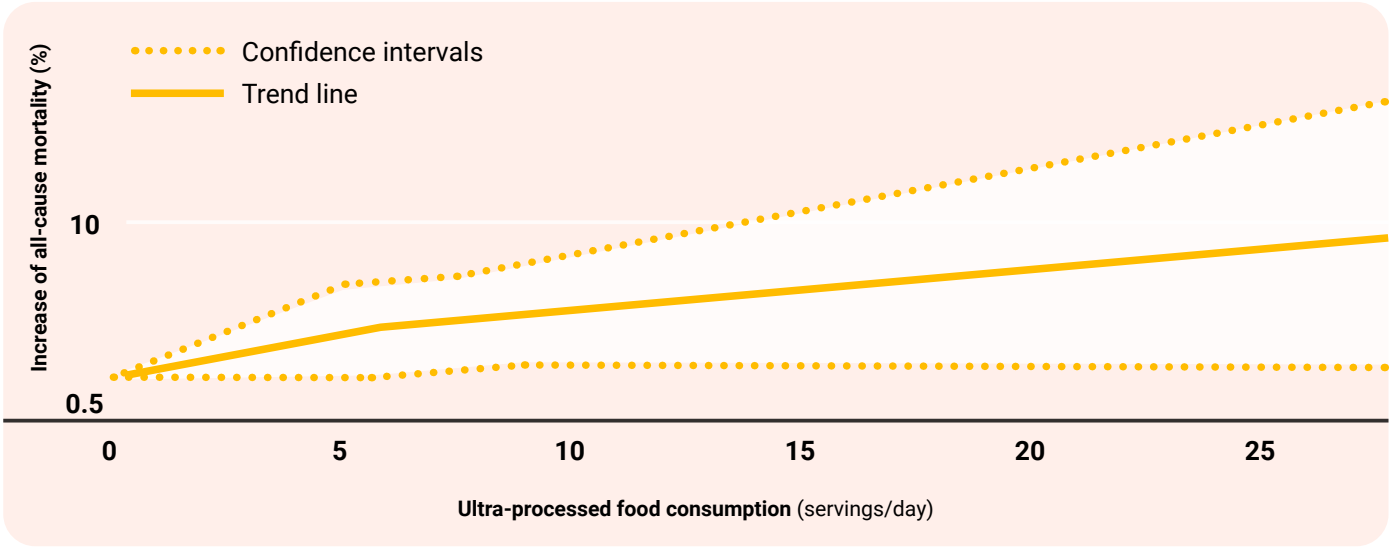
The food and nutrition sector faces a complex interplay of regulatory pressures, consumer expectations, economic constraints, and market dynamics. Challenges such as food deserts, pricing imbalances, and unequal access to nutritious food underscore the need for an inclusive food system that prioritizes accessibility, affordability, and transparency. As the industry adapts to new standards, it grapples with balancing affordability while meeting growing demands for health-conscious, sustainable practices.

Addressing Food Deserts, Food Swamps, and Accessibility Challenges

In low-income communities worldwide, access to healthy, affordable food is often limited. This manifests in “food deserts,” where residents lack access to grocery stores offering fresh produce, and “food swamps,” where the abundance of fast-food and processed options outweighs healthier choices. These environments contribute to higher obesity rates, diet-related diseases, and a widening gap in public health outcomes between affluent and underserved communities. Current initiatives focus on improving accessibility to healthy foods by supporting grocery stores, fresh food markets, and zoning changes in these areas, creating pathways for more balanced food choices across socioeconomic divides.

Ultra-processed food consumption linked to mortality

(BMJ,2019)



Economic incentives also play a significant role in this disparity. Unhealthy, processed foods are often more affordable and accessible, partially due to subsidies that keep their prices artificially low. By contrast, nutritious foods like fresh produce are often more expensive due to shorter shelf life, spoilage risks, and transport costs.

This price imbalance hinders access to healthier options for lower-income populations, further exacerbating diet-related health issues. Efforts to address these disparities are gaining traction through policies that propose subsidies for fresh produce, incentives for healthy food stores in underserved areas, and reduction of zoning restrictions that limit access to nutritious options.

In an era of rising costs, the food industry faces economic pressure to sustain affordable yet nutritious options. “Shrinkflation,” where product sizes shrink without reducing prices, and the rise of budget-friendly value packs are strategies companies are adopting to maintain loyalty amidst inflation. However, with consumer expectations for quality and health still strong, brands that can offer nutritious, budget-friendly options retain a competitive edge.

Regulatory Shifts: Promoting Health and Transparency in Food Choices

Governments worldwide are stepping up to encourage healthier eating and greater transparency in food labeling. In the European Union, there is significant variation in the extent of regulatory control over food and beverage choices, as shown in the Nanny State Index. Countries like Hungary, Turkey, and Ireland score high, reflecting strict regulations around issues like sugar content, advertising restrictions, and accessibility of unhealthy foods. In contrast, countries such as Germany, Slovakia, and Romania have relatively lower levels of regulation, indicating a more market-driven approach to consumer food choices.

For example, the UK’s High Fat, Sugar, and Salt (HFSS) regulations limit the promotion of unhealthy foods in prominent retail locations and during specific advertising times, aiming to decrease consumption of high-calorie, low-nutrient options. In high-regulation countries, policies like these are becoming more common, pushing companies to reformulate products, improve nutritional quality, and align their strategies with public health objectives.

In response to these evolving standards, companies operating across Europe need to navigate a complex regulatory landscape that varies greatly by country. Multinational corporations face the challenge of adapting products and marketing strategies to align with the most stringent regulations in the region, which increasingly focus on promoting public health and limiting the impact of unhealthy food and drink options.

Food and soft drinks: **nanny state index** in the European Union (EU-28) in 2023, by country

Source: EPCENTER 2024

In the European Union, the adoption of front-of-pack labels like Nutri-Score is gaining ground. Nutri-Score, used in countries such as France, Belgium, and Germany, categorizes food with easy-to-understand color codes and scores based on nutritional value, helping consumers make informed choices at a glance. Despite industry resistance, Nutri-Score and similar systems are likely to expand as consumer demands for clarity and transparency grow.

Danone's Agile Adaptation to Market Dynamics

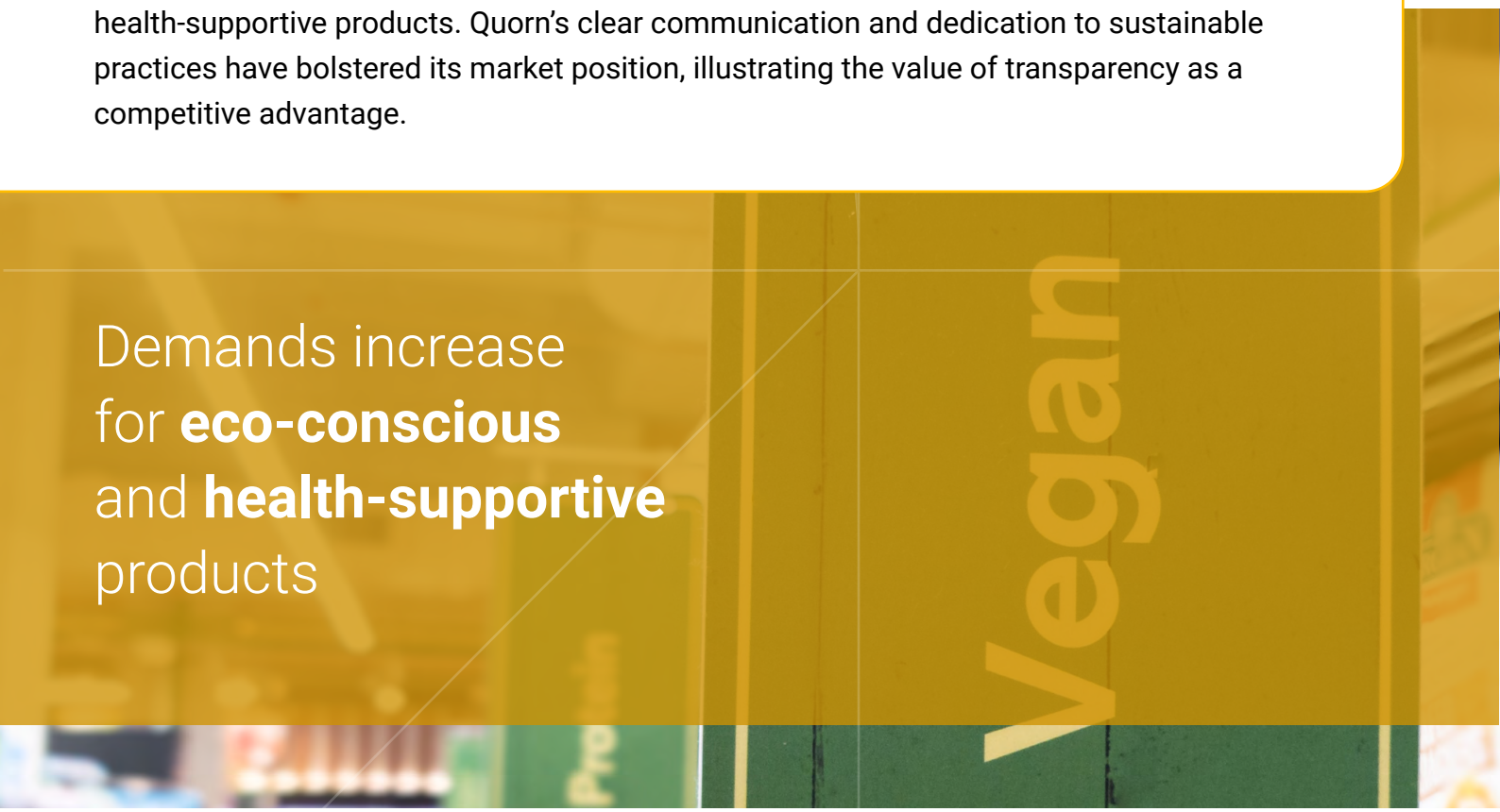
Danone has taken proactive steps to adapt to evolving health regulations by reformulating many of its products to reduce sugar levels and improve nutritional value. Through initiatives like the Nutri-Score system, Danone provides clear, accessible information that aligns with regulatory guidelines while meeting growing consumer expectations for transparency and health consciousness.

This global push for health-focused regulations compels companies to align products and marketing strategies with transparency and nutritional quality standards. Some companies are even preemptively reformulating their product lines and adopting labeling practices that exceed minimum regulatory requirements, both to ensure compliance and to foster consumer trust.

Quorn

Transparency and Sustainability as a Market Strategy

Quorn, a leading plant-based protein brand, has set a new standard for transparency and sustainability by including carbon footprint labels on its packaging. This initiative not only educates consumers but also aligns with increasing demands for eco-conscious and health-supportive products. Quorn's clear communication and dedication to sustainable practices have bolstered its market position, illustrating the value of transparency as a competitive advantage.



Demands increase for **eco-conscious** and **health-supportive** products

Mergers, Strategic Alliances, and Competitive Positioning

In response to market pressures, companies are also turning to mergers, acquisitions, and strategic partnerships to expand reach, pool resources, and strengthen competitive positions. For instance, Mars' acquisition of Pringles owner Kellanova in 2024 illustrates a trend of strategic consolidation, enabling Mars to diversify its portfolio and strengthen its position in the snack sector. Strategic consolidations also enable companies to gain scale, optimize distribution channels, and improve resilience against market pressures.

Looking Ahead: Broader Market Shifts by 2035

This section explores the evolution of market-driven shifts in food and nutrition, focusing on sustainability, resilience, and accessibility. Using the S-curve model with four stages—Emerging, Growing, Maturing, and Saturating—we map how these trends are anticipated to develop by 2035. Each stage highlights a strategic focus for companies as they adapt to changing regulatory landscapes, technological advancements, and evolving consumer values.

S-Curve Stages of Market Trend Development

Emerging: At this stage, market shifts are fueled by early adopters and innovators. There is growing awareness, but industry-wide adoption remains low, and regulatory frameworks are in early development.

Growing: Adoption expands as these trends gain traction and regulatory frameworks mature. Industry practices start aligning with new standards, driven by increasing consumer expectations and environmental goals.

Maturing: The market shift achieves mainstream adoption, with standardized practices across industries. Compliance becomes mandatory, and these trends shape core business models and operations, driving competitive advantage and customer loyalty.

Saturating: Growth slows as the shift reaches widespread adoption. Companies focus on innovation within established frameworks to differentiate and maintain relevance in a saturated market.

Recommended Action:

Monitor and Pilot

For emerging trends, closely track developments and consider launching pilot programs to test viability. This phase is critical for understanding demand, identifying barriers, and refining approaches for broader industry adoption.

Scale and Standardize

As trends grow, focus on establishing scalable, standardized processes that align with compliance and consumer expectations. Building credibility and alignment with regulatory standards will be essential as adoption spreads.

Optimize and Innovate

In maturing and saturated markets, focus on refining operations and exploring niche innovations to stay competitive. Deepening stakeholder relationships and emphasizing customer loyalty will be key to sustaining market position as the trend saturates.

2025

Monitor and Experiment

Scale and Standardize

Optimize and Innovate

TREND DEVELOPMENT

6.Regenerative Practices Adoption

Regenerative practices are emerging, particularly in textiles and agriculture. The EU's sustainability goals for durable, repairable, and recyclable products by 2030 reflect early growth. Bio-based materials and circular production models are positioning this trend for broader adoption.

5. Accessible Food Options

1.Circular Practiced Adoption

The circular economy is gaining traction, especially in developed markets, driven by investment and new technologies that reduce raw material use, pollution, and carbon emissions. With nearly 4,000 startups focused on circular solutions globally, adoption is expanding, though progress remains uneven between developed and developing regions.

2.Localized Food Systems & Short Food Supply Chains

Aligned with circular economy goals, localized food systems and short supply chains are on the rise. Regulatory support, especially in the EU, is driving sustainable practices, including food waste reduction and resource efficiency, which promote regional food systems and lower transport emissions.

3. Sustainable Packaging Adoption

4. Nutritional labeling & health transparency

EMERGING

GROWING

MATURING

SATURATING

2030

Monitor and Experiment

Scale and Standardize

Optimize and Innovate

TREND DEVELOPMENT

1.Circular Economy Adoption

By 2030, the circular economy is approaching maturity, driven by public and private initiatives, global cooperation, and rising societal demand for climate action. New metrics, such as product and infrastructure longevity, are beginning to rival traditional economic indicators like GDP. In Europe, a shift to a circular economy could increase GDP by up to 7% and have a positive impact on employment.

4. Nutritional labeling & health transparency

3.Sustainable Packaging Adoption

Sustainable packaging is maturing, supported by updated regulations mandating material reuse and recycling across multiple sectors. Primary material consumption, including packaging, could decrease by as much as 32% by 2030, reflecting a broad shift toward circular practices.

2.Localized Food Systems SFSC

6.Regenerative Practices Adoption

Regenerative practices are expanding rapidly, with key sectors such as mobility, food, and construction projected to cut carbon emissions by as much as 48% from 2012 levels. This shift reflects a focus on enhancing natural capital and advancing systems for sustainable material and waste management.

5.Accessible Food Options and Affordability Initiatives

Circular economy models has increased disposable income for European households by up to 11% by 2030. Improved resource efficiency and innovative business models contribute to more affordable and accessible options across food and other sectors.

EMERGING

GROWING

MATURING

SATURATING

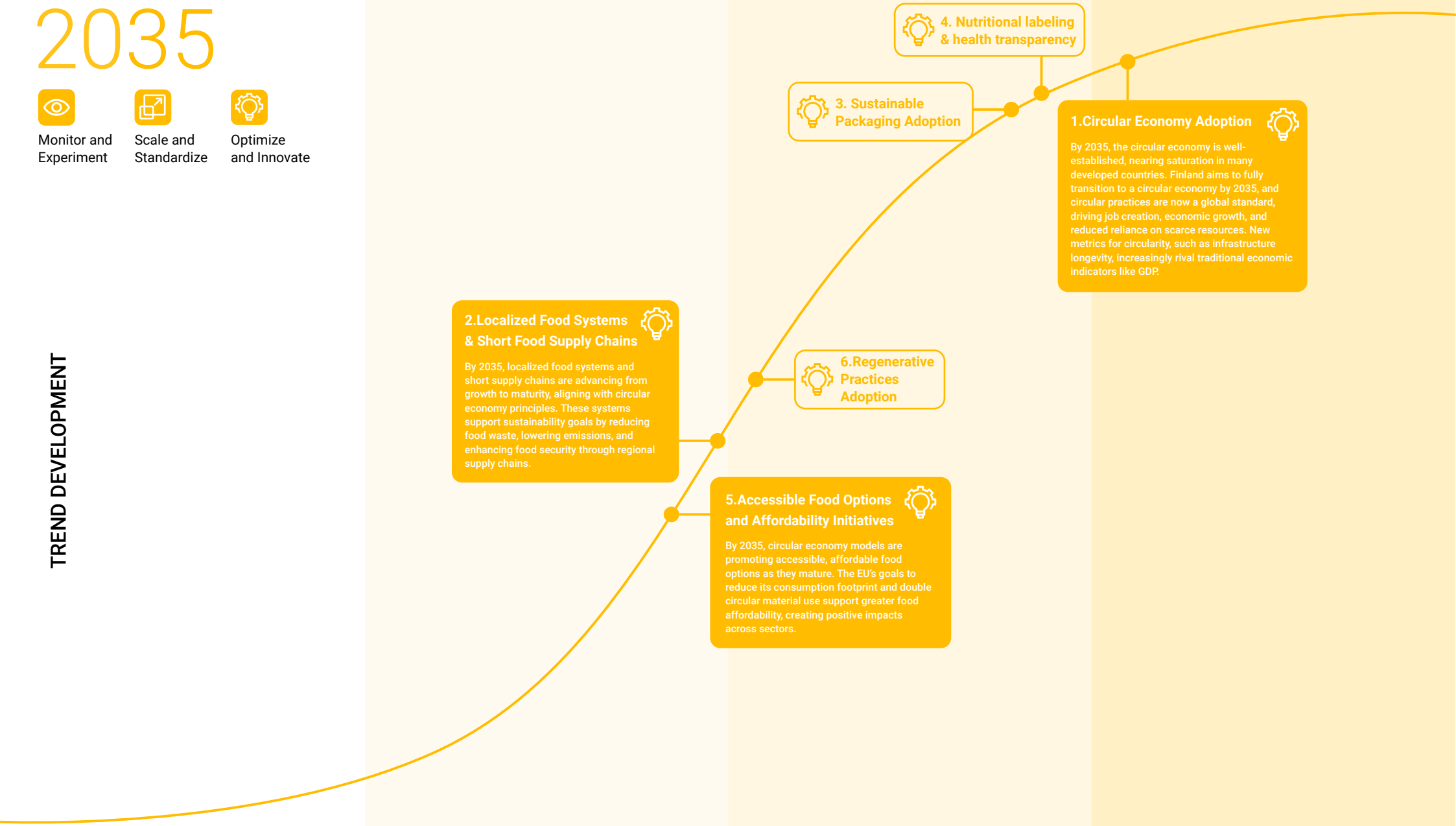
2035

Monitor and Experiment

Scale and Standardize

Optimize and Innovate

TREND DEVELOPMENT



4. Nutritional labeling & health transparency

3. Sustainable Packaging Adoption

1.Circular Economy Adoption

By 2035, the circular economy is well-established, nearing saturation in many developed countries. Finland aims to fully transition to a circular economy by 2035, and circular practices are now a global standard, driving job creation, economic growth, and reduced reliance on scarce resources. New metrics for circularity, such as infrastructure longevity, increasingly rival traditional economic indicators like GDP.

2.Localized Food Systems & Short Food Supply Chains

By 2035, localized food systems and short supply chains are advancing from growth to maturity, aligning with circular economy principles. These systems support sustainability goals by reducing food waste, lowering emissions, and enhancing food security through regional supply chains.

6.Regenerative Practices Adoption

5.Accessible Food Options and Affordability Initiatives

By 2035, circular economy models are promoting accessible, affordable food options as they mature. The EU's goals to reduce its consumption footprint and double circular material use support greater food affordability, creating positive impacts across sectors.

EMERGING

GROWING

MATURING

SATURATING

Projected Consumer Landscape by 2035

The food and nutrition sector will be deeply integrated with circular economy principles, resilience, and equitable access. Circular practices and localized supply chains will be standard, with most major companies operating under zero-waste models and sustainable packaging. Comprehensive nutritional labeling will empower consumers with transparency, fostering trust and enabling informed choices.

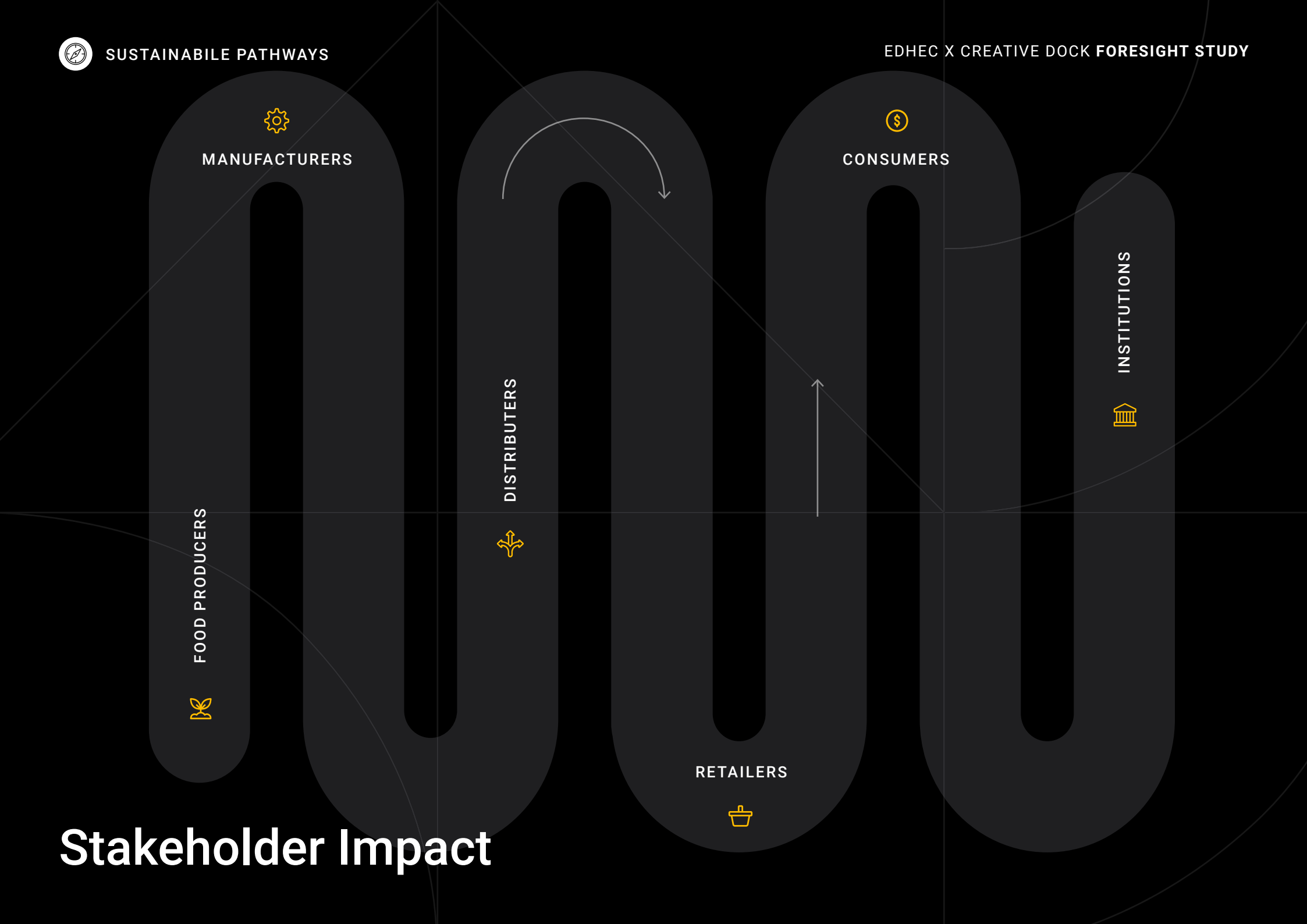
This evolved market landscape will prioritize accessible, nutritious, and sustainable food options, reducing health disparities and supporting public health. The industry will function as a cohesive, transparent ecosystem that emphasizes environmental stewardship, equitable access, and resilience. Despite challenges—such as economic disparities, infrastructure limitations, and climate-driven supply chain risks—the global food system will have made significant strides toward adaptability, efficiency, and societal alignment.

With ongoing innovation and coordinated efforts, the 2035 market will move closer to a future where nutritious, affordable, and sustainable food is accessible to all, advancing long-term goals for health, environmental sustainability, and equity.

Sustainable Pathways for Accessible, Nutritious, and Resilient Food Systems

As outlined in this report, the global food system stands at a critical juncture, shaped by three transformative forces: consumer behavior, technological innovation, and market and regulatory dynamics. Together, these forces form a synergistic feedback loop, catalyzing profound changes across the food value chain. In response to growing consumer demand for healthier, sustainable, and ethically sourced food, the industry must adopt practices that protect both human health and the planet's resources. Technological advancements and stricter regulatory standards further propel this transformation, offering both opportunities and challenges for businesses aiming to navigate a complex and rapidly evolving landscape.

To successfully align with these shifts, stakeholders throughout the food value chain—from producers to policymakers—must adopt strategies that are both adaptive and collaborative. The Implications chapter provides targeted recommendations for each stakeholder group, grounded in the insights from the report's three Big Shifts. By prioritizing sustainability, transparency, and innovation, each group can actively contribute to building a food system that is resilient, equitable, and capable of meeting the demands of a growing global population.



Stakeholder Impact

Stakeholder Impact Overview

The following table outlines how these shifts impact key stakeholder groups within the food value chain, highlighting the unique pressures and opportunities each group faces:

	FOOD PRODUCERS	MANUFACTURERS	DISTRIBUTORS	RETAILERS	CONSUMERS	INSTITUTIONS
CONSUMER SHIFT	• Increased demand for organic and alternative proteins • Need for transparency in sourcing and environmental impact	• Expectation to offer functional foods with health benefits • Preference for clean labels and whole ingredients	• Demand for local, fresh products with minimal waste	• Desire to provide personalized shopping experiences and health-focused options	• Demand for organic, ethical, and locally produced products • Interest in personalized nutrition	• Responsibility to ensure access to nutritious, affordable food • Addressing public health concerns
TECHNOLOGICAL SHIFT	• Adoption of precision agriculture for resource efficiency • Use of real-time monitoring to improve yields	• Implementation of blockchain for tracking and verifying sourcing • Utilization of AI and food science (e.g., CRISPR, fermentation) for innovation	• Deployment of AI-driven personalization and digital transparency tools	• Desire to provide personalized shopping experiences and health-focused options	• Use of AI-driven health tools for personalized dietary guidance	• Utilization of technology for compliance monitoring and food safety
MARKET SHIFT	• Pressure to implement sustainable farming practices • Compliance with regulations encouraging regenerative agriculture	• Requirements for zero-waste and circular economy practices • Mandates to reduce carbon emissions	• Compliance with stricter packaging and waste reduction regulations • Support for local sourcing and clean labels.	• Compliance with stricter packaging and waste reduction regulations • Support for local sourcing and clean labels.	• Shift towards eco-friendly diets • Support for regulations promoting health-conscious options	• Implementation of stricter policies on sustainability and labeling • Provision of incentives for local and sustainable agriculture

Building a **Foundation** of Sustainability and Innovation

FOOD PRODUCERS MANUFACTURERS

The transformation of consumer expectations, technological capabilities, and regulatory standards implies that food producers and manufacturers must take an active role in creating sustainable and innovative food systems. As demand grows for healthier, ethically sourced products, and as policies favor low-impact agriculture and circularity, producers and manufacturers are uniquely positioned to lead this shift. By adopting regenerative practices, strengthening supply chains, and investing in technology, they can directly address sustainability pressures while gaining a competitive edge.

How?

Embed Regenerative and Sustainable Practices

- Adopt Regenerative Agriculture: Practices such as crop rotation, agroforestry, and soil management not only improve biodiversity and soil health but also align with consumer demands for eco-conscious sourcing and regulatory incentives for sustainable farming.
- Implement Sustainable Sourcing: Manufacturers can prioritize regenerative and ethically sourced ingredients, with measurable goals like achieving zero waste by 2030, to reinforce brand credibility in an increasingly transparent market.

Enhance Supply Chain Resilience and Resource Efficiency

- Diversify and Strengthen Supply Chains: The recent supply chain disruptions highlight the importance of risk mitigation. Expanding sourcing regions and suppliers, coupled with advanced inventory and data analytics, enables proactive adjustments and resilience against future disruptions.
- Integrate Energy-Efficient Technologies: By adopting renewable energy sources and closed-loop water systems, producers and manufacturers can reduce emissions and align with tightening environmental regulations, benefiting from cost savings over time.

Drive Innovation in Food Production and Product Development

- Implement Precision Agriculture: Leveraging AI, drones, and sensors optimizes resource use, addressing environmental concerns while enhancing yields to meet growing food demands.
- Explore Biotech for Sustainable Product Lines: Technologies like CRISPR and precision fermentation allow manufacturers to produce nutrient-dense, eco-friendly products, appealing to health-conscious consumers and minimizing environmental impact.

By adopting these practices, food producers and manufacturers position themselves to meet future challenges with sustainable operations, thereby securing their role in the next-generation food system.

Delivering Sustainable and **Personalized** Consumer Experiences

DISTRIBUTORS RETAILERS

As consumer-facing stakeholders, retailers and distributors face the immediate impacts of evolving consumer preferences, particularly around transparency, local sourcing, and low-waste practices. Today's consumers seek out health-focused, personalized options, which also must align with sustainable values. Retailers and distributors must therefore deliver on these expectations by integrating transparent and interactive shopping experiences, reducing waste, and supporting local supply chains, all of which reinforce brand loyalty in an increasingly competitive market.

How?

Prioritize Local Sourcing and Accessibility of Sustainable Products

- Build Partnerships with Local Producers: By prioritizing local sourcing, retailers reduce transport emissions and satisfy consumer preferences for regional products. This approach also strengthens ties with local communities, aligning with both consumer values and environmental goals.
- Highlight Sustainable Products in-Store: Dedicating sections to local and eco-friendly items caters to consumers' demand for ethical purchasing options, enhancing brand reputation and consumer trust.

Optimize Logistics and Reduce Waste Across the Supply Chain

- Adopt Sustainable Transport Solutions: Transitioning to electric or alternative-fuel vehicles and utilizing AI for optimized routes can lower emissions and reduce transportation costs.
- Implement Advanced Inventory Management: IoT sensors and real-time monitoring prevent spoilage and minimize waste, reinforcing commitment to sustainability and quality.

Provide Transparent and Personalized Shopping Experiences

- Use AI for Customized Product Recommendations: AI-driven recommendations help retailers cater to individual dietary needs and preferences, enhancing customer satisfaction and brand loyalty.
- Leverage Digital Transparency Tools: Providing clear, accessible information on sourcing, nutritional content, and sustainability practices through QR codes or digital platforms meets consumer expectations for informed, responsible purchases.

By emphasizing these areas, retailers and distributors can provide a shopping experience that aligns with consumers' growing demand for health, sustainability, and personalization, positioning themselves as trusted partners in sustainable consumption.

Supporting **Health Equity**, Innovation, and Sustainable Development

GOVERNMENT & PUBLIC INSTITUTIONS

The scale of transformation needed within the food system requires coordinated action from public institutions. Governments have the opportunity—and responsibility—to facilitate change through policies that ensure access to nutritious, affordable, and sustainable food for all communities. With pressing public health concerns, environmental targets, and the necessity for resilient food systems, public institutions must drive initiatives that support health equity, incentivize sustainable innovation, and enforce standards to catalyze industry-wide progress.

How?

Promote Equitable Access to Nutritious and Affordable Food

- Implement Subsidies and Incentive Programs: Supporting producers and retailers in underserved areas with tax incentives or subsidies promotes affordability and accessibility. Additionally, backing community programs like farmers' markets and mobile food vendors can directly improve food access.
- Support Public Health Campaigns and Nutrition Education: Increasing public awareness of the benefits of nutritious, sustainable diets can positively impact community health. Collaborations with schools and local organizations are essential for raising awareness around health and nutrition.

Drive Innovation and Technology Adoption in Sustainable Food Production

- Fund Research and Development: Incentivizing sustainable food innovations through grants for precision agriculture, lab-grown proteins, and sustainable packaging can help meet future food demands while reducing environmental impact.
- Encourage Food Safety and Compliance Technologies: Blockchain, IoT, and AI can enhance transparency and safety within the food supply chain. Public institutions can support these technologies through funding and partnerships that boost trust in the food system.

Set and Enforce Standards for Environmental and Health Sustainability

- Strengthen Regulatory Standards: Governments can establish and enforce policies on circular economy practices, sustainable packaging, and reduced emissions, helping industry stakeholders meet environmental goals.
- Incentivize Local and Regenerative Agriculture: Grants or tax incentives for regenerative and low-impact farming methods support a shift toward regional and sustainable food systems. Local agriculture minimizes transport emissions and enhances food security, meeting sustainability and health priorities.

Through these actions, public institutions can create an enabling environment for sustainable food systems, ensuring they meet modern demands for public health, environmental stewardship, and food equity.

Call for Action

Innovating for a Sustainable and Resilient Food Future

The future of our global food system depends on our collective ability to innovate and transform. As the challenges of climate change, population growth, and resource scarcity intensify, every stakeholder—from food producers and manufacturers to retailers, distributors, and public institutions—has a vital role to play. This is a call for action grounded in creative solutions, forward-thinking practices, and adaptive technologies. By pioneering regenerative agriculture, adopting precision technologies, and embracing circular economy models, we can turn today's challenges into opportunities for sustainable growth and resilience.

Innovation must be at the heart of this transformation. With tools like AI, blockchain, and biotech revolutionizing production, transparency, and accessibility, the food industry has an unprecedented opportunity to reinvent itself for the future. But achieving a truly sustainable and equitable food system will require commitment, collaboration, and the courage to reimagine every stage of the food value chain. Together, we can build a system that prioritizes human health, environmental stewardship, and food security for all. Now is the time to lead with purpose and bold innovation, creating a food landscape that not only meets today's demands but safeguards our world for generations to come.

Appendix

EDHEC Business School

Operating from campuses in Lille, Nice, Paris, London and Singapore, EDHEC is one of the top 15 European business schools. Fully international and directly connected to the business world, EDHEC is a school for business, rather than a business school, where excellence in teaching and research focuses on innovation to stimulate entrepreneurship and creativity. EDHEC functions as a genuine laboratory of ideas and produces innovative solutions valued by businesses. The School's teaching philosophy, inspired by its award-winning research activities, focuses on "learning by doing".

The EDHEC Chair for Foresight, Innovation and Transformation

The EDHEC FIT Chair was created in 2018 and its mission is:

"Making organizations FIT to drive desirable futures for prosperity, people and planet."

The double meaning of "fit", referring to building organizational capabilities and "FIT" as an acronym of Foresight, Innovation and Transformation is intentional. Our research is driven by the belief that organisations as we have built them for stable environments are ill equipped for the era of relentless changes that they face today. Change creates challenges, but also opportunities. The ability to embrace and profit from change will determine the winners from the losers in the 21st century. Over more than a decade we have studied organisations that profit from change, developed a maturity model for the future preparedness of organisations and developed a comprehensive set of practices for enabling foresight, innovation and transformation (FIT) by systematically integrating the three.

Creative Dock

Over the past 11 years, we have grown from a disruptive startup into the largest independent player in the corporate venture-building category, with a track record of 100+ ventures. We provide large companies with end-to-end venture building, from idea to execution and scaling, with a singular focus — to create valuable client ventures. Using hard-won strategic insights from our foresight capabilities, we bring ideas to life and turn them into actual MVP products and services. In addition, we collaborate with our clients to unlock new revenue concepts, boost in-house innovation capacity and capability, and leverage existing products and assets for new and improved use.

Thanks to strategic foresight tools and our AI expertise, we are in touch with early-stage and long-term trends, and combinations of both. We have an open-minded approach within the Explore and Venture Design phases, which allows us to build truly transformational innovations, disrupting the market and scaling them to create new revenue for our clients.

Curious to learn more about strategic foresight, AI Transformation, sustainability transformation, and corporate venture building?

Our team of experts would be happy to schedule a call to discuss your needs.

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Our Strategic Foresight Services:

Foresight-Driven Strategy & Innovation enhances future preparedness by upgrading traditional strategy processes, making them more robust, agile, and flexible. Our seasoned team helps organizations move from incremental and reactive innovation approaches to instead adopt bolder, accelerated action to get ahead of the curve.

Foresight Intelligence & Capability-Building leverages cutting-edge research capabilities and tools to uncover foundational insights about the topics that may determine your business's future trajectory. We can train your team to innovate and drive the future with both professional and corporate education, providing continuous learning and competency development.

Elvin Ibishli | Manager, Foresight

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Methods

The insights generated in this foresight study on Food & Nutrition Market are the product of an array of strategic foresight methods. Informed by desk research, the analyst team outlined actionable strategies and Sustainability Pathways tailored to diverse stakeholders across the food value chain. The resulting Implications for 2035 forms the basis for identifying business opportunities that might arise under these future conditions. For a complete and comprehensive foresight analysis, multiple pathways must be considered.

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About this Report

In analyzing these Big Shifts, the report outlines actionable strategies and Sustainability Pathways tailored to diverse stakeholders across the food value chain. These pathways provide a roadmap for companies to integrate sustainable practices, leverage technology, build resilient supply chains, and foster consumer trust. Through strategic recommendations and insights, this report equips leaders with the tools to adapt, thrive, and contribute to a future of accessible, nutritious, and resilient food systems.

This study serves as both a call to action and a practical guide for industry players who seek to align with the shifting landscape of consumer preferences, technological advances, and regulatory standards. By embracing sustainable growth pathways, companies can drive long-term value while playing an essential role in addressing the world's most pressing health, environmental, and social challenges.

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