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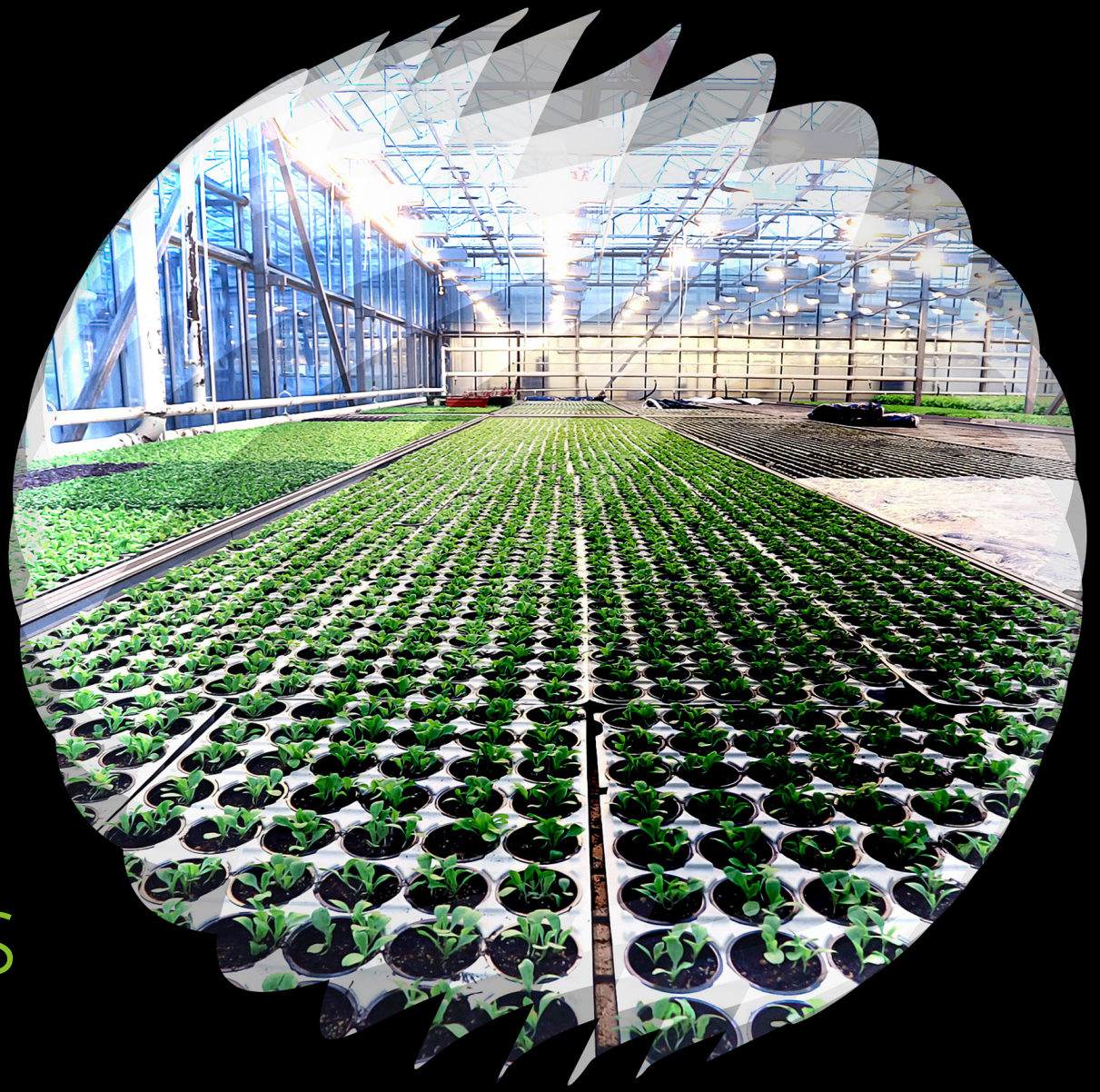
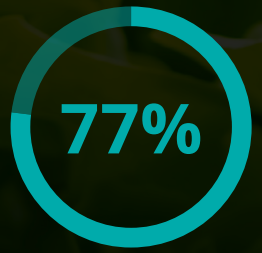


Circular food systems

Transforming our food systems is vital for a sustainable future

The urgent need to transform our food systems is grounded in the environmental impacts linked to production and distribution. Responsible for nearly **30% of global greenhouse gas emissions, the food system's environmental footprint is daunting.**[1] For instance, if we consider food waste as a country, it would be the third-largest emitter of greenhouse gases, trailing only China and the US.[2]



To navigate this transformation, it's important to recognize that **agriculture occupies half of the world's habitable land, with livestock production consuming 77% of this space.**[3] This underlines the critical role of system-level principles in restructuring our food supply model into a sustainable, efficient, and net-positive system.

A PROMISING, STILL EMERGING FRAMEWORK: CIRCULAR FOOD

By mirroring nature's regenerative systems, **we can help eliminate waste and create a food ecosystem that values every resource**, including wasted food and packaging.[4] However, the transition to a circular food ecosystem demands broad, collaborative efforts encompassing changes in land-use practices, technology adoption in agriculture, reevaluation of financial incentives, and promotion of sustainable eating habits among consumers.

Deloitte is committed to contributing to this transformation by initiating innovative climate solutions that engage various stakeholders within the food ecosystem such as the net positive network, Greenspace and Greenlight. By embracing a circular food ecosystem, we can collectively develop a sustainable, efficient, and net-positive food production and supply model. This collaborative approach will not only meet the growing demand for food but also facilitate the achievement of nature and climate goals, thereby fostering a resilient food sector.

Square the circle

LINEAR VS. CIRCULAR ECONOMY

Linear economy principles

Circular economy principles

The distance from farm to table

CHALLENGES IN THE FOOD SYSTEM

As we strive to transform our food systems into more sustainable, efficient, and net-positive models, we are confronted with significant challenges. Our ever-growing global population and associated demands are driving the expansion and degradation of agricultural land, despite compelling evidence of the unsustainable nature of our current food system. **Furthermore, with demand for agricultural commodities predicted to surge by 70% to 100% by 2050, the pressure for land conversion and increased agricultural yield will persist.**[5]

DIVERSIFICATION AND LAND USE

38%

Agricultural land currently covers 38% of the global land surface and, alarmingly, two-thirds of the world's caloric intake relies on just **three crop types.**[6] This land use, heavily subsidized by governments, underscores the urgent need for diversification in our food systems.

90%

Today, **15 crops account for 90% of the global population's caloric intake**, with **three staple crops**—rice, maize, and wheat—making up two-thirds of this total.[7]

123%

This over-reliance on carbohydrates poses a dual challenge. Firstly, while these crops help meet our caloric needs, they lack essential vitamins and nutrients, resulting in a nutrition gap. **In fact, the global calorie supply is 23% higher than what's required.**[8] Secondly, this monoculture approach to agriculture leads to significant waste and contributes to land degradation.

50%

Over the last 30 years, we have lost an area the size of Iraq due to deforestation[9], and **nearly half of the Earth's soil is severely degraded.**

Are we subsidizing the future?

~$700B

Current subsidies often promote environmentally harmful practices **~$700 billion annual agricultural subsidies worldwide** are damaging biodiversity, climate, and water quality.[10]

up to $967B

$722–967 billion annually in financing needed to support biodiversity conservation by 2030.[11]

$2.7T

$2.7 trillion saved by 2050 in annual benefits from a circular economy for food through health cost savings, job creation, and environmental preservation.[12]

FEED THEM WHAT THEY CAME FOR—AND LABEL IT

64% of Gen Z

say they're willing to pay more for environmentally sustainable products.[13]

Despite willingness to pay a premium, inconsistent or unclear labeling around what constitutes sustainable products or ingredients creates confusion.

As we navigate these challenges, the focus must remain on reducing waste and enhancing nutrition to create a food system that caters to our caloric needs and nourishes, all while respecting the planet's capacity and our future generations' needs.

Things to watch for in the new furrow

REGULATIONS, FRAMEWORKS AND POLICIES

Along with the circular transformation in our food systems, policy and legislation is underway to address the role of agriculture and food production in addressing climate change and biodiversity loss. Here are some driving forces happening in the transition towards a climate-neutral economy.

JULY 5, 2021

The **United Nations Convention of Biological Diversity** (CBD) released the first draft of a new global biodiversity framework recognizing agriculture must be part of the solution.[14]

NOVEMBER 8, 2022

The Nature-Based Solutions Roadmap was released by the Biden-Harris Administration at the United Nations Conference of the Parties COP27.[16]

MARCH 22, 2023

The **Green Claims Directive** aims to address greenwashing and food labels by establishing rules to substantiate environmental claims, thereby protecting consumers and accelerating the transition to a circular, climate-neutral economy.[18]

SEPTEMBER 28, 2022

Science-Based Targets Initiative (SBTi) Forest, Land & Agriculture guidance provides standard methodology aiming to tackle Greenhouse Gases (GHGs) from land use by promoting sustainable land management practices.[15]

JANUARY 5, 2023

The EU's **Corporate Sustainability Reporting Directive** (**CSRD**) requires large Food & Beverage (F&B) companies to disclose social and environmental risks to promote transparency and accountability in sustainability performance.[17]

SEPTEMBER 2023

The 2023 Farm Bill is expected to present critical opportunities to transforming food systems by addressing regenerative agriculture, water quality, and waste reduction.[19]

Taskforce on Nature-related Climate Disclosures (TNFD) is developing a risk management and disclosure framework to help assess, manage, and disclose impacts on nature in the food system, promoting better practices that contribute to conservation of resources.[20]

NATURE POSITIVE

More than 400 companies with combined revenues of $2 trillion urged governments to agree to the pledge at Cop15 in December along with launching dedicated initiatives to create more efficient and equitable food systems.[21]

REGENERATIVE AGRICULTURE

The main principles behind regenerative agriculture are farming practices that increase biodiversity, restore soil and ecosystem health, and address inequalities.

Companies are committing millions of acres of farmland towards regenerative agriculture.

To accelerate this transition, partnerships are supporting farmers and rewarding environmental outcomes, including initiatives to help farmers adopt regenerative farming practices with emphasis on soil health, future supply of regenerative ingredients, and technological solutions.[22]

Sustainable sourcing is another key trend, with innovative approaches such as seaweed for feed and fertilizer and data-driven farming helping to reduce carbon emissions and capture impacts. Companies are refocusing their strategic sustainability targets to align with regenerative agriculture and circular economy principles.

The Sustainable Markets Initiative is being rolled out to scale regenerative farming globally to address climate change and biodiversity loss.[23] The initiative aims to:

- **Decide** upon common metrics for environmental outcomes
- **Build** farmers' income from environmental outcomes such as carbon reduction and removal
- **Create** mechanisms to share the cost of transition with farmers
- **Ensure** government policy enables and rewards farmers for transition
- **Develop** new sourcing models to spread the cost of transition

New tools in the barn?

EMERGING AND ENABLING TECHNOLOGIES

To achieve a circular food ecosystem, we need greater efficiency and visibility across products and supply chains, including the origin of materials, activities of suppliers, and data on environmental and social impacts throughout the value chain. Several emerging technologies are enabling this shift including Supply Chain Management Platforms, Geographical Information Systems, Drone Technologies, Artificial Intelligence, Blockchain, 3D Printing, and Digital Twins.

SUPPLY CHAIN MANAGEMENT PLATFORMS

To achieve greater visibility within supply chains, we must prioritize more accurate calculations of true resource impacts and operational control. Supply chain data platforms such as Enterprise Resource Planning, Customer Relationship Management, and Supplier Relationship Management, collect supply chain information and develop a unified view of the overall supply chain, enabling data-driven decisions to optimize efficiency, lower waste, and enhance reuse.

AUTONOMOUS DRONES AND SATELLITE IMAGES

Autonomous drones play a critical role in driving sustainability within agriculture, from land surveying, crop growth assessment, livestock management, habitat intactness, and irrigation.

Geospatial tools are critical to showing the impact we have on nature. Technology that combines satellite images and Artificial Intelligence such as WWF's Forest Foresight can be used to predict areas at risk of deforestation.[24]

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This is not your father's tractor

ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) has the potential to help design waste-free economies for food. Greater awareness is needed in agri-food sectors about how AI can enhance supply chains and help fostering digital transformation to improve production and circular management of human resources. Robotics and machine learning play a role in scaling regenerative agriculture, reducing chemical inputs, and helping farmers anticipate problems, reduce waste, and create adaptive strategies to maximize yields and profits.

BLOCKCHAIN

Blockchain technology provides an opportunity for greater transparency and traceability within food systems, connecting all parties in a product's supply chain. It can reduce demand-supply imbalances, central causes of food loss, and be used for sustainably sourcing and traceability while facilitating accurate calculation of carbon emissions in the supply chain.

3D PRINTING

3D printing contributes to the development of closed-loop manufacturing processes by introducing new materials that repurpose waste. Innovative projects have used food waste as ink for food 3D printers, 3D printing filaments made from fishing nets or plastic, and even termite waste.

DIGITAL TWINS

Digital twin technology is an emerging area with significant potential to accelerate the transition towards circular and sustainable supply chains. A digital twin is an evolving digital profile of the historical and current behavior of a physical object or process that helps optimize business performance, a digital copy of the physical world.[25] By leveraging digital twins, we can gain an in-depth assessment of products and processes before development and deployment, allowing for the adoption of optimal strategies without wasting resources. This includes optimizing recycling, repairs, and reuse processes, contributing to the overall goal of creating sustainable, efficient, and net-positive food production and supply models.

Value from systems level change: $10T by 2030[26]

Applying the principles of the circular economy to supply chains brings to light the interconnectedness of our food systems. Governments, the private sector, Non-Governmental Organizations and society all have a role to play in creating sustainable food systems.

Using the principles of the circular economy and technology to increase visibility over supply chains will help to prevent the degradation of ecosystems and the loss of species we all depend on. Visibility over supply chains and resources increases security of supply by preventing overuse, facilitates end markets and collaboration between supply chain actors.

ACTION STEPS TO TAKE

Embed circularity and nature impacts into organizational strategy and make timebound, science-based commitments on nature positive activities.

Diversify product portfolios and move away from monocultures. Include low impact ingredients in products and help consumers understand the benefits of sustainably produced resources.

Map supply chain risks and opportunities and invest in supply chain visibility and impact measurement technologies to measure and disclose total impact.

Collaborate with multiple actors in the value chain through cost and knowledge sharing, data enhancement and investment in sustainable solutions that create new circular value.

We'd love to start the conversation

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