ELLEN MACARTHUR FOUNDATION

CIRCULAR ECONOMY GROWTH POTENTIAL BY SECTOR

Food and agriculture

Introduction

The circular economy is built on three principles, driven by design: eliminate waste and pollution, circulate products and materials (at their highest value), and regenerate nature. A circular economy gives us the tools to tackle climate change and biodiversity loss together. It can scale fast across industry to create value and jobs, while increasing the resilience of supply chains and delivering massive economic growth potential.

Circular economy opportunities can be found in nearly every sector in the global economy. The plastics, fashion, and food sectors stand out as some of the most likely to be significantly impacted or even disrupted by the circular economy in the near term, driven by innovation, regulation, and evolving customer preferences. The electronics, transport, and technology sectors also have high circular economy growth potential.

Moving from a linear to a circular economy is not only about financing perfectly circular companies or turning away from extractive ones. This transformation will require all sectors to shift fast and at scale to achieve climate targets and build a resilient economy.

This document provides a qualitative assessment of circular economy growth potential across food and agriculture.

A full sector-by-sector analysis can be found in our paper Financing the circular economy: capturing the opportunity.

Food and agriculture

Key circular economy strategies

- Source food grown regeneratively, and locally, where appropriate
- Apply circular practices to controlled or precision agriculture solutions (e.g. nutrient and water looping for vertical or indoor farming)
- Prevent surplus edible food in production
- Design food products and supply chains to eliminate waste, bring production closer to consumption, and regenerate nature and soils
- Transform food by-products into new products, biomaterials, and agriculture and aquaculture inputs to return nutrients to the soil
- Collect and recover resources from post-consumer organic waste

Drivers of circular economy growth potential

Innovation and corporate action	
Industry action	• Increasing industry action on climate change mitigation and tackling biodiversity loss, e.g. OP2B, an international business coalition on biodiversity including Barry Callebaut, Danone, McCain, Nestlé, Walmart • Growing industry understanding of circular economy benefits beyond packaging and waste management
Innovation	• Emerging business models that redistribute surplus food and reduce food waste • Increasing AgTech innovation (e.g. regenerative agriculture, microbe engineering, robotics, advanced data analytics, and agriculture management software)

Policies and regulation	
Increasing policies and regulation	• Increasing regulation (e.g. reducing food waste), with fragmented incentives for regenerative practices, but attention is growing, e.g. the EU's New Circular Economy Action Plan, EU 'Farm to Fork' Strategy, EU Biodiversity Strategy, carbon farming initiatives in California (e.g. Marin Carbon Project)
Public procurement	• Public procurement policies (e.g. Brazil National School Feeding policy prioritises local, organic, regenerative food sourcing; Good Food Purchasing Program in cities across the United States)
Political priorities	• Attention on food security by shifting to regionalised, resilient food systems, reinforced by the Covid-19 crisis, is creating a rapidly changing landscape (e.g. relocalisation of supply chains)

Customer preferences and macrotrends	
Health	• Rising awareness of food-related health issues, including diabetes and obesity • Growing preference for diverse ingredients (e.g. proteins, indigenous species) and shifting dietary preferences (e.g. towards plant-based, local and seasonal)
Climate change and global challenges	• Emerging awareness of the connection between agriculture and biodiversity loss, soil depletion, and water issues • Increasing understanding of agriculture as major contributor to climate change (CO_2 emissions from the global food system could be reduced by 49% in a circular scenario by 2050)[1]

Types of circular economy opportunity areas

- Circular design and innovation
- Circular business models
- Reuse, repurpose, and redistribute
- Repair, remanufacture, and refurbish
- Collect, sort, and recycle
- Regenerative and renewable practices and materials
- Enabling digital technologies

Current circular economy opportunity areas

Technologies to turn organic waste streams, including human waste, into commercially viable agriculture inputs

Regenerative agricultural practices, including shifting from synthetic to organic fertilisers, employing crop rotation, and using greater crop variation

(e.g. agroecology, rotational grazing, agroforestry, conservation agriculture, and permaculture)

Community Supported Agriculture model, which connects growers and consumers providing mutual support and sharing the risks and benefits of food production

Geospatial mapping solutions that provide visibility into food flows and organic waste streams to effectively capture and transform them

Design of food products and menus based on circular economy principles

(e.g. innovate new plant-based protein options as alternatives to meat and dairy, develop products and recipes that use food by-products as ingredients, and encourage customers towards them)

Digital customer-facing tools to create transparency on food products and supply chains

Examples: **Large corporates**

Danone
has committed EUR 2 billion (USD 2.4 billion) to scaling regenerative agriculture, reducing virgin plastic in packaging, and shifting to renewable energy, and has pledged to source 100% of ingredients produced in France from regenerative agriculture by 2025

AB Inbev
turns brewing by-products into protein-rich food products

Balbo Group
uses regenerative farming practices to achieve 20% higher productivity than conventional sugarcane production

General Mills
has committed to advance regenerative agriculture practices on 1 million acres of farmland by 2030, and have invested over USD 5 million to advance soil health on US agricultural lands, including RegenAg pilot projects

Examples: **Innovators**

Apeel Sciences
has developed an invisible coating made from plant material that extends the shelf-life of loose fruit and vegetables

Winnow
uses AI machine-vision technology to reduce food waste in commercial kitchens

Sanergy
sanitation company treats human waste with black soldier flies to create agriculture products

Row 7
seed company brings diverse plant varieties to food service players, individuals, and chefs

Feitosa Foodtech
turns surplus bananas, otherwise wasted on farms, into banana ketchup

Agricycle
provides drying technology to farmers in places like Africa to turn surplus fruits into shelf-stable snacks

Kaffe Bueno
valorises spent coffee grounds into cosmetics and food products

Greenplat's Plataforma Verde
blockchain software provides geospatial mapping of organic material flows

Ecovative
grows mycelium-based biomaterials to create, e.g. alternative meat products and biodegradable packaging materials

Agriprotein
uses insects to convert organic waste into valuable proteins

Endnotes

1 Material Economics, *The Circular Economy: the next low-carbon frontier* (2019)

The Ellen MacArthur Foundation, an international charity, develops and promotes the circular economy in order to tackle some of the biggest challenges of our time, such as climate change, biodiversity loss, waste, and pollution.

We work with our network of private and public sector decision-makers, as well as academia, to build capacity, explore collaborative opportunities, and design and develop circular economy initiatives and solutions.

Increasingly based on renewable energy, a circular economy is driven by design to eliminate waste, circulate products and materials, and regenerate nature, to create resilience and prosperity for business, the environment, and society.

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