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Project Result 5: Digital Course in Circular Agriculture

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“Strengthening Key Competences in Agriculture
for Value Chain Knowledge”



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Digital Course: Introduction to Circular Agriculture

Chapter 2: Objectives and potentials of Circular Agriculture

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Digital Course: Introduction to Circular Agriculture

Chapter 2: Objectives and potentials of Circular Agriculture 2.1. EXPLORATION OF THE OBJECTIVES OF CA

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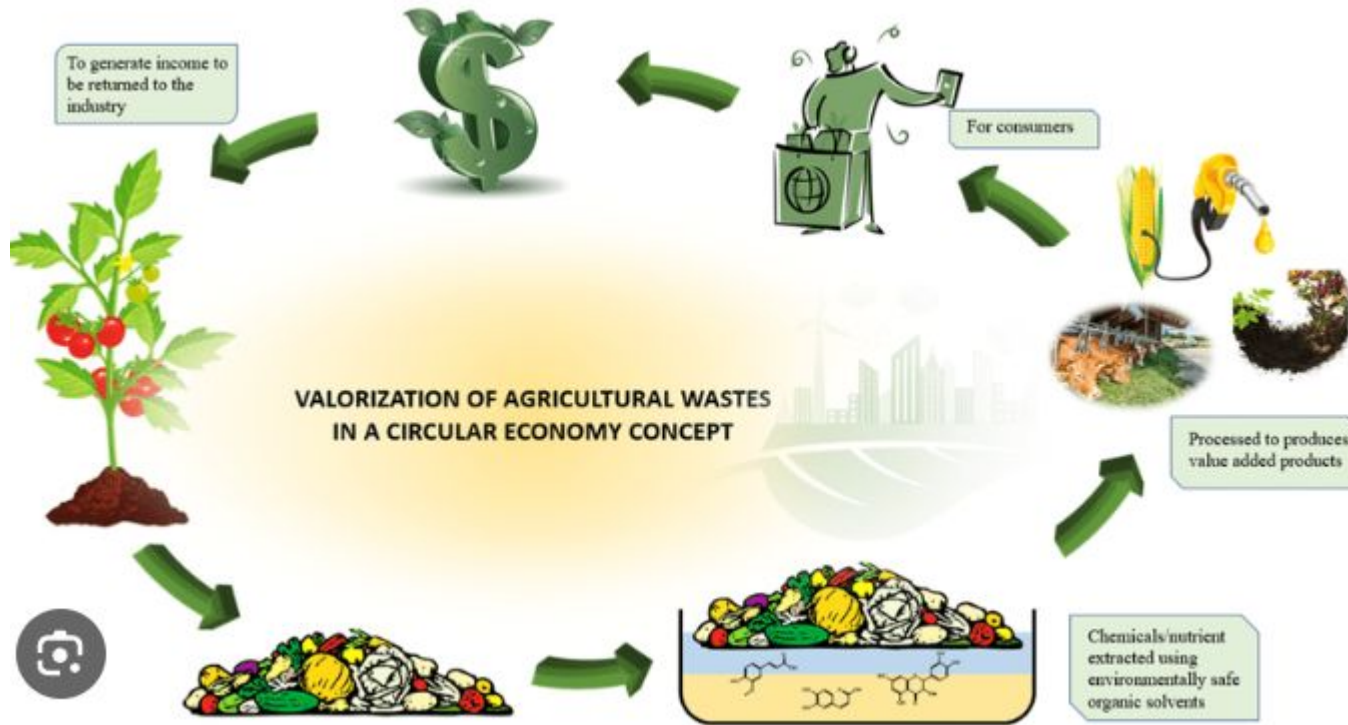
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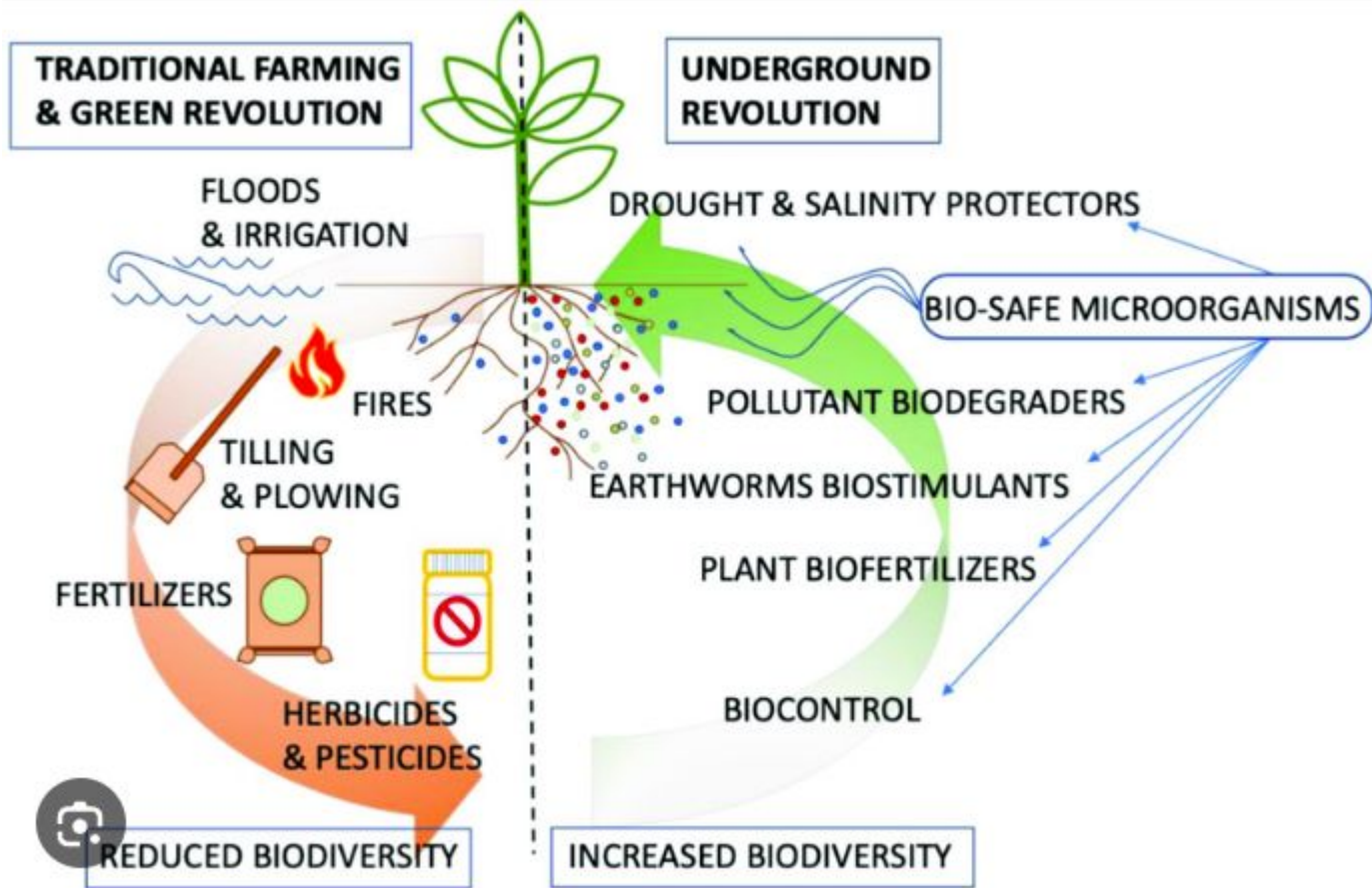


Introduction to Circular Agriculture (CA)



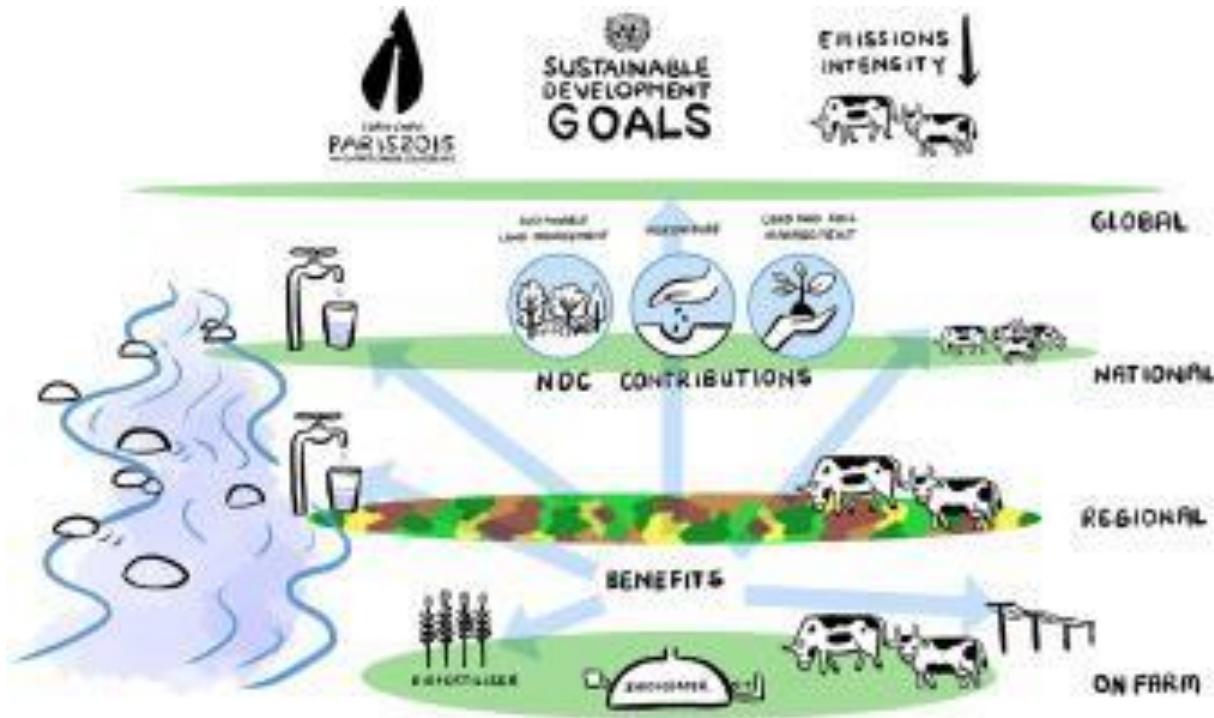
- In this presentation, we will explore the concept of circular agriculture and its objectives.
- Circular agriculture is a **sustainable approach** to farming that aims to minimize waste and maximize resource efficiency.
- Circular agriculture is a **closed-loop system** that minimizes waste and maximizes resource efficiency.
- It mimics the **natural cycles** found in nature.
- It is a promising solution for the challenges facing agriculture today, such as climate change, pollution, and resource depletion.

The Problem with Traditional Agriculture 🌱



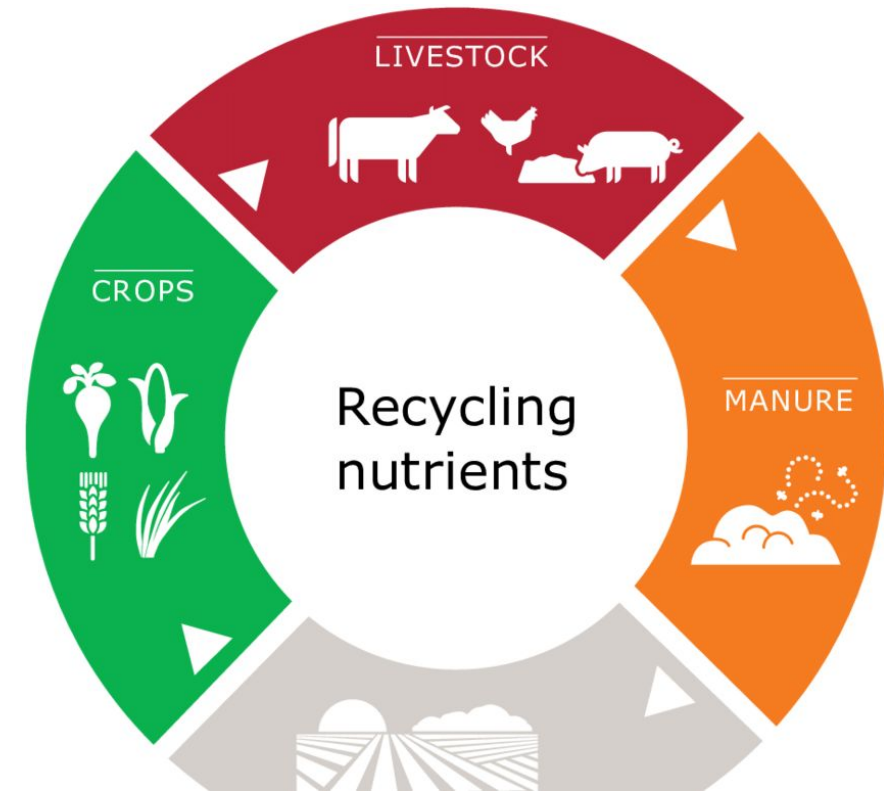
- The traditional linear model of agriculture is unsustainable.
- It is based on extracting resources, production, consumption, and waste disposal.
- It relies on the heavy use of fertilizers, pesticides, and water, which can lead to pollution and resource depletion.
- This model depletes natural resources, pollutes ecosystems, and contributes to climate change.
- Traditional agriculture can contribute to climate change through the release of greenhouse gases.

Circular agriculture aims to:



- Reduce reliance on external inputs
- Close nutrient loops
- Regenerate soils
- Minimize environmental impact
- Reduce resource requirements
- Reduce land use
- Reduce chemical fertilizer and waste
- Promote smallholder farming
- Improve food security and nutrition
- Create rural jobs
- Reduce barriers to entry for women in agriculture
- Promote sustainable development

Objectives of Circular Agriculture:



- Minimize waste: A core principle is to create a closed-loop system where everything is reused or recycled, eliminating waste.
- Mimic natural processes: Circular agriculture aims to emulate nature's regenerative cycles, promoting sustainability.
- Maintain soil health: By returning nutrients to the soil through organic fertilizers, circular agriculture promotes soil fertility and productivity.
- Reduce reliance on external inputs: The system should minimize dependence on external resources like fertilizers and focus on closed-loop nutrient cycles within the farm.
- Decouple food production from environmental harm: Circular agriculture strives to achieve food production that minimizes negative impacts on the environment, such as water pollution and greenhouse gas emissions.
- Implement localized solutions: While some general principles apply, circular agriculture acknowledges the need for adaptable and context-specific approaches based on local conditions.

Key Objectives of Circular Agriculture 🌱



- **Minimize External Inputs:** Reduce reliance on external resources like fertilizers and pesticides by using natural alternatives and on-farm resources.
- **Close Nutrient Loops:** Ensure nutrients are recycled within the farm system through practices like composting and manure management, reducing the need for chemical fertilizers.
- **Regenerate Soils:** Implement practices such as cover cropping, crop rotation, and reduced tillage to enhance soil health and fertility.
- **Minimize Environmental Impact:** Focus on reducing pollution, conserving water, and protecting biodiversity to create a more sustainable farming system.



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2.2. POTENTIAL ECONOMIC BENEFITS ASSESSION

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Economic Benefits of Circular Agriculture



Image: Sustainable Global Resources Ltd.
Recycling Council of Ontario

- **Reduced Input Costs:** Lower expenses on chemical fertilizers, pesticides, and other external inputs by using natural and recycled alternatives.
- **Waste Reduction and New Revenue Streams:** Convert agricultural waste into valuable products such as bio-fertilizers, bioenergy, and animal feed, reducing waste disposal costs and generating additional income.
- **Improved Water Management:** Efficient use and recycling of water resources can lead to cost savings on water acquisition and potentially higher yields due to better water management practices.

Circular Economy Action Plan (EU)



- **Overview:** The Circular Economy Action Plan is a key element of the European Green Deal, aiming to transition Europe towards a more sustainable economic model.
- **Objectives:** Improve the durability, reusability, renewability, and maintainability of products. Address the presence of hazardous chemicals and increase the content of recycled materials in products.
- **Implementation:** Developed with the participation of businesses and stakeholders, the plan is supported by the European Commission to drive sustainable development across Europe.

Circular agriculture nature



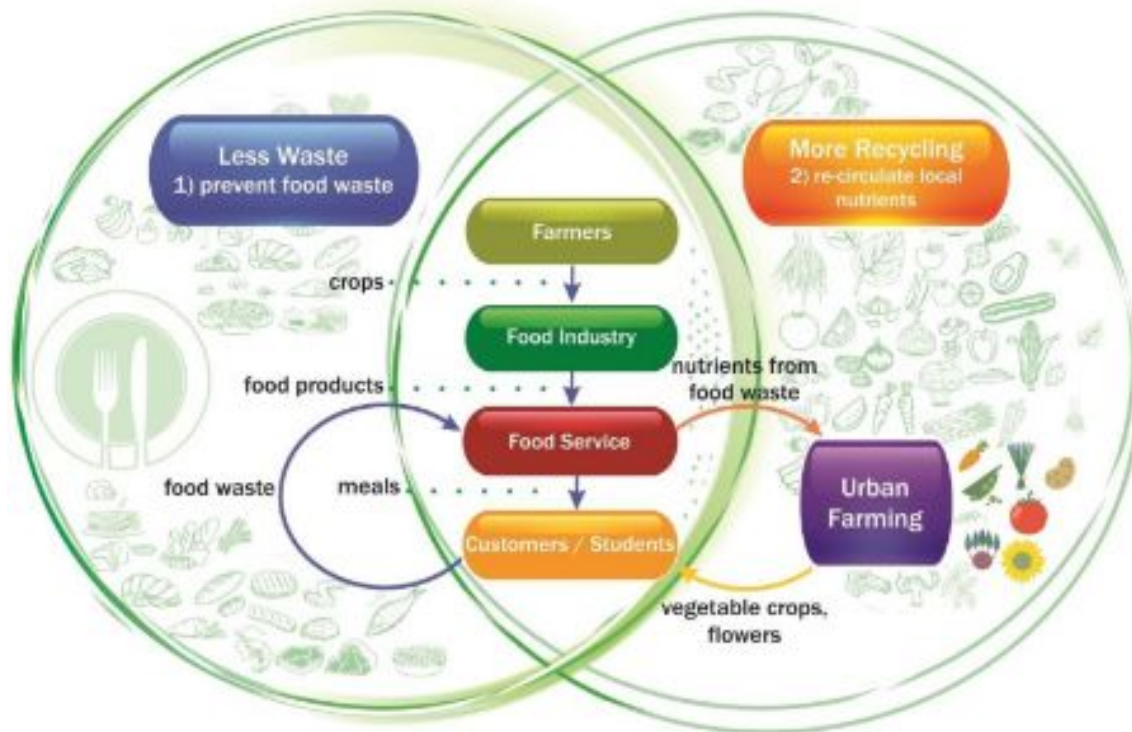
- **Maximize Resource Use:** Extend the value of agricultural products, co-products, and by-products throughout the supply chain by finding new uses for agricultural waste, such as bioenergy production and soil amendments.
- **Regenerate Natural Systems:** Implement regenerative agriculture practices that improve soil health, reduce greenhouse gas emissions, enhance water storage capacity, and increase carbon sequestration in soil and plants.

Strategies for Sustainable Development



- **Decouple Food Production from Environmental Harm:** Achieve food production that minimizes negative environmental impacts like water pollution and greenhouse gas emissions by adopting sustainable farming practices.
- **Promote Localized Solutions:** Recognize the need for adaptable and context-specific approaches based on local conditions to ensure the effectiveness and sustainability of circular agriculture practices.

Circular Agriculture and Food Security



- **Objective:** Improve food security and nutrition by promoting diverse production systems that provide a wide variety of nutritious food.
- **Benefits:** Increase the availability of healthy food options, particularly in rural areas, by integrating crops and livestock and reducing dependency on external inputs.

Promoting Sustainable Rural Economies



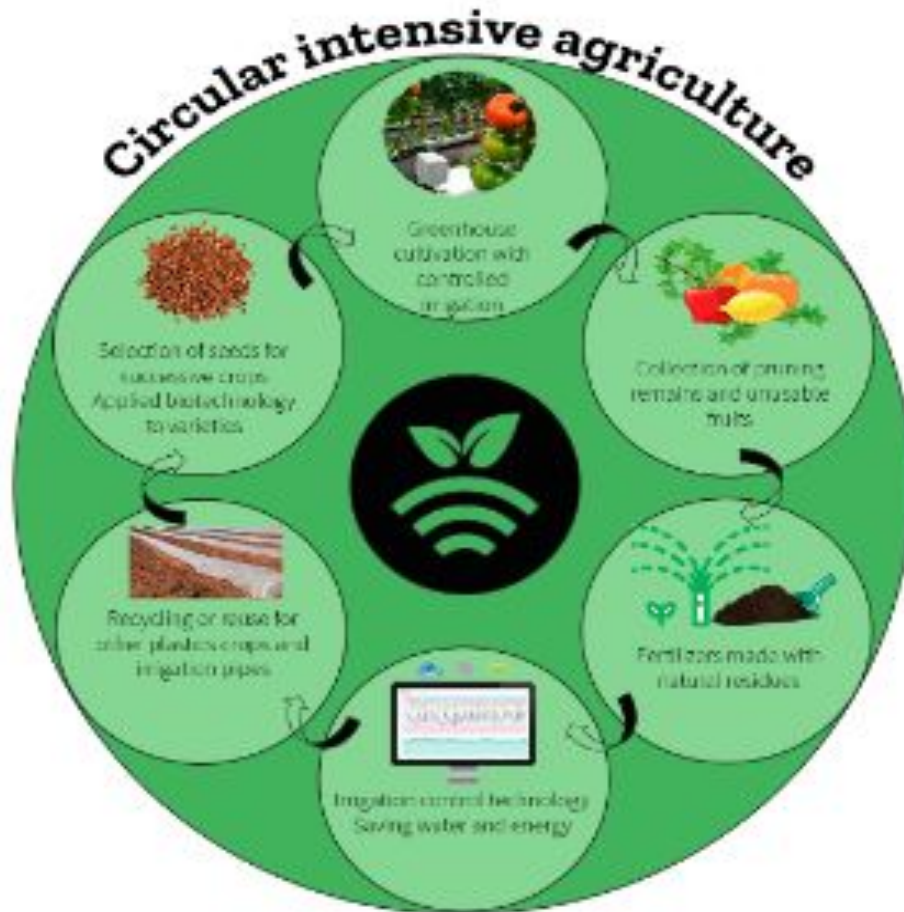
- **Objective:** Create rural jobs and boost local economies through the labor-intensive nature of circular agriculture practices.
- **Empowerment:** Lower input needs in circular agriculture can empower smallholder farmers and reduce barriers to entry for women, enabling more inclusive participation in farming.

Future Outlook and Challenges



- **Opportunities:** Market differentiation through sustainable practices, allowing farmers to attract environmentally-conscious consumers, command premium prices, and develop brand loyalty.
- **Challenges:** Initial investment costs, need for education and training on new practices, adaptation to local conditions, and alignment with policy frameworks are key challenges to widespread adoption of circular agriculture.

Benefits of Circular Agriculture



- **Benefits for farmers:**

- Reduced input costs
- Improved soil health
- Increased yields
- New revenue streams

- **Benefits for the environment:**

- Reduced pollution
- Conserved water
- Reduced greenhouse gas emissions
- Improved biodiversity

- **Benefits for consumers:**

- More sustainable food
- Safer food
- More affordable food

Conclusions



- **Summary:** Circular agriculture aims to transform farming into a sustainable and resilient system by focusing on closed-loop cycles, resource efficiency, and environmental protection.
- **Impact:** By enhancing resource efficiency, reducing waste, and promoting economic and environmental well-being, circular agriculture offers a promising path towards a sustainable future.
- **Call to Action:** Embrace circular agriculture practices to ensure a more sustainable and profitable future for farming and contribute to global efforts in combating climate change and promoting sustainable development.



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2.3. IDENTIFICATION OF NEW JOB OPPORTUNITIES

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New Job Opportunities in Circular Agriculture



- The transition to circular agriculture offers exciting new opportunities for farmers and the agricultural sector as a whole.
- This presentation will explore the potential for circular agriculture (CA) to create new job opportunities.
- By analyzing the core principles and practices of CA, we will identify areas requiring novel green skillsets and expertise, leading to the emergence of new professions and the expansion of existing ones.
- We will also discuss how innovation and technological advancements play a crucial role in driving job creation within the circular bioeconomy fostered by CA.

Job Opportunities in Circular Agriculture



- Circular agriculture aims to create a sustainable, regenerative agricultural system that minimizes waste and maximizes resource use efficiency.
- Circular agriculture is a closed-loop system that mimics nature's cycles.
- Benefits include enhanced soil health, biodiversity, and ecosystem resilience.
- The transition to circular agriculture creates new job opportunities and transforms existing roles.
- Key sectors include regenerative farming, waste management, water resource management, and community engagement.

The Need for Green Skills



Typology of Green Skills



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- The transition to a circular agriculture requires a new set of skills, often referred to as "green skills."
- "Green skills encompass the knowledge, abilities, and attitudes necessary to perform tasks and solve problems in a way that is environmentally sustainable."
- Farmers need green skills to understand and implement CA practices effectively.

Regenerative Agriculture Specialist



- Focuses on farming practices that restore soil health, enhance biodiversity, and improve ecosystem resilience.
- Skills: Crop rotation, cover cropping, reduced tillage.
- Importance: Reduces reliance on synthetic fertilizers and enhances farm sustainability.
- Practices: Restore soil health; Enhance biodiversity; Improve ecosystem resilience.
- Techniques include: Crop rotation; Cover cropping; Reduced tillage.

Sustainable Crop Manager



- Manages crop production with an emphasis on sustainability.
- Skills: Crop rotation and diversification, sustainable pest and disease management.
- Importance: Reduces monoculture farming, enhances resilience against pests, diseases, and climate change.

Sustainable Pest and Disease Manager



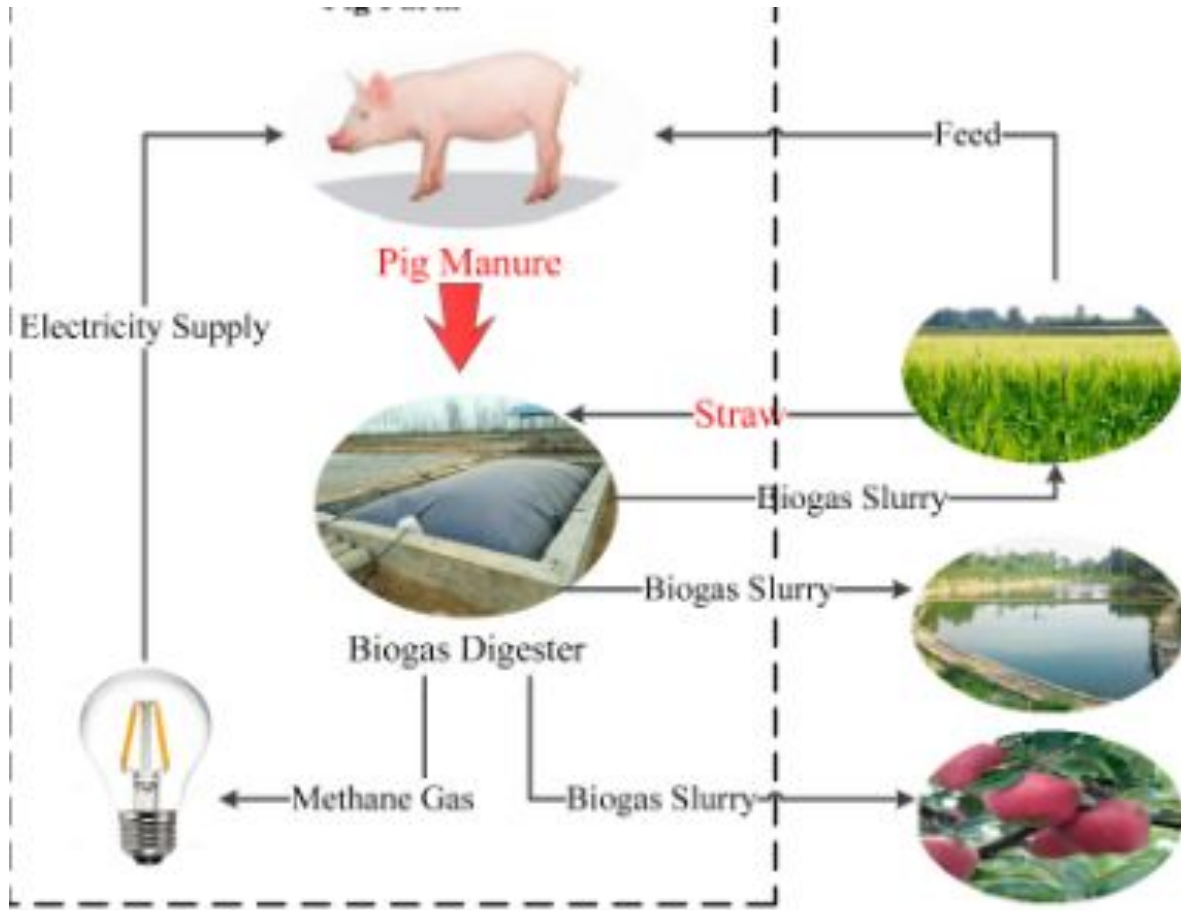
- Oversees pest and disease management with a focus on sustainability. Develop and implement strategies for managing pests and diseases in a sustainable way.
- Skills: Integrated Pest Management (IPM) techniques, use of biological controls.
- Importance: Minimizes chemical pesticide use, promotes environmental stewardship.
- Techniques include:
 - Integrated pest management (IPM): This approach uses a combination of methods to control pests, such as biological controls, cultural practices, and mechanical controls, in order to minimize the use of chemical pesticides.
 - Organic pesticides: These are pesticides derived from natural materials, such as plants, animals, or bacteria. They are generally less harmful to the environment and human health than synthetic pesticides.
 - Beneficial insects: These are insects that prey on pests or help to pollinate crops. Sustainable pest and disease managers may encourage the presence of beneficial insects by planting flowering plants or providing habitat for them.

Water Resource Manager



- Manages efficient water practices in agriculture.
- Skills: Drip irrigation, rainwater harvesting, sustainable irrigation scheduling, rainwater harvesting.
- Importance: Reduces water waste, ensures efficient use of water resources.

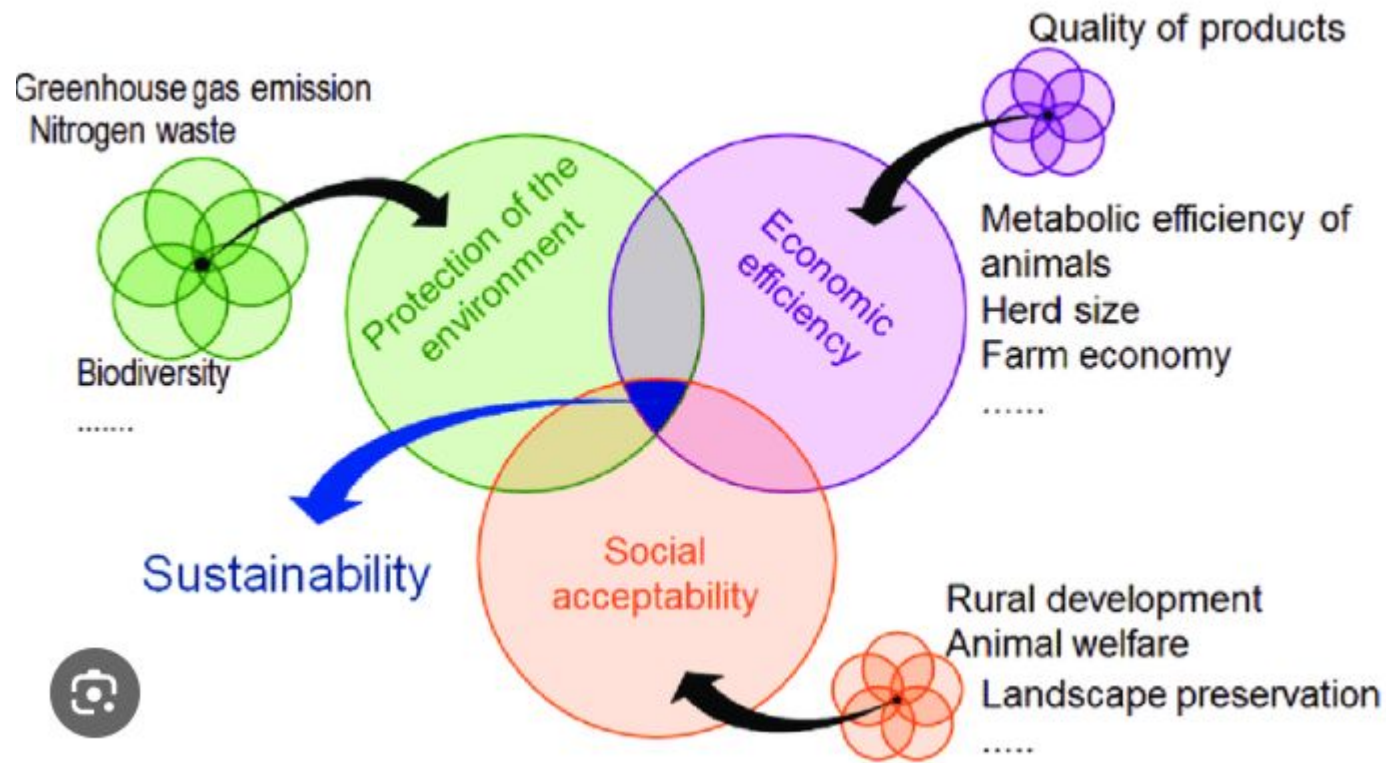
Agriculture Waste Reduction and Recycling Manager



- Develops and implements strategies for waste reduction and recycling.
- Skills: Composting, mulching, organic waste management.
- Importance: Converts waste into valuable soil amendments, reduces need for synthetic fertilizers.



Sustainable Livestock Manager



- Sustainable livestock managers oversee livestock operations with a focus on:
 - Rotational grazing
 - Improved animal welfare
 - Efficient feed

Community Engagement Manager



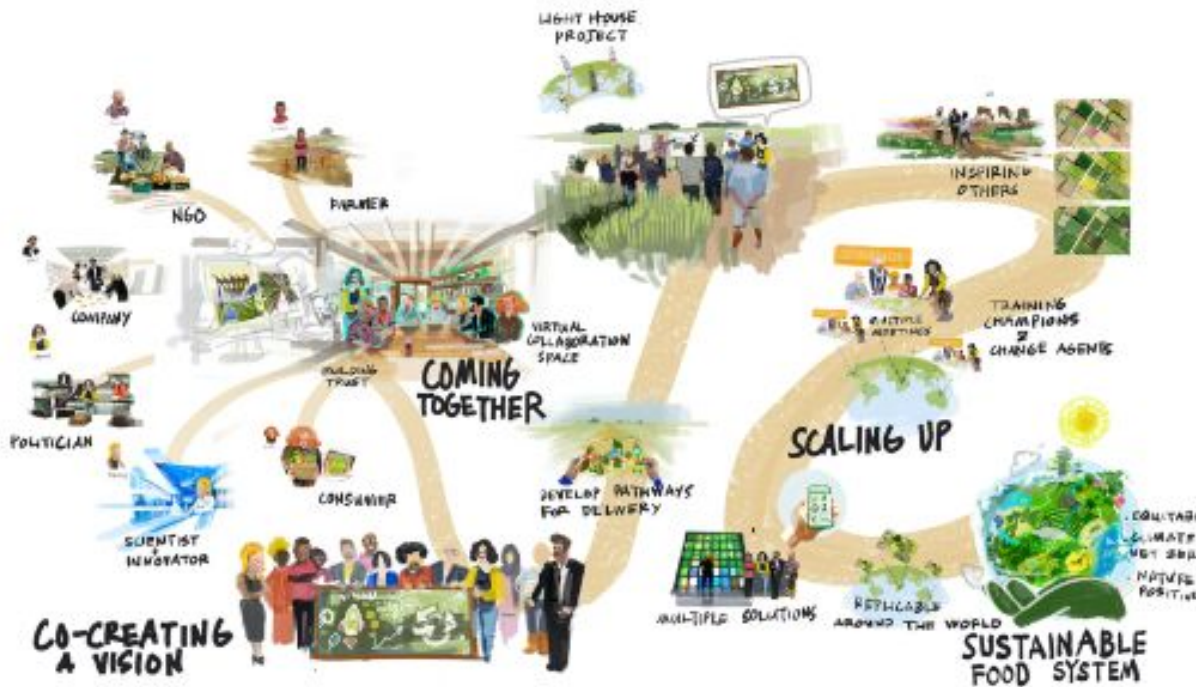
- Engages local communities in sustainable farming practices.
- Skills: Education, promotion of sustainable food choices, support for local agriculture.
- Importance: Fosters community support, enhances knowledge about sustainable farming.
- Engaging local communities in sustainable farming practices.
- Promoting education, support for local agriculture

Sustainable Production Manager



- Overseeing practices that prioritize environmental and social sustainability
- Objectives: reducing emissions, using renewable energy, ensuring fair worker conditions

Embracing Circular Agriculture for Job Creation



- Circular agriculture offers significant job opportunities by fostering innovation and sustainable practices.
- Importance: Revitalizes rural communities, creates a resilient and resource-efficient food system.
- Future Outlook: Further research and targeted training programs needed to equip the workforce with green skills.



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2.4. Showcase examples of economic development

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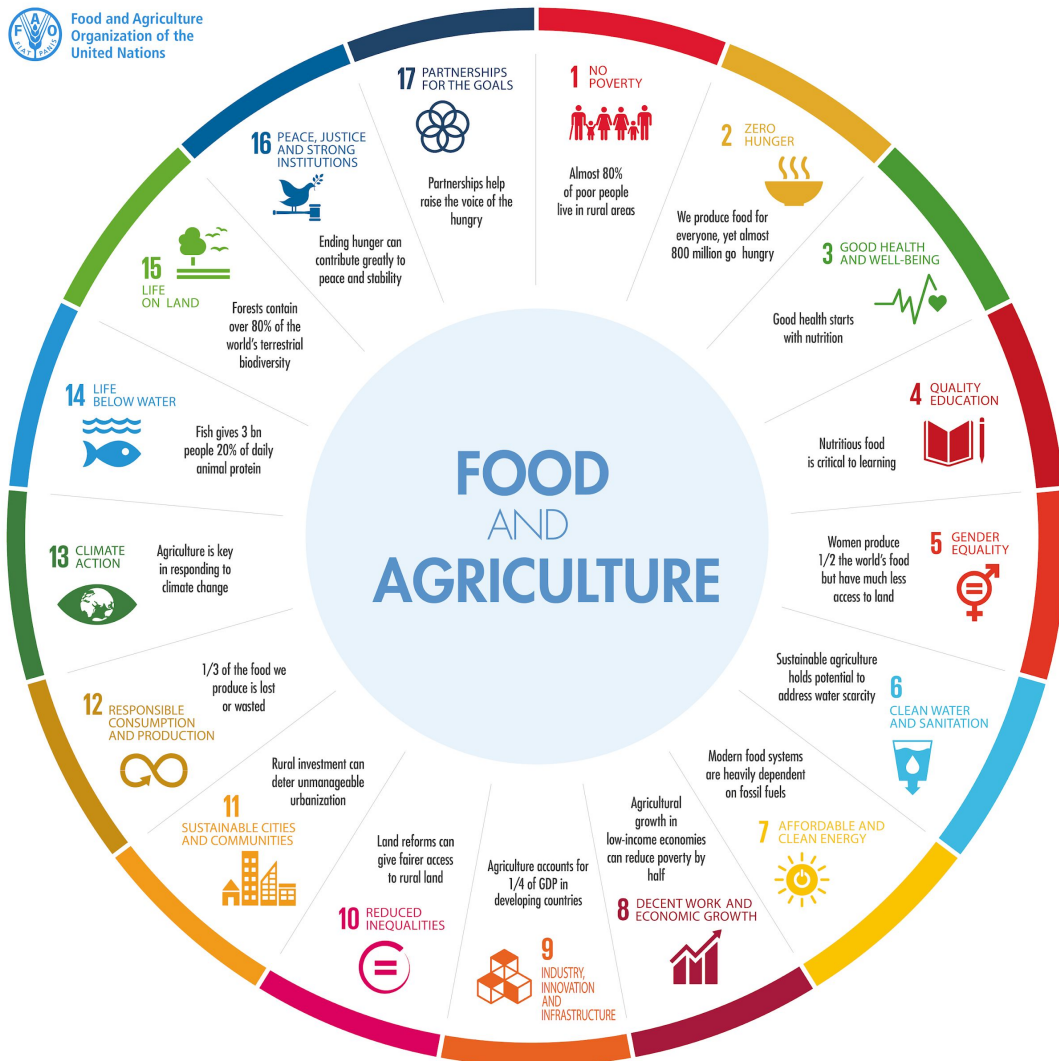
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The Current Food System: Challenges and Impact



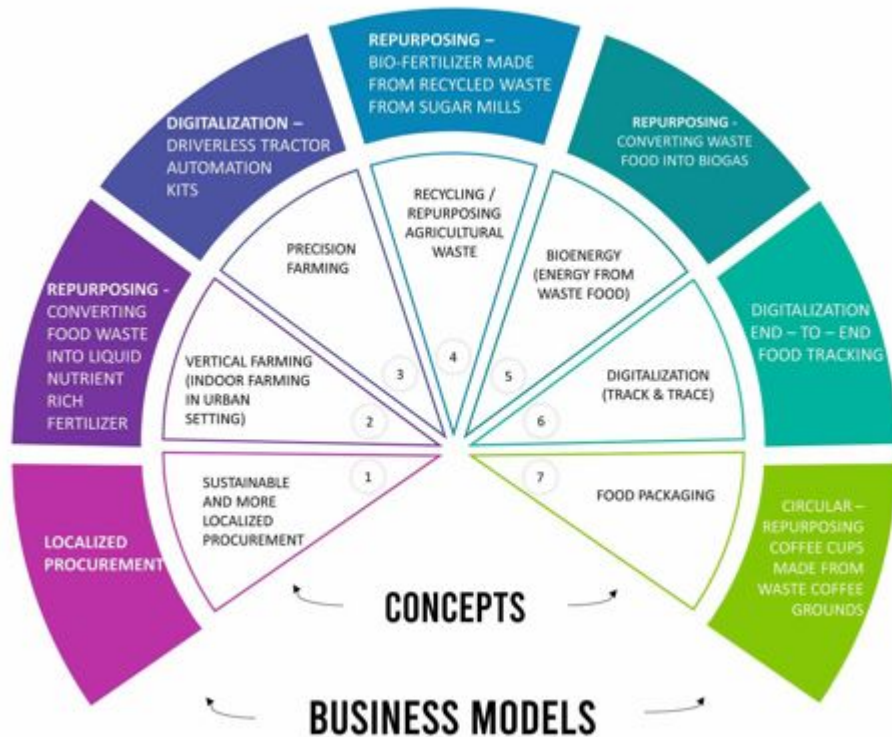
- The current food system is dominated by industrial farming, which focuses on maximizing output.
- While this has led to increased food production, it has significant negative impacts on the environment and society.
- **Key Issues:**
 - **Greenhouse Gas Emissions:** Industrial farming is a leading source of CO₂, methane, and nitrous oxide emissions.
 - **Pollution:** Pesticides, herbicides, and fertilizers pollute soil, water, and air.
 - **Species Extinction:** Habitat destruction and pesticide use contribute to the loss of biodiversity.
 - **Slow Adoption of Sustainable Practices:** Farms are slowly moving towards resource-efficient farming methods.

Understanding the Circular Economy



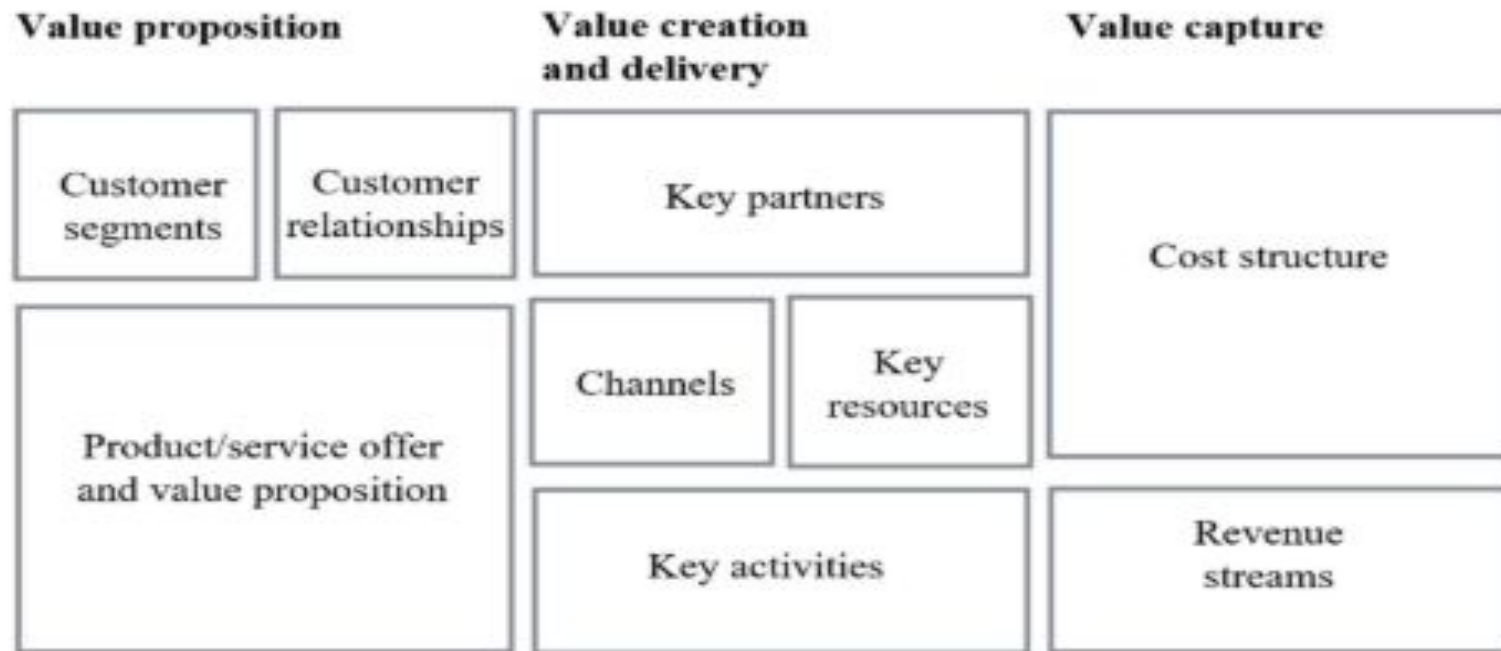
- **A circular economy is an economic system aimed at eliminating waste and the continual use of resources.**
- Key Principles:
 - Design Out Waste and Pollution: Products are designed to reduce waste and environmental impact.
 - Keep Products and Materials in Use: Maximizing the use of products and materials through reuse, repair, remanufacturing, and recycling.
 - Regenerate Natural Systems: Enhancing natural resources and ecosystems rather than depleting them.

Circular Business Models in Agriculture

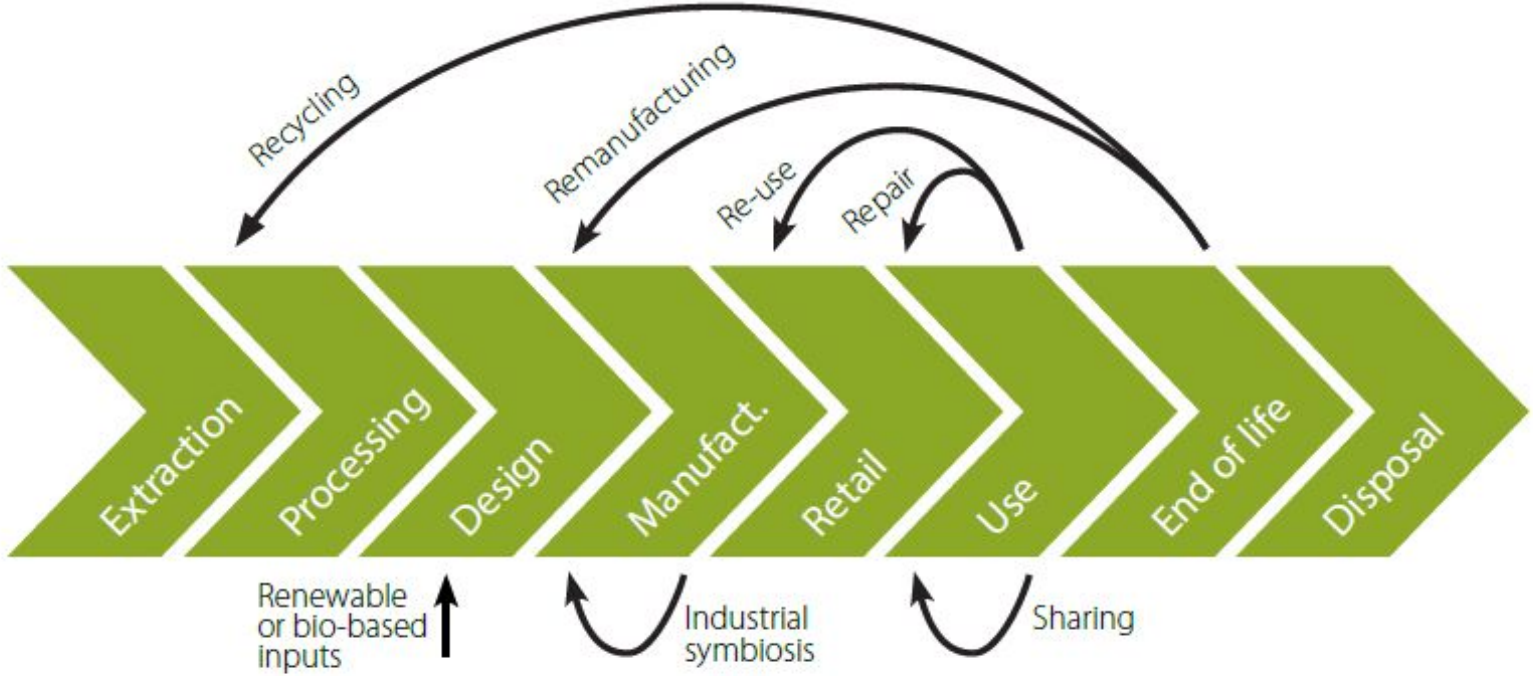


- Circular business models help implement the circular economy at an organizational level, focusing on value creation while minimizing ecological and social costs.
- Key Components:
- Value Proposition: Delivering value to customers and stakeholders in a sustainable manner.
- Value Creation and Delivery: Efficient use of resources and sustainable processes.
- Value Capture: Economic viability through cost-saving and sustainable practices.

Business model conceptualization, adapted from Osterwalder and Pigneur (2010)



Circular business models operate in different parts of the value chain (Accenture (2015) ; OECD, 2018)



Source: Adapted from Accenture (2015)

Case Study: Dutch Farmers on the Path to Circularity



- The Dutch government aims to establish a circular economy by 2050, and many farmers are adopting circular practices.
- **Examples of Farms:**
 - **Conventional Pig Farmer:** Uses residual flows from the food industry and invests in sustainable energy.
 - **Biodynamic (BD) Multifunctional Farms:** Combine livestock, crops, nature conservation, and direct sales through farm shops and webshops.
 - **High-tech Broiler Farm:** Implements technology to reduce ammonia emissions and improve sustainability.
 - **Organic Mixed Farm:** Integrates dairy cattle with arable crops for a closed nutrient cycle.

Farmers' Motivations for Adopting Circular Practices



- **Personal Motivations:**

- Health Concerns: Some farmers transition to circular practices due to personal health issues and distrust in conventional food systems.
- Environmental Awareness: Many farmers are motivated by a desire to protect the environment and ensure sustainable futures for their families.
- Economic Incentives: Circular practices can offer economic benefits such as cost savings and new revenue streams.

- **Quotes from Farmers:**

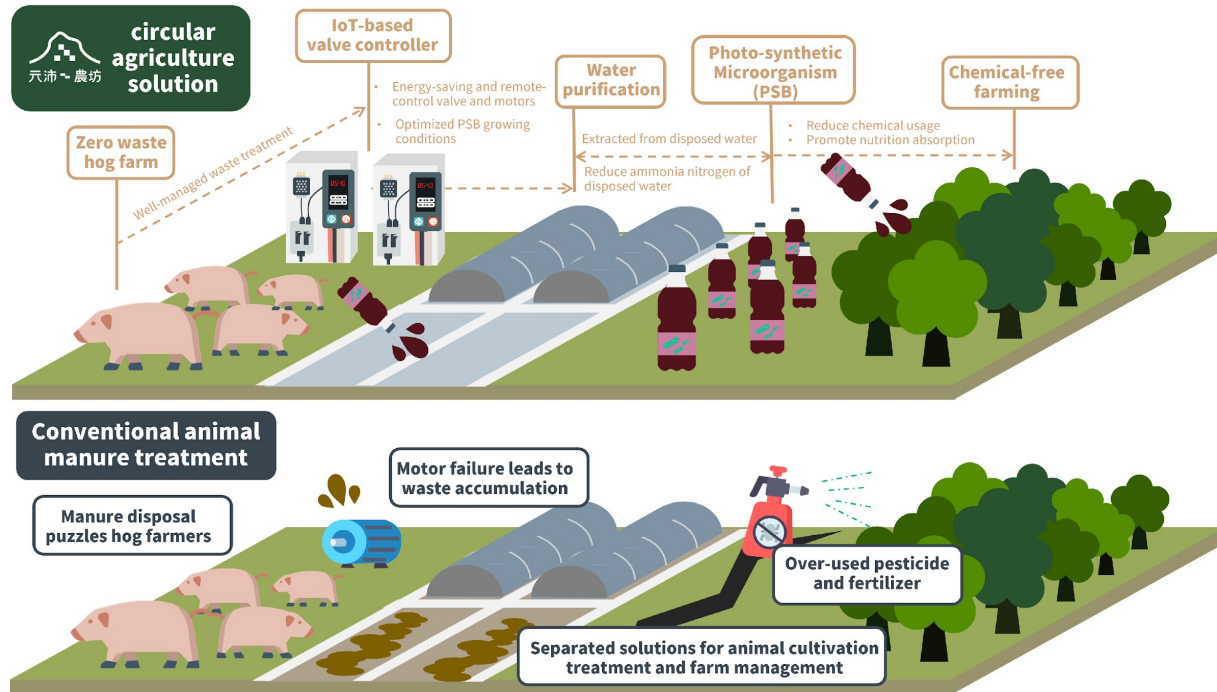
- “I started producing my own food because I lost trust in food from retailers.” - BD Outdoor Pig Farmer“
- I realized that conventional farming developments are not future-proof.” - BD Multifunctional Farmer“
- I wanted to align my farming with societal needs rather than just producing for the world market.” - BD Multifunctional Farmer

How Circular Are Farms in Practice?



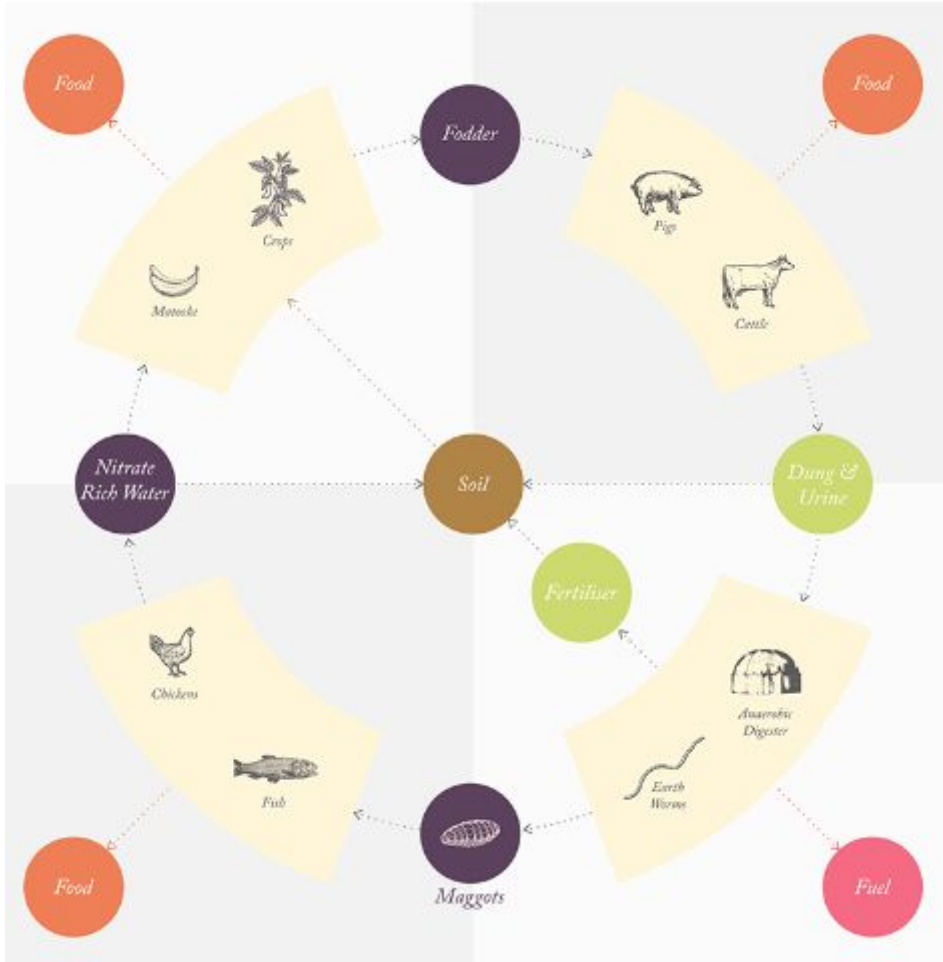
- **Assessment of Circular Practices:**
- Many farmers have taken steps towards circularity, but achieving 100% circularity is challenging.
- Examples of circularity challenges include dependency on external inputs and the difficulty of closing nutrient cycles completely.
- **Quotes from Farmers:**
- “The farm is not completely circular yet, and I hardly know how to make further improvements.” - BD Dairy Farmer
- „Our farm tries to be as local as possible, but we still rely on some external inputs.” - Outdoor Pig Farmer

Key Performance Indicators for Circular Agriculture



- **Soil Preservation:** Maintaining healthy soil through sustainable practices.
- **Closing Nutrient Cycles:** Reducing nutrient loss and recycling organic matter.
- **Reduction of Greenhouse Gases and Ammonia:** Minimizing emissions from farming activities.
- **Sustainable Energy:** Using renewable energy sources on farms.
- **Maintenance of Biodiversity:** Supporting diverse ecosystems on and around farms.
- **Nature Conservation:** Integrating conservation practices into farming.
- **Animal Welfare:** Ensuring humane treatment of livestock.
- **Animal Health:** Promoting the health and well-being of farm animals.
- **Using Residual Flows:** Utilizing by-products from other industries.
- **Contribution to Regional Economy:** Supporting local economies through direct sales and local supply chains.

Conclusion and Future Outlook



- Circular agriculture offers a sustainable alternative to traditional farming, addressing environmental and societal challenges.
- Examples from Dutch farms show the diverse ways in which circular practices can be implemented.
- Farmers' motivations highlight the personal and economic benefits of transitioning to circular systems.
- Continued innovation in farming practices and technologies will drive the adoption of circular agriculture.
- Policy support and consumer awareness will play crucial roles in promoting circular models.
- Collaboration among farmers, researchers, and policymakers is essential for achieving a sustainable agricultural future.



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Introduction to Circular Agriculture



- Circular agriculture (CA) is an innovative approach that focuses on minimizing waste and maximizing resource efficiency in farming practices.
- The primary goals of CA are to reduce the environmental impact, enhance economic sustainability, and foster social benefits.
- By incorporating practices like nutrient recycling and renewable energy use, CA aims to create a closed-loop system that benefits both the environment and the economy.

Role of Policy in Circular Agriculture



- Policy plays a crucial role in the successful implementation of circular agriculture.
- Key policy needs include government subsidies and tax incentives for sustainable practices, regulatory frameworks that promote CA, and educational programs to inform and support farmers.
- Examples of effective policies include subsidies for composting and cover cropping, as well as tax breaks for adopting sustainable farming methods.
- Policy can play an important role in addressing the market failures, policy incoherence, and status quo biases that currently hinder the competitiveness of circular business models.
- Policymakers can help to ensure that the full environmental costs of production and consumption activities are reflected in market prices.

Overcoming Challenges



- Circular agriculture faces several challenges, including market failures, policy incoherence, and biases toward maintaining the status quo.
- To overcome these obstacles, policy solutions should focus on reflecting the full environmental costs in market prices, improving collaboration across sectors, and ensuring regulatory frameworks are coherent and fit for purpose.
- By addressing these challenges, we can create a more supportive environment for CA.
- The concept of circular agriculture, as a guiding mission for food system innovations, lacks clarity and risks being used superficially without real transformative impact.
- Policymakers need to make clear decisions about the future of food systems and further operationalize the term of circular agriculture.

Practical Steps for Stakeholders



- To implement circular agriculture effectively, stakeholders can take several practical steps:
 - Measuring the circularity of the food production systems is the first step in the process of moving towards a circular food production system.
 - Policymakers should develop eco-design standards and strengthen extended producer responsibility (EPR) schemes.
 - Farmers can adopt nutrient recycling technologies and engage in cooperative resource sharing.

These steps will help create a more sustainable and efficient agricultural system.

Measuring Circularity



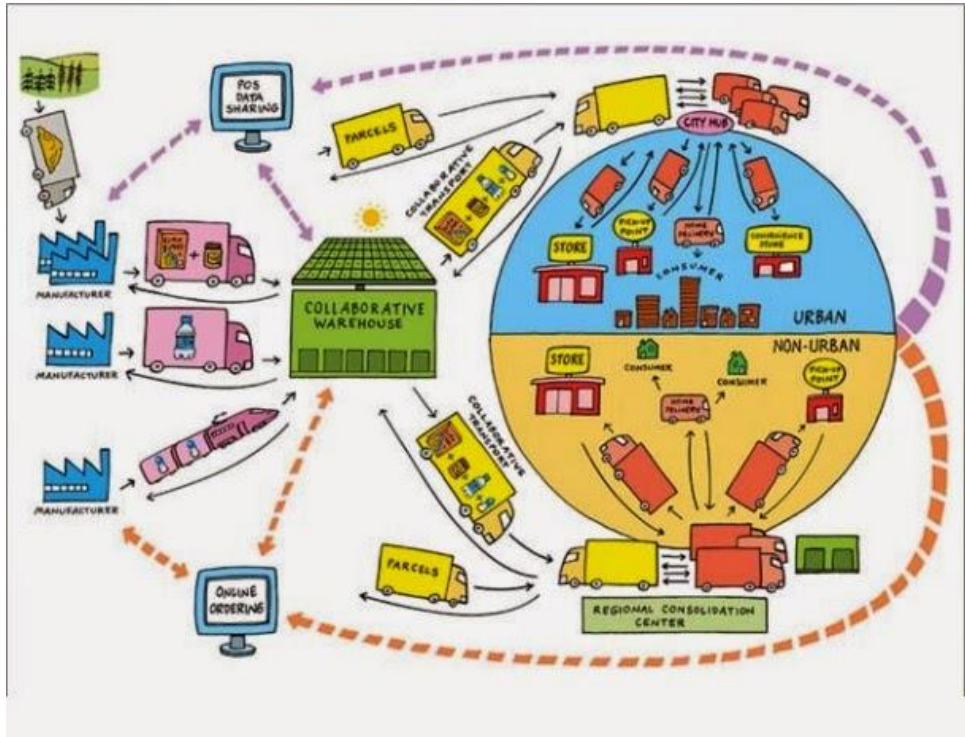
- Measuring the circularity of food production systems is essential for tracking progress and identifying areas for improvement.
- Key indicators of circularity include soil health, water usage, and waste reduction.
- The process involves assessing current practices, implementing measurement tools, and continuously monitoring and improving.
- Accurate measurement is the first step toward achieving a truly circular food production system.

Investment Strategies



- Investment strategies are vital for advancing circular agriculture. The private sector can invest in biorefineries for processing agricultural waste and explore opportunities for impact investing.
- The public sector can provide funding for research and development in CA innovations and offer crop insurance tailored to CA practices.
- Successful biorefinery projects and case studies of impact investing demonstrate the potential for economic growth through CA.
- Policymakers can promote the supply of circular products and the demand for them.
- This could involve eco-design standards, strengthened extended producer responsibility (EPR) schemes, and the provision of targeted R&D funding.

Collaboration Within Value Chains Opportunities



- Building a circular economy ecosystem requires collaboration among various stakeholders. Farmer cooperatives can facilitate resource sharing and knowledge exchange, while supply chain partnerships can develop and promote CA-produced products with premium pricing.
- Public-private partnerships can help develop comprehensive CA strategies. Examples of successful cooperatives and supply chain partnerships highlight the benefits of collaborative efforts.
- Policymakers can also improve collaboration within and across sectoral value chains.
- This could involve fostering industrial symbiosis clusters, promoting online material marketplaces, and establishing secondary raw material certification schemes.

Recognizing True Transformative Potential



- To achieve real transformation, it's important to focus on initiatives that lead to sustainable food systems rather than merely using the term "circular agriculture" superficially.
- Emphasizing practices with true transformative potential ensures that efforts contribute to long-term sustainability. Initiatives with real impact and practices that align with sustainable food systems are essential for meaningful change.
- It is important to find common ground between different visions of agriculture in order to move forward.
- We should not simply dismiss the role that incremental steps can play in achieving our goals.

Conclusion and Future Outlook



- In conclusion, supportive policies and investments are crucial for the successful adoption of circular agriculture. Collaboration among stakeholders, including farmers, policymakers, researchers, and industry players, will drive the development of a robust circular agricultural economy.
- Circular agriculture presents a paradigm shift in agricultural practices, advocating for closed-loop systems that minimize waste and maximize resource efficiency.
- By implementing these recommendations, stakeholders can create an enabling environment for CA adoption and unlock its full economic potential.
- Future trends indicate innovation in CA practices, increased consumer awareness, and stronger policy frameworks. By embracing circular agriculture, stakeholders can achieve economic, environmental, and social benefits, paving the way for a sustainable agricultural future.

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Key Action: Cooperation among organisations and institutions

Action Type: Cooperation partnerships in higher education (HED)

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