The Green Deal: Paving the way to defossilise agriculture

In the face of accelerating climate change and its impacts on our planet, it is imperative to explore sustainable solutions across all sectors. Agriculture, as a significant contributor to greenhouse gas emissions, must undergo a transformative shift towards defossilisation. The Green Deal, a comprehensive and ambitious framework proposed by the European Union, offers a promising pathway to not only address climate change but also promote sustainable agricultural practices. This article delves into the essence of the Green Deal and explores strategies to defossilise agriculture for a greener future.

Understanding the Green Deal

The Green Deal, unveiled by the European Commission in December 2019, aims to make Europe the world's first climate-neutral continent by 2050. At its core, the Green Deal seeks to decouple economic growth from environmental degradation by transforming Europe into a sustainable, low-carbon society. As agriculture is responsible for approximately 10% of the EU's greenhouse gas emissions, the Green Deal recognizes the need for a comprehensive strategy to defossilise this sector.

Promoting sustainable farming practices

- **Enhancing soil health:** Healthy soils act as carbon sinks, sequestering atmospheric carbon dioxide. Promoting sustainable soil management practices, such as conservation agriculture, cover cropping, and reduced tillage, helps improve soil structure, increase organic matter content, and enhance carbon sequestration.

- **Precision agriculture:** Leveraging technological advancements like remote sensing, GPS, and machine learning, precision agriculture minimizes the use of fertilizers, pesticides, and water by optimizing resource allocation. This reduces the carbon footprint of agriculture while maximizing yields and minimizing environmental impacts.

- **Organic farming:** Encouraging the transition to organic farming practices reduces dependence on fossil fuel-intensive inputs like synthetic fertilizers and pesticides. Organic farming promotes biodiversity, improves soil fertility, and reduces greenhouse gas emissions associated with chemical inputs.

- **Agroforestry and perennial crops:** Integrating trees and perennial crops into agricultural landscapes not only provides sustainable sources of food and fuel but also sequesters substantial amounts of carbon. Agroforestry systems, such as alley cropping and silvopasture, combine trees with annual crops or livestock, resulting in enhanced carbon storage and diversified income streams for farmers.

- **Renewable energy adoption:** Agriculture can contribute to defossilization by transitioning to renewable energy sources. Solar panels, wind turbines, and biogas digesters can provide clean energy for on-farm operations, reducing reliance on fossil fuels and decreasing emissions.

- **Sustainable livestock management:** Livestock farming is a significant contributor to agricultural emissions. Encouraging the adoption of sustainable livestock management practices, such as improved feed efficiency, methane capture, and alternative protein sources, can substantially reduce the carbon footprint of animal agriculture.

- **Circular economy principles:** Adopting circular economy principles in agriculture promotes resource efficiency and waste reduction. Implementing practices like nutrient recycling, anaerobic digestion of organic waste, and the use of bio-based materials fosters a closed-loop system that minimizes the need for fossil fuel-based inputs.

Investing in research and innovation

To successfully defossilise agriculture, significant investments in research and innovation are essential. Research institutions, policymakers, and farmers should collaborate to develop and deploy innovative solutions, such as climate-resilient crop varieties, sustainable livestock feed alternatives, and efficient agricultural machinery. Public-private partnerships and funding initiatives can support research and accelerate the adoption of sustainable agricultural practices.

Governments and policymakers play a vital role in defossilising agriculture. Setting clear targets, implementing effective policies, and providing financial incentives can encourage farmers to adopt sustainable practices. Supportive measures like subsidies, tax breaks, and access to green financing can help alleviate the financial burden associated with transitioning to sustainable farming systems.

The Green Deal encompasses a wide range of European projects aimed at addressing climate change, promoting sustainability, and transitioning to a low-carbon economy.

AREA ZERO: Alliance for Renewable Energy in Agriculture and Zero Fossil Energy

The Alliance is a collaboration of six EU-funded projects working together on solutions to overcome current challenges still facing agricultural and livestock farming sectors.

Our main objectives are to enhance the collaboration toward improvement of energy efficiency in the European agriculture; maximize the impact and improve the quality and the relevance of the outputs generated by each of the projects conforming the alliance; and contribute to the 2050 climate goals of the European Union.

AREA ZERO is an alliance bringing together four projects funded by the European Union under Horizon 2020 Research and Innovation Programme, which aim to work together for implementing technologies, techniques or strategies toward lower harmful emission, cleaner energy and improved energy efficiency in the agricultural sector.

Website: www.area-zero.eu

AgroFossilFree: Strategies and technologies to achieve a European Fossil-energy-free agriculture

To feed a growing world population, the global food system needs to reduce its dependence on fossil fuels. A shift to an 'energy smart' model will safeguard the agri-food system, which is currently impacted by the high and fluctuating prices of fossil fuels and the risk that fossil fuels may not be available in the future. The project evaluates the current status in EU agriculture regarding energy use and assess existing needs, allowing farmers to optimize agricultural production through more efficient energy use and reduced GHG emissions, resulting in economic, agronomic and environmental benefits. AgroFossilFree brings together key stakeholders to evaluate and promote currently available fossil energy-free technologies and strategies (FEFTS) in EU agriculture. The goal is to close the gap between the available FEFTS, either commercial or from applicable research results, and everyday EU agricultural practices. The results assist in the creation of policy recommendations and the promotion of viable strategies and technologies.

The project has also created a Decision Support Tool, based on Artificial Intelligence, to provide an initial ranking of the technology categories best suited for each user that visits the tool. The tool mimics the consultation process of a series of experts as if they were evaluating and ranking the input data provided by the end user in order to propose the most interesting interventions for each farm. The Decision Support Tool allows to improve the visitor's experience by guiding them to the most suitable FEFTS for their day-to-day farming use.

Website: www.agrofossilfree.eu

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101000496.

RES4LIVE: Energy Smart Livestock Farming towards Zero Fossil Fuel Consumption

The farming industry inherently relies too heavily on unsustainable fossil fuels. The EU livestock sector is a significant contributor to climatic change, a driver of land-use change, is dependent on fossil energy sources, and a significant emitter of greenhouse gas (GHG) emissions. However, there is no need to maintain this harmful and non-sustainable strategy. It is currently feasible to achieve sustainable farming that is efficient, cost effective and low maintenance. In recent years, EU policy has focused on improving environmental sustainability and animal welfare of livestock production to achieve the goals set out in the European Green Deal. This signifies a transformation of the industrial sector in the near future.

In the RES4LIVE project, farmers in Belgium, Italy, Germany, and Greece are teaming up to illustrate the potential for livestock farms to reduce their fossil fuel dependence and implement renewable energy solutions. At the same time, it should be ensured that the applied sustainable energy practices do not come at the expense of animal welfare and comfort.

Sustainable farming in action: RES4LIVE incorporates a variety of renewable energy installations into four different pilot farm projects: a poultry farm in Greece, pig farms in Belgium and Italy, and a dairy farm in Germany. The selected technologies include PVT systems, PV panels, modular heat pumps, biogas upgrading to biomethane, biomethane-fuelled tractors, smart energy control systems and electrically powered on-farm machinery.

Website: https://res4live.eu/

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HyPErFarm: Hydrogen and photovoltaic electrification on farm

Reinventing agriculture is essential to aim for a climate-resilient future. While traditionally known for food production, the agricultural sector can concurrently function as an energy source, without causing any harm to its primary role. With photovoltaic (PV) technology now as competitive as wind power, the sector is poised to dramatically revolutionize renewable energy generation. Yet, the current model of sprawling PV-parks demands vast land areas, inadvertently displacing land once used for farming. The solution? Enter agrivoltaic systems, a dual land-use innovation that seamlessly integrates crop production with power generation.

HyPErFarm brings together diverse stakeholders with a singular mission: to optimize and validate agrivoltaic business models in 3 different pilot sites (Belgium, Denmark and Germany). This innovative approach incorporates cutting-edge PV technologies, such as PV H2-production and bifacial PV-panels, into radically new crop production systems. Through stakeholder innovation workshops, public perception analysis, and farmer adoption studies, HyPErFarm aims to test the marketability of its products and gauge citizen-consumer acceptance. Moreover, the consortium is exploring new methods of harnessing and distributing the on-farm energy produced through heat pumps, e-robots, hydrogen production, storage and use, and e-driven pyrolysis of biomass side-streams. The latter not only captures carbon but also enhances soil quality.

HyPErFarm's potential impact is profound. By elevating agrivoltaic systems to TRL7-8 and crafting appealing business models, the project enables farmers to participate in this transformative innovation. The overall vision? A low fossil-carbon, climate-resilient future for EU farming that can also power local communities with clean energy and hydrogen.

Website: https://hyperfarm.eu/

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101000828.

TheGreefa: Thermochemical fluids in Greenhouse Farming

TheGreefa focuses on improving energy and resource efficiency in the greenhouse sector. The main challenge for the sector currently is high energy consumption for heating in Central Europe and water quality improvement in the South Mediterranean and storage of goods. The project aims to recover heat and water from the air and to create optimal climate conditions in the greenhouse. To minimise heat losses through ventilation, a technology for humidity control, heating and cooling in one system is being developed. This system utilises the absorption process using thermochemical fluid (TCF) to recover heat from the air and provide storage for the greenhouse's needs for heating, cooling, humidity control and water recovery. In another application, the absorption process produces dry air, that can be used for low temperature dying of herbs and fruits without losing their qualities, such as smell or taste.

Another TheGreefa solution is the regeneration of TCF, allowing it to absorb humidity again. This can be achieved by using low temperature renewable energy or residual heat. The regenerated TCF can then be transported and stored for extended periods without energy losses. The developed technologies are tested in two demonstrators – in Switzerland for heating and in Tunisia for cooling, water recovery and desalination. The implementation of the technologies in the greenhouse sector will result in reduced energy and water consumption, cost savings for the greenhouse owners and enhance the use of renewable energies.

Website: https://thegreefa.eu/

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