# SESSION REPORT AND SUMMARY: BIODIVERSITY AND REGENERATIVE AGRICULTURE: IMPACT AND RELEVANCE FOR FARMING. CHALLENGES AND OPPORTUNITY FOR AG-MECHANIZATION AND TECHNOLOGY.

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**1. Talk 1: *Moving Towards the Preservation and Improvement of Biodiversity in Agricultural Ecosystems***

Speaker: Gottlieb Basch, University of Évora; European Conservation Agriculture Federation (ECAF)

1. European Conservation Agriculture Federation (ECAF)
    - ECAF is a non-profit founded in 1999, representing 19 national associations across Europe.
2. Drivers of Biodiversity Loss in Europe
    - 25% of agricultural practices exert pressure on habitats and species.
    - Key factors include abandonment of grasslands, intensification, and pollution.
    - Negative impact on pollinators, farmland birds, and natural habitats.
3. Challenges in Biodiversity Restoration
    - Urgent need to restore agricultural habitats.
    - Considerations include:
        - Expanding ecological focus areas.
        - Enlarging protected areas.
        - Achieving 25% organic farming by 2030.
    - Potential trade-offs:
        - Reduced land productivity.
        - Challenges to food production and global food security.
4. The Need for Conservation Agriculture (CA)
    - Agricultural practices should mimic natural ecosystem conditions.
    - Natural conditions include no soil turnover, permanent soil cover, and diverse plant growth.
    - Conservation Agriculture aligns with regenerative agriculture principles.
5. Three Key Principles of CA
    - Minimum soil disturbance (no tillage).
    - Permanent vegetative mulch cover on soil.
    - Species diversification.
    - Represents an ecosystem approach to sustainable agriculture, adaptable to local conditions.
6. Practical Implementation of CA
    - Using specialized equipment for no-till seeding.

- Maintaining ground covers in permanent crops.
- Incorporating crop rotation.
- Increasing organic carbon through cover crops.

7. Positive Impact on Biodiversity
   - Sustainable and economically feasible approach.
   - Enhances soil biodiversity (soil food web) and above-ground biodiversity.
   - Minimizes soil disturbance, fostering diverse organisms from soil fauna to birds.
8. Evidence Supporting CA
   - Studies show significant increases in soil fauna, such as mites, bacteria, springtails, and earthworms.
   - Above-ground biodiversity also benefits, including higher densities of arthropods, spiders, reptiles, mammals, and birds.
   - Ground-nesting birds thrive due to undisturbed soil and vegetation cover.
9. Need for Adoption in Europe
   - CA is currently practiced on only 6% of cropland in Europe.
   - Regions like North and South America, Australia, and New Zealand have higher adoption rates.
   - Agricultural ecosystems cover about 40% of Europe—significant potential to improve biodiversity through wider adoption of CA.
10. Prioritizing CA to Achieve Sustainability Goals
   - To meet the European Green Deal, Farm to Fork, and Biodiversity Strategy objectives, CA must be prioritized.
   - By doing so, Europe can enhance agricultural sustainability and biodiversity without compromising food production or global food security.

**2. Talk 2: *Initial Steps to Consider Biodiversity and Ecosystem Services in a Sustainability Strategy***

Speaker: Gianluca Feligini,, CNH Industrial

1. CNH Industrial Background and Commitment to Innovation
   - 180-year legacy with multiple brands in the agricultural sector.
   - Strong emphasis on digital transformation for sustainability and future challenges.
   - Operates 49 R&D centers globally and produces numerous patents annually.
   - Dedicated to advancing agricultural practices through technological support.
2. Mission: Helping Farmers Work Smarter
   - Aim to help farmers work smarter on their own terms.
   - Focus on innovation that meets diverse needs, recognizing different farming practices based on location, crops, and individual methods.
   - Solutions designed to be adaptable for different farming needs, as one-size-fits-all approaches are unsustainable.

3. Holistic Approach to the Crop Cycle
    - Cover the entire crop cycle: soil preparation, seeding, planting, crop protection, harvesting, and fleet management.
    - Prioritize tools that are accessible, understandable, and easy to integrate.
    - Technologies need to communicate seamlessly and be intuitive for all farmers.
4. Water Optimization and Sustainable Use
    - Water optimization is critical due to its significant role in greenhouse gas emissions.
        - For example, energy consumption, soil emissions, fertilizer use, etc.
        - By optimizing water use through technology, farmers can reduce the energy required for irrigation and minimize soil emissions.
        - Sustainable water management practices contribute to a decrease in GHG emissions from agriculture, aligning with environmental and climate goals
    - Emphasis on efficient use of limited groundwater resources for agriculture.
    - Applying precision technologies for better irrigation and broader agricultural practices to reduce water waste.
5. Guidance Systems and Automation and Land Leveling and Crop Sensors
    - Employ GPS guidance, application control, and automation for efficient resource use.
    - Data management tools for land leveling to ensure proper water distribution.
    - Use of crop sensors and variable rate technology to optimize chemical use and reduce disease pressure.
6. Importance of Data Management and Collaboration
    - Combining machinery expertise with agronomic expertise to provide comprehensive data.
    - Data management tools offer insights into machinery performance, $CO_2$ calculations, and sustainable recommendations.
    - Practical examples in Kazakhstan, the UK, and Poland where connectivity, data management, and agronomic algorithms are integrated to enhance precision and sustainability.
7. Advancements in Automation and Autonomy
    - Focus on automation and autonomous machinery to reallocate farmers' time to planning and data management.
    - Aim to increase farming efficiency and make agriculture appealing to younger generations.
8. Innovation Spotlight: Vision-Assisted Guidance System - Machine Vision for Orchards and Vineyards
    - Vision-assisted guidance system using AI and machine vision for autonomous machinery operation without GPS.
    - Assess plant health in real-time and control input application to reduce farmers' data management burden and save inputs.
9. Conclusion: Importance of Industry Collaboration
    - Emphasize collaboration within the industry to make technology accessible and effective.

- Drive a sustainable future in agriculture through connectivity and automation, avoiding wasted efforts by working together.

**2. Talk 3: Navigating the Transition to Regenerative Agriculture with Digital Solutions**

Speaker: Peter Fröhlich, CEO, AgriCircle

1. AgriCircle Introduction
   - Mission: Empower farmers to nurture the earth to combat the decline in biomass productivity.
2. The Global Decline in Biomass Productivity
   - Everything we use, including fossil fuels, originates from biomass.
   - Earth has experienced a 50% decrease in biomass productivity over thousands of years, linked to soil degradation and biodiversity loss.
   - Current reliance on fossil fuels is unsustainable, lasting less than two seconds in Earth's timescale.
   - Agriculture is the only way to address this decline and combat climate and biodiversity crises.
3. Role of Soil Microbes and Plant Interaction
   - Life on Earth is created by interactions between soil microbes and plants.
   - Degrading soils reduces this life-creating process, and only regenerative agriculture can restore it.
4. Challenges for Farmers
   - Decreased productivity due to climate change, biodiversity loss, soil degradation, and erosion.
5. Regenerative Agriculture Principles
   - Focus on context-specific, life-enhancing continuous improvement.
   - Key principles include:
     - Maximizing soil cover.
     - Minimizing soil disturbance.
     - Maintaining living roots in the soil.
     - Increasing biodiversity with diverse crops.
     - Purposeful integration of animals.
     - Understanding the specific context.
6. Challenges with Top-Down Policy Frameworks
   - Top-down policies focus on specific measures rather than outcomes.
   - Need for a farmer-centric, outcome-focused approach.
   - Emphasize outcomes like increased plant life, soil cover, and soil health.
7. AgriCircle's Approach to Measurable Outcomes
   - Developed methods to measure outcomes like photosynthesis activity and soil cover using satellite data and algorithms.
   - Soil sampling for minerals and pH to assess soil health.

   - Emphasis on yield, inputs, and resource efficiency.
   - Simplify data gathering to free up funds for the agricultural transition.
8. Framework for Continuous Improvement
   - Four Key Monitoring Areas
     - Landscape Productivity.
     - Landscape Protection.
     - Vitality.
     - Resource Efficiency.
   - Feedback Loops for Improvement
     - Provide feedback loops rather than prescriptive measures.
     - Enable farmers to make small, continuous improvements, leading to significant gains over time.
9. Changing Machinery Needs in Regenerative Agriculture
   - Minimal tillage, cover crops, and crop diversity reduce herbicide and fertilizer needs.
   - Need machinery and technology that support regenerative practices, potentially differing from current offerings.
10. Rethinking Waste Management and Biological Processes
   - Treat manure and organic matter to enhance soil biology rather than sterilize it.
   - Use aerated water and compost extracts to support beneficial microbes and fungi for plant health.
11. Establishing a Regenerative Company Structure
   - Involvement of stakeholders: farmers, industry, nature organizations, and employees.
   - Purpose economy model to accelerate the transition to regenerative agriculture.
   - Need rapid adaptation from machinery producers and technology providers.

**4. Panel Discussion and Q&A Session - Key Sentences**

- Strip-tillage using vertical implements is preferable to minimum tillage that disturbs about 70% of the soil surface because it leaves more soil covered and undisturbed between strips, benefiting ecological services by minimizing interference with soil organisms. If strip-tillage affects less than 25% of the soil surface, it is considered close to no-till and optimal for conservation agriculture; shallow strip-tillage is preferable, as deeper tillage impacts a larger area and may not align with conservation goals.
- The low adoption of conservation agriculture in Europe is due to insufficient economic pressure from subsidies and the difficulty of changing deeply entrenched traditional farming practices, indicating a need for a mindset change. As environmental conditions in Europe become more extreme with heavier rains and droughts, conservation agriculture will become essential, and within the next decade, Europeans will have no choice but to adopt no-till practices for environmental reasons.
- Transitioning to regenerative agriculture may initially lead to mistakes and yield reductions due to inexperience, but over time, yields can recover or even surpass previous levels if proper nutrient management and fertilization are maintained, as soil nutrients must be replenished to prevent depletion. If yields decrease under regenerative agriculture, it's likely due to incorrect implementation;

with proper learning and adaptation to site-specific conditions, regenerative agriculture can improve soil health and increase yields over time, as evidenced by successful examples in South America.

- There's a debate between adopting a farmer-centric, bottom-up approach to ensure desired agricultural outcomes through inclusive decision-making, versus a top-down approach where leadership directs the process.
- To halt or reverse soil degradation and maintain future food supply, we need a farmer-centric approach that mimics natural conditions through minimal soil disturbance and biodiversity enhancement—driven by factors beyond current economic incentives—while reorienting precision agriculture technologies for regenerative agriculture to urgently adopt sustainable farming practices using all available technical tools without rendering current materials or investments obsolete.
- Adopting regenerative agriculture practices—such as minimizing soil disturbance through no-till methods, maximizing soil cover with vegetative mulch, enhancing biodiversity with hedgerows, utilizing advanced technologies like digital solutions and driverless machinery, and improving education on soil and environmental stewardship—is essential to preserve biomass, regenerate Earth's soils, and improve quality of life.
- Adopting regenerative farming—which, unlike organic farming that may have negative ILUC effects, supports biodiversity without contributing to soil degradation—and utilizing automation and autonomy technologies can effectively preserve biodiversity and soil health.