Sustainable Agriculture Market

TechSci Research Analysts in Conversation with:

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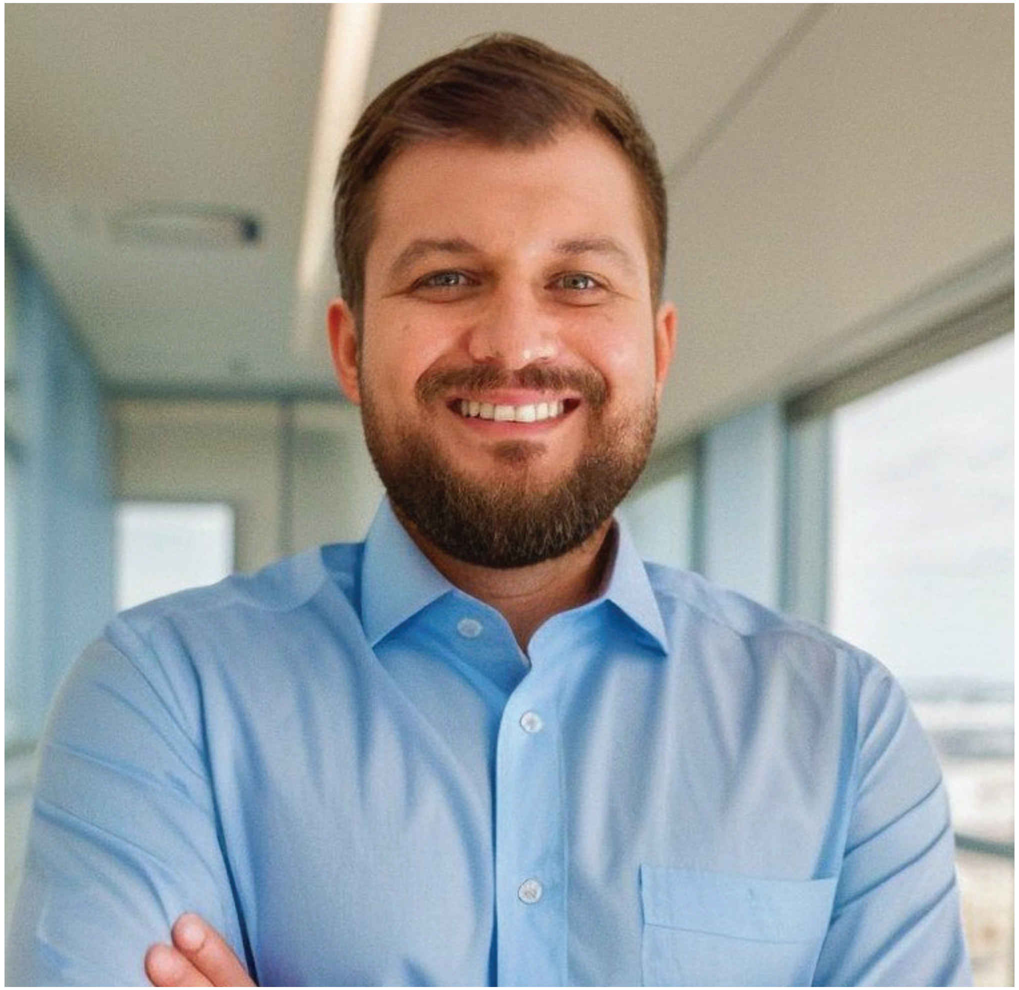
Head of Carbon and MRV | Alberami



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Could you start by sharing your journey into the world of sustainable agriculture?

I was born and raised on a farm in the countryside of Brazil, in the state of Paraná. My parents still live there, and I have fond memories of growing up in an environment deeply connected to the rhythms of nature and agriculture. Our farm was a place of great diversity, reflecting a holistic approach to farming that my family has always embraced.

We cultivated a wide variety of crops, including beans, rice, cotton, and corn, alongside fruit orchards that provided a range of seasonal produce. In addition to crop farming, we also maintained pastures for dairy cattle, which added another layer of richness to our agricultural operations. This diversity not only sustained us but also taught me the importance of resilience and adaptability in farming. It was a way of life where every element contributed to a sustainable and productive system.

Growing up in such an environment instilled in me a deep respect for the land and a strong appreciation for the values of hard work, resourcefulness, and connection to the community. It also shaped my understanding of how diversified agriculture can contribute to food security, ecological balance, and economic stability, lessons that continue to resonate with me today.

This upbringing has profoundly influenced my perspectives and the principles I apply in my life and work, fostering a commitment to sustainability and an appreciation for the interconnectedness of natural systems.

What inspired you to focus on regenerative agriculture and its connection to carbon sequestration?

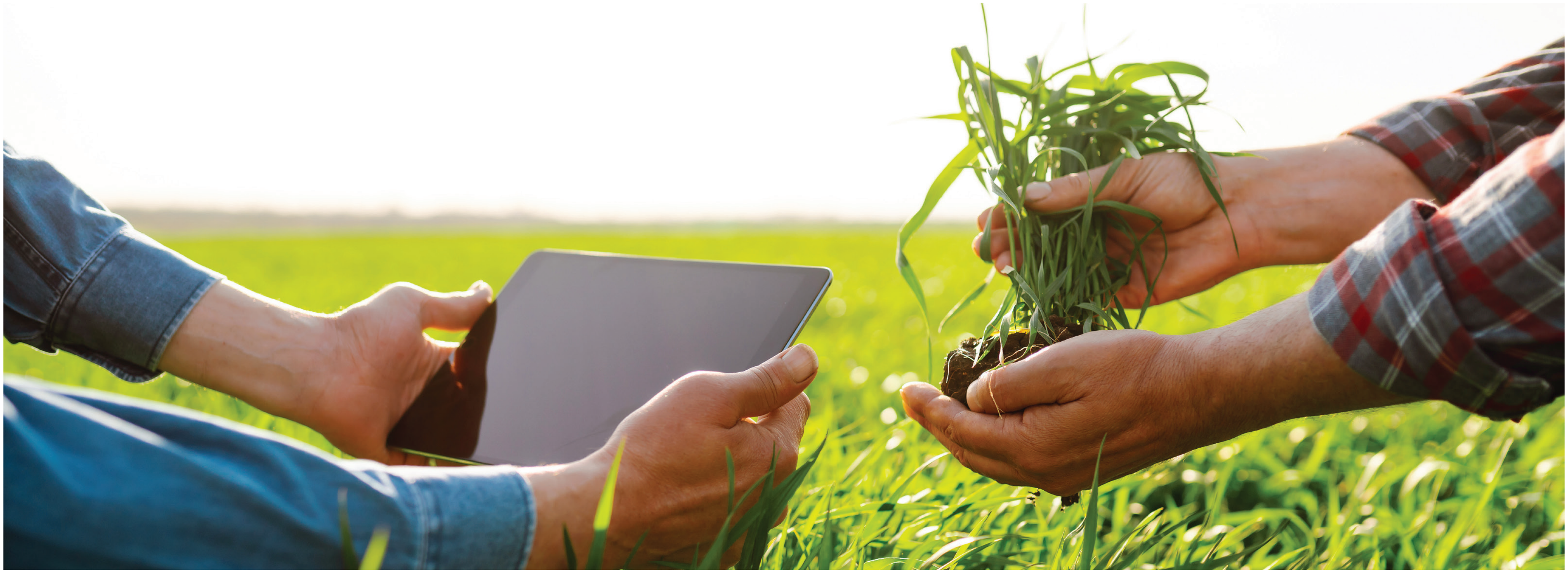
My passion for regenerative agriculture and its connection to carbon sequestration is deeply rooted in my life story. Growing up on a farm in the heart of Paraná, Brazil, I was immersed in nature from a young age, watching my parents and grandparents nurture the land with care and reverence. They taught me the value of harmony with nature, a lesson that stayed with me as I pursued my academic path. My studies in remote sensing, geomorphology, and biodiversity opened my eyes to the environmental challenges posed by industrial-scale agriculture when it is not managed responsibly—deforestation, soil degradation, and biodiversity loss are just some of the consequences. Yet, these same studies also revealed the immense potential of sustainable farming practices to heal the planet. I became particularly drawn to the idea that agriculture, when approached regeneratively, could play a pivotal role in addressing climate change. By reducing reliance on nitrogen-based fertilizers and agrochemicals, restoring riparian zones, maintaining ecological corridors, and prioritizing consolidated agricultural areas over expansion, farming could not only sustain livelihoods but also sequester carbon and enhance biodiversity. This realization brought together my personal connection to the land and my academic insights, shaping my mission to promote practices that balance productivity with ecological restoration. For me, regenerative agriculture represents not just a profession, but a way to honor my roots, contribute to global sustainability, and drive meaningful change.

How do you view the current state of agriculture's relationship with climate change?

I see agriculture's relationship with climate change as a double-edged sword. On one side, there is the concerning reality of agricultural expansion into natural biomes, such as deforestation in the Amazon and other tropical regions of the planet. These actions, often driven by overconsumption and unsustainable global demand for agricultural products, exacerbate greenhouse gas emissions, disrupt ecosystems, and accelerate biodiversity loss. This side of agriculture reveals the urgent need for systemic changes to balance food production with ecological preservation.

On the other side, however, I see a growing wave of innovative and inspiring initiatives that demonstrate agriculture's potential to be a powerful ally in combating climate change. For example, through my involvement with AgroEcology_Italy at Alberami, I've witnessed firsthand how regenerative agricultural practices can restore ecosystems, enhance biodiversity, and contribute to carbon sequestration. Projects like this showcase how sustainable farming methods can produce food while rebuilding soil health, reducing the use of synthetic inputs, and creating resilient landscapes capable of withstanding climate shocks.

This dual reality highlights the critical crossroads at which agriculture stands today. While traditional, extractive practices pose significant risks to the planet, the



emerging emphasis on agroecology, regenerative farming, and sustainable innovation offers a hopeful path forward. It is a time of both great challenge and immense opportunity, and the decisions we make now will shape agriculture's role in either exacerbating or mitigating the climate crisis. My perspective is grounded in the belief that with the right policies, technologies, and collective action, agriculture can transform into a cornerstone of global climate solutions.

Why is it critical for agriculture to transition from conventional methods to sustainable, regenerative practices?

The transition from conventional agriculture to sustainable, regenerative practices is not just a necessity but a profound opportunity to reshape the future of our planet. Conventional methods, while historically focused on maximizing yields, have often come at the expense of soil health, biodiversity, and ecological balance, leaving behind degraded landscapes vulnerable to erosion, water scarcity, and declining productivity. Regenerative agriculture offers a different path, one that restores and nurtures the land while addressing critical global challenges like climate change and food security. By enhancing soil organic carbon, promoting biodiversity, and reducing reliance on synthetic inputs, these practices transform farms into thriving ecosystems capable of sequestering carbon and withstanding the impacts of climate variability. This shift not only fosters healthier soils and more resilient crops but also reduces input costs and increases profitability for farmers, creating a foundation for long-term economic sustainability. Beyond the environmental and economic benefits, regenerative methods reconnect farmers with their land and communities, building systems that support local resilience and global sustainability goals. It is a transformation rooted in hope and responsibility, showing that agriculture can evolve from being a driver of environmental degradation to becoming a powerful force for healing and renewal.

In your words, what is regenerative agriculture, and how does it differ from traditional sustainable farming methods?

Defining regenerative agriculture is challenging, as it goes beyond a set of practices and touches on a philosophy of reconnecting with the land. My first encounter with the concept was through the works of Ana Maria Primavesi, a pioneer of agroecology in Brazil. Her teachings deeply influenced my understanding of how to approach agriculture as a living system, one that thrives when we nurture the intricate relationships between soil, plants, animals, and people. Following her line of thought, I

see regenerative agriculture as an evolution of sustainable farming, emphasizing not just minimizing harm but actively healing and rebuilding ecosystems. While traditional sustainable farming methods aim to reduce negative impacts—such as lowering pesticide use, conserving water, or protecting biodiversity—regenerative agriculture takes this a step further. It seeks to restore degraded soils, enhance carbon sequestration, and create self-sustaining ecosystems. Practices such as cover cropping, agroforestry, rotational grazing, and composting are not just about maintaining productivity but revitalizing the land to make it even more resilient and fertile over time.

In essence, sustainable farming often focuses on maintaining the status quo, whereas regenerative agriculture aims to leave the land healthier and more abundant for future generations. It is a holistic and proactive approach that not only supports food production but also contributes to solving global challenges like climate change and biodiversity loss. For me, regenerative agriculture embodies a profound respect for the interconnectedness of all living systems and reflects a commitment to rebuilding our relationship with the Earth.

Why do you believe regenerative agriculture holds the key to long-term soil health and carbon storage?

I believe regenerative agriculture is the key to achieving long-term soil health and carbon storage because it represents a paradigm shift from degradation to restoration. In my role as Head of Carbon and MRV at AgroEcology_Italy at Alberami, I have had the privilege to lead science-driven initiatives that showcase the potential of regenerative practices to transform agricultural landscapes. Our results are grounded in robust methodologies, including the LIFE C-Farms framework, Verra's VM0042, and the CDM AR-AMS0007 protocols, which ensure our approaches are scientifically validated and impactful.

The AgroEcology_Italy project is built on a foundation of measurable and verifiable outcomes. Through systematic monitoring, reporting, and verification (MRV), we have been able to quantify significant improvements in soil organic carbon levels, reductions in greenhouse gas emissions, and increased carbon sequestration across thousands of hectares. For example, we have already engaged over 296 farmers with a combined agricultural land surface of 1,474.89 hectares and are on track to expand to 200,000 hectares by 2030. Our models predict a total gross carbon removal of over 51 million tons of CO_2 over the 45-year project

crediting period.

What makes our work unique is the integration of science and community. By empowering farmers with knowledge, technical support, and financial incentives, such as access to the voluntary carbon market, we ensure that regenerative practices are not only adopted but sustained. Farmers commit to implementing at least three new sustainable practices, such as reduced tillage, cover cropping, or agroforestry, which directly enhance soil health and resilience.

Moreover, the project's contributions extend beyond carbon storage to broader sustainable development goals, including poverty reduction, biodiversity conservation, and economic stability. Our initiatives create economic opportunities for farmers, foster rural development, and generate environmental benefits that resonate across generations. This holistic approach to regeneration underscores why I see regenerative agriculture as the pathway to achieving sustainable agricultural and climate solutions.

Can you explain how regenerative practices, such as cover cropping, crop rotation, and reduced tillage, contribute to carbon sequestration?

I will answer this by bringing demonstrative examples: at AgroEcology_Italy, we have witnessed the profound impact of regenerative practices, such as cover cropping, crop rotation, and reduced tillage, in transforming agricultural lands into powerful carbon sinks. These practices form the backbone of our initiative, which is dedicated to reducing greenhouse gas emissions and enhancing carbon sequestration in Italian agriculture. By working with over 296 farmers across diverse regions of Italy, we have seen how these methods not only restore soil health but also significantly contribute to climate mitigation.

Cover cropping has been a cornerstone of our approach. Farmers plant legumes, grasses, and other non-harvested species during off-seasons, ensuring that the soil is never left bare. This simple yet effective practice enriches soil organic carbon levels as the plants decompose, locking carbon into the soil. Moreover, cover crops protect the land from erosion, a crucial factor in areas prone to heavy rainfall or strong winds. The root systems of these crops also sustain soil microbial life, fostering a dynamic ecosystem that stabilizes organic matter and enhances the soil's long-term carbon storage capacity.

Crop rotation, another practice we promote, ensures that the same crops are not planted repeatedly on the same land. By alternating crops with different root systems and nutrient requirements, farmers improve soil structure and fertility, allowing the soil to capture and hold more carbon. For example, incorporating nitrogen-fixing crops like legumes into rotations not only replenishes soil fertility but also reduces the need for synthetic fertilizers, minimizing emissions. This diversity also interrupts pest cycles and fosters a resilient ecosystem, which is essential for sustainable carbon sequestration.

Reduced tillage, or no-till farming, has been particularly transformative in maintaining soil integrity. Conventional tillage disrupts soil structure, exposing organic carbon to oxygen and accelerating its release as carbon dioxide. By minimizing soil disturbance, we help farmers retain carbon-rich topsoil and encourage the development of microbial and fungal communities, such as mycorrhizal fungi, which play a key role in stabilizing carbon within the soil matrix. This approach has proven especially effective in regions like Puglia and Calabria, where soil degradation has historically been a challenge.

These practices are not just theoretical solutions; they are part of our verified methodologies at AgroEcology_Italy, supported by frameworks such as LIFE C-Farms and Verra's VM0042. By integrating scientific rigor with local agricultural knowledge, we've documented significant results, including improved soil organic carbon levels and measurable greenhouse gas reductions. Our farmers have also benefited economically, gaining access to the voluntary carbon market, which rewards their efforts in sequestering carbon.

The results speak for themselves. By implementing cover cropping, crop rotation, and reduced tillage, AgroEcology_Italy has catalyzed a shift towards sustainable, climate-resilient farming. These regenerative practices not only sequester atmospheric CO_2 but also ensure healthier soils, more robust ecosystems, and long-term agricultural productivity. This synergy between nature and farming underscores the transformative potential of regenerative agriculture in addressing climate change.

Are there specific practices that have shown measurable success in sequestering carbon and improving yields simultaneously?

At Alberami, our AgroEcology_Italy project is designed to integrate regenerative agricultural practices that not only enhance carbon sequestration but also improve yields and soil health. According to our PDD and MRV reports, we have identified several Best Agricultural Practices (BAPs) that have demonstrated measurable success in both carbon sequestration and yield improvement.

Key Practices with Proven Impact:

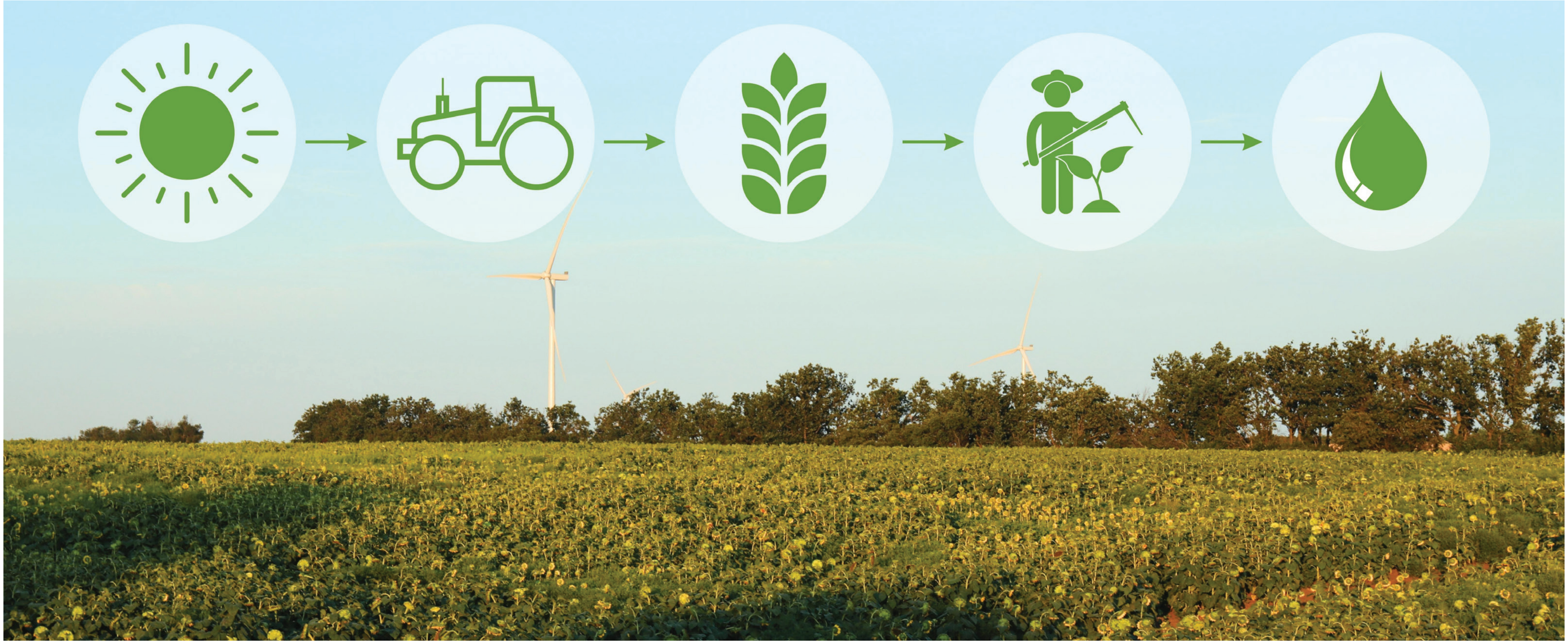
1. Cover Crops & Green Cover (Δ 1.85 - 2.7 tCO_2/ha/yr)
- Maintains soil structure, reduces erosion, and enhances soil organic matter.
- Increases microbial activity, improving nutrient cycling and water retention.
- Results in higher yields due to improved soil fertility.

2. Zero & Minimum Tillage (Δ 1.13 - 2.08 tCO_2/ha/yr)
- Reduces soil disturbance, leading to better soil carbon retention.
- Enhances water infiltration and reduces erosion, preserving nutrients for crop productivity.
- Yields are stabilized due to reduced soil degradation and increased soil microbial diversity.

3. Agroforestry & Intercropping (Δ 1.1 - 4.0 tCO_2/ha/yr)
- Trees act as carbon sinks, while diverse cropping systems optimize land productivity.
- Provides microclimatic benefits, reducing heat stress on crops.
- Improves soil biodiversity and water efficiency, leading to higher long-term yields.

4. Application of Organic Matter (Biochar, Compost, Farmyard Manure) (Δ 2.05 tCO_2/ha/yr)
- Boosts soil fertility and water-holding capacity.
- Increases nutrient availability, reducing the need for synthetic inputs.
- Improves overall crop resilience and productivity.

5. Radical Reduction of Synthetic Fertilizers & Pesticides (Δ 0.28 - 1.27 tCO_2/ha/yr)



- Reduces N_2O emissions (a potent greenhouse gas).
- Prevents soil degradation and promotes beneficial microorganisms.
- Leads to higher quality and more resilient crops, often with better market value.

6. Conversion of Cropland to Permanent Crops or Grasslands (Δ 4.69 tCO_2/ha/yr)

- Creates perennial root systems that store more carbon.
- Reduces input costs while stabilizing long-term yields.
- Scientific Validation & Monitoring

We also follow rigorously measure these impacts using the RothC Model for soil carbon sequestration, Remote Sensing & GIS for land-use changes and biomass monitoring and farmer-reported data combined with satellite imagery to track soil and productivity improvements. In summary, our experience at Alberami, based on scientifically validated MRV methodologies, shows that combining multiple regenerative practices leads to the best outcomes for both carbon sequestration and yield enhancement. Our two-year MRV cycle ensures that we can continuously refine our approach, making data-driven decisions that benefit both farmers and the environment.

How do carbon credits fit into the broader conversation about incentivizing sustainable agriculture?

At Alberami, we see carbon credits as a key financial mechanism that directly incentivizes farmers to adopt sustainable, regenerative agriculture while ensuring measurable climate benefits. Many regenerative practices, such as agroforestry, organic amendments, and reduced tillage, require upfront investment and technical knowledge. Carbon credits provide financial compensation to farmers for sequestering carbon and reducing emissions, making these practices economically viable.

In our AgroEcology_Italy project, farmers receive payments based on verified soil carbon improvements and emission reductions, connecting them to the voluntary carbon market (VCM), where corporations and investors support agriculture-based carbon removal projects.

For carbon credits to be effective, they must represent real, additional, and permanent emissions reductions, which is why robust Monitoring, Reporting, and Verification (MRV) systems are essential. At Alberami, we utilize the RothC model to track soil carbon sequestration, alongside satellite imagery, GIS tools, and farmer-reported data to ensure accuracy and transparency.

Our credits are validated through the International Carbon Registry (ICR) and Verra's VM0042 methodology, providing market confidence and scientific credibility.

These financial mechanisms also enable scaling regenerative agriculture beyond early adopters, with our project aiming to expand from 1,474.89 hectares to 200,000 hectares by 2030, ensuring long-term carbon storage and climate resilience.

Beyond carbon sequestration, these projects deliver co-benefits, including biodiversity restoration, soil health improvement, and rural economic resilience. By reducing GHG emissions (CO_2, N_2O, CH_4) while enhancing water retention, nutrient cycling, and crop productivity, carbon finance serves as a powerful tool for transforming agriculture from extractive to regenerative.

At Alberami, we view carbon credits as more than just a revenue stream—they are a catalyst for climate-positive agriculture, ensuring that sustainability aligns with profitability.

When supported by scientific MRV methodologies and farmer engagement, carbon finance has the potential to reshape global food systems and drive meaningful climate impact.

For farmers, what are the primary benefits of participating in carbon credit markets?

For farmers, participating in carbon credit markets offers several key benefits, both economic and environmental, making regenerative agriculture financially viable while enhancing soil health and climate resilience. At Alberami, through our AgroEcology_Italy project, we have seen how carbon finance provides direct incentives for farmers to transition to sustainable agricultural practices while ensuring measurable climate benefits.

The most immediate advantage is the additional revenue stream generated from carbon credits, which compensates farmers for adopting practices that sequester carbon and reduce greenhouse gas (GHG) emissions. Given that many regenerative methods, such as cover cropping, agroforestry, compost application, and reduced tillage, require upfront investments, carbon credits help offset these costs, making the transition financially sustainable. Our project provides farmers with monetary incentives based on verified soil carbon improvements, with credits issued through ICR (International Carbon Registry) and aligned with ISO 14064-2 and Verra's VM0042 methodologies.

Beyond financial benefits, participating in carbon markets leads to long-term improvements in soil health and productivity. Practices such as organic amendments, reduced pesticide use, and no-till farming enhance soil organic matter, improve water retention, and increase biodiversity, leading to higher and more resilient yields. By maintaining healthy soils, farmers reduce dependence on synthetic fertilizers and pesticides, lowering input costs while improving crop quality and profitability. Additionally, farms that adopt sustainable practices often gain premium market access, as consumers and food companies increasingly demand climate-friendly agricultural products.

Another major benefit is climate resilience. With increasing climate variability, regenerative practices help buffer farms against droughts, floods, and extreme weather. For example, improved soil organic carbon enhances water infiltration and retention, reducing the risks of soil erosion and nutrient loss. This not only secures long-term agricultural productivity but also contributes to regional food security.

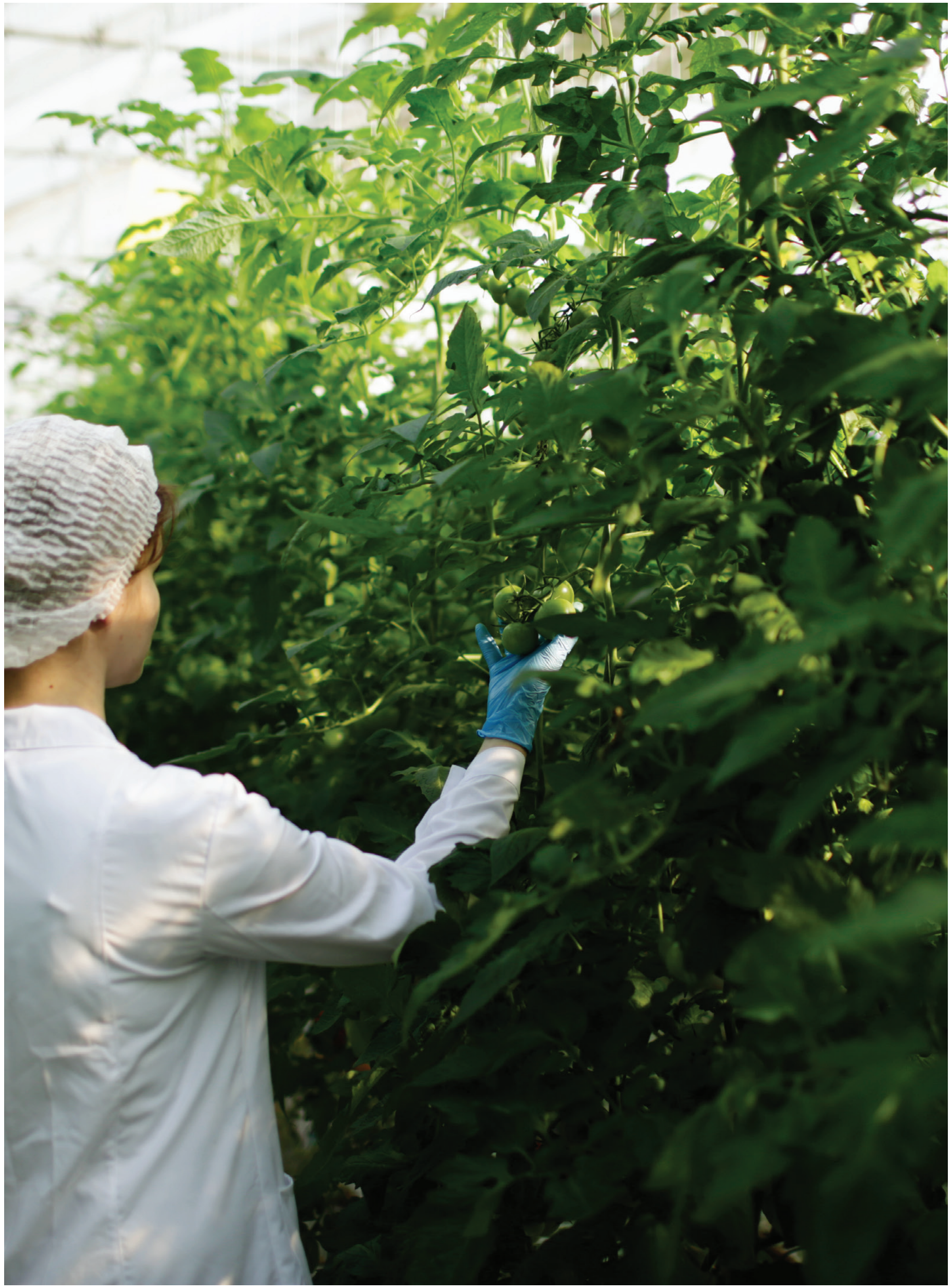
Lastly, carbon credit programs promote farmer empowerment and community development. By participating in structured Monitoring, Reporting, and Verification (MRV) systems, farmers gain data-driven insights into their land's carbon dynamics, improving decision-making for sustainable land management. Many programs, including ours at Alberami, offer training, technical support, and access to regenerative agriculture networks, fostering knowledge exchange and innovation in the farming community.

What hurdles do farmers face in accessing and implementing carbon credit systems?

Farmers face significant barriers when trying to access and implement carbon credit systems, including high costs of certification, complex land tenure issues, knowledge gaps, and market access limitations. At Alberami, we have seen these challenges firsthand in our AgroEcology_Italy project, which is designed to ensure that farmers can benefit equitably from carbon finance. However, as highlighted in Randa Mahran's thesis and my own research supervision at TUM (Technische Universität München), many smallholder farmers still struggle to fully integrate into the voluntary carbon market (VCM) due to structural and regulatory challenges.

One of the biggest hurdles is the high cost and complexity of project certification. The verification process under international standards like Verra's VM0042 or the Gold Standard is expensive and time-consuming. According to Mahran's findings, individual farmers rarely have the financial resources to cover validation fees, monitoring costs, and annual verification expenses, which can exceed $10,000 per project. This is why most smallholder farmers can only participate in grouped projects rather than as independent project owners. At Alberami, we address this by using advanced MRV systems, including satellite monitoring and farmer-reported data, to reduce costs while maintaining scientific rigor.

Another critical challenge is land tenure security and governance. Mahran's research found that in many countries, farmers lack formal land ownership documents, which prevents them from being recognized as legitimate project stakeholders. This is a major issue, as carbon credits are tied to land-based activities. Without clear land rights, farmers risk being excluded from financial benefits or, worse, displaced from their own land by corporate-led carbon projects. In response, Alberami ensures that farmers retain control over their



land and supports legalization efforts where necessary.

A third major barrier is the lack of technical knowledge and institutional support. The carbon market is highly technical, requiring expertise in carbon sequestration modeling, emissions baselines, and credit calculation methodologies. Smallholder farmers often lack access to this knowledge, making it difficult for them to navigate registration, monitoring, and trading processes. As a supervisor of master's and PhD students at TUM, I have seen that capacity-building and education are key to bridging this gap. That's why Alberami provides training programs, ensuring that farmers understand how carbon finance works, how to measure soil carbon, and how to implement regenerative practices effectively.

Another obstacle is market access and price volatility. Mahran's thesis highlights that carbon credit prices fluctuate based on demand from corporate buyers, making revenue unpredictable for farmers. Additionally, intermediaries often take a significant portion of the profits, leaving farmers with a fraction of the credit value. At Alberami, we mitigate this by ensuring direct farmer participation in carbon trading, reducing reliance on brokers, and advocating for fairer pricing mechanisms.

Lastly, long-term commitment requirements can be a barrier. Many carbon credit projects require farmers to commit for 10-30 years, which can be challenging for smallholders who need short-term financial stability. Some farmers are hesitant to sign agreements that might limit their land-use flexibility, especially if they lack trust in the system. Based on Alberami's MRV data, we work to ensure flexible participation models, allowing farmers to scale their involvement gradually without excessive risk.

How can these challenges, such as high costs of verification or lack of awareness, be overcome?

Overcoming the barriers to smallholder participation in carbon credit markets requires a multi-faceted approach that includes grouped projects, government incentives, innovative startups, socially driven initiatives, and a shift in market perception. At Alberami, we have structured our AgroEcology_Italy project to address these challenges, ensuring that small farmers can benefit from carbon finance while maintaining the integrity and scalability of regenerative agriculture.

One of the most effective solutions is grouped projects. Instead of individual farmers bearing the high costs of MRV (Monitoring, Reporting, and Verification), they can aggregate their land into a collective carbon project, reducing overall transaction costs. This allows them to share resources for certification, technical expertise, and monitoring technologies, making participation financially viable. Our experience at Alberami, supported by scientific MRV methodologies, demonstrates that aggregated regenerative agriculture projects have higher carbon sequestration potential per hectare than individual efforts, justifying a higher carbon credit value. This is fundamentally different from REDD+ (Reduced Emissions from Deforestation and Degradation) credits, which are cheaper to verify but do not offer the same additional soil regeneration, biodiversity restoration, and water retention benefits as regenerative agriculture.

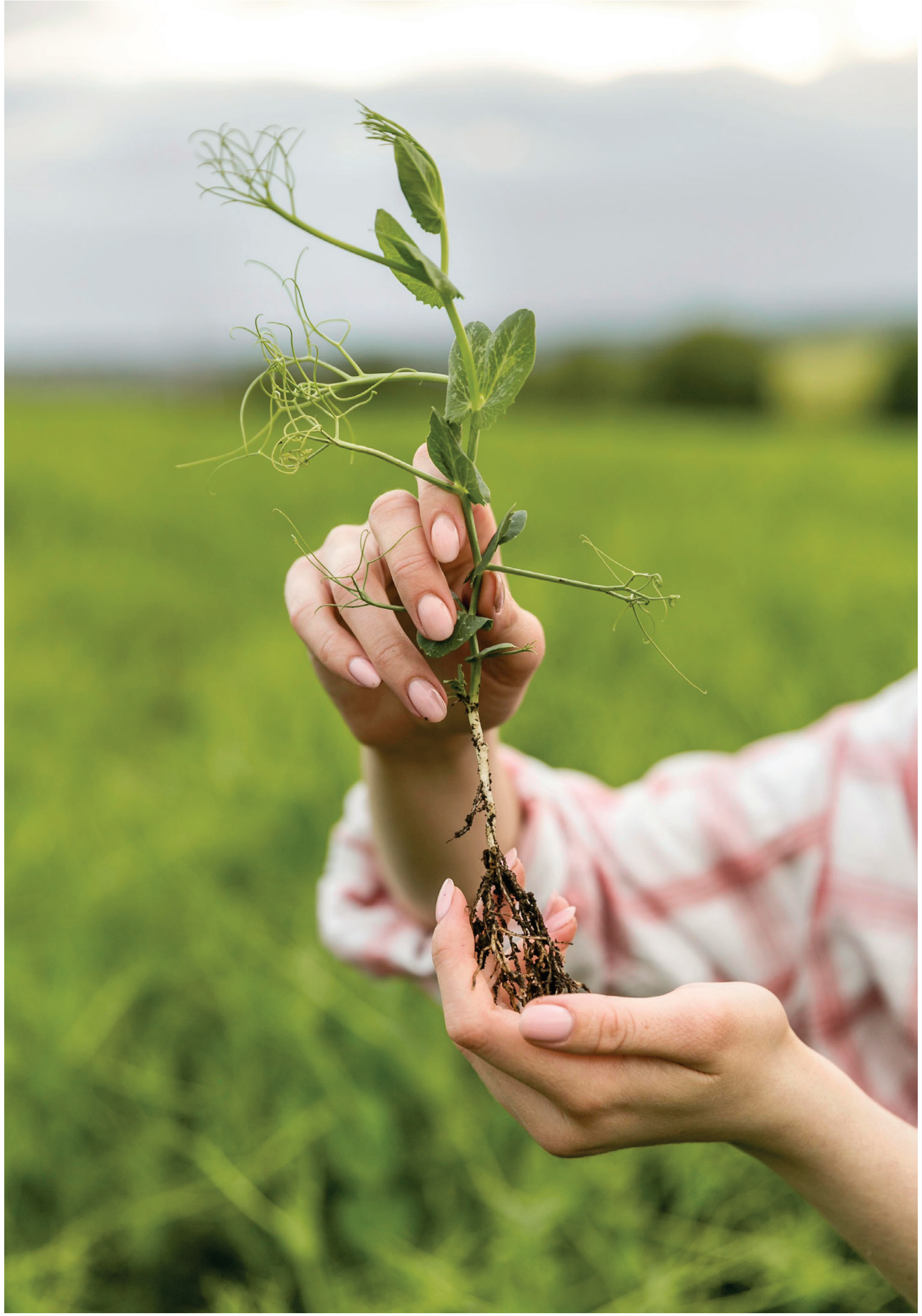
In addition to grouped projects, government incentives and grants play a crucial role in lowering entry costs for farmers. Many countries are beginning to introduce subsidies, public-private partnerships, and incentive programs that support carbon sequestration in soils, agroforestry, and regenerative land-use practices. These grants help cover the upfront costs of certification, monitoring, and training. Policymakers must recognize that regenerative agriculture requires a different financial model than avoided deforestation projects like REDD+, as it involves ongoing land management efforts, not just preservation.

Startups and socially driven projects also contribute to overcoming these barriers. Innovative agri-tech startups are leveraging AI, blockchain, and remote sensing to make carbon tracking more accessible and affordable for smallholder farmers. These technologies reduce the need for costly field-based measurements, providing credible, verifiable carbon data at a lower cost. Additionally, social impact organizations and ethical investors are stepping in to support projects where financial returns are balanced with ecosystem restoration and farmer well-being. At Alberami, we collaborate with such organizations to ensure that farmers receive a fair share of carbon finance revenues.

Finally, a market perception shift is necessary. Currently, carbon credits from regenerative agriculture are often compared to REDD+ credits, which are typically cheaper and easier to certify. However, regenerative agriculture delivers additional benefits, including soil restoration, improved biodiversity, and food security, which should command a higher market price. The carbon market must differentiate and properly value these credits based on their long-term impact rather than just cost efficiency. Educating buyers, investors, and policymakers about the true value of regenerative agriculture carbon credits will help create stronger demand and better pricing for these projects.

In your opinion, how can we ensure that carbon credits are credible, measurable, and fair for all stakeholders?

Ensuring that carbon credits are credible, measurable, and fair for all stakeholders requires a combination of scientific rigor, technological innovation, and strong community engagement. At Alberami, we integrate field sampling, remote sensing, independent model validation, and continuous monitoring to ensure that every carbon credit issued truly reflects real, additional, and long-term carbon sequestration. A crucial aspect of our process is the involvement of Verra's Independent Modeler Expert (IME) to comply with VMD0053 guidelines, which govern model calibration, validation, and uncertainty analysis. This independent validation ensures that our estimates are scientifically robust, preventing any overstatement of carbon sequestration while aligning with the highest international standards. We combine this with ground-truthing methods, where soil samples are collected directly from farmers' fields to establish accurate baselines, ensuring that carbon sequestration is not just modeled but also physically measured. However, technology alone is not enough—stakeholder participation is fundamental. Farmers and landowners are not just beneficiaries but active participants in the carbon crediting process, engaged from data collection to decision-making on revenue distribution. To ensure transparency, we utilize remote sensing and satellite monitoring to verify that regenerative practices such as cover cropping, agroforestry, reduced tillage, and organic soil amendments are being properly implemented. Unlike avoided deforestation projects like REDD+, which are often cheaper and easier to verify, regenerative agriculture requires a more detailed, high-frequency monitoring approach, as it involves continuous soil improvement rather than just preventing land-use change. That's why we use high-resolution multispectral imagery, LiDAR, and GIS mapping to track soil health, biomass growth, and land-



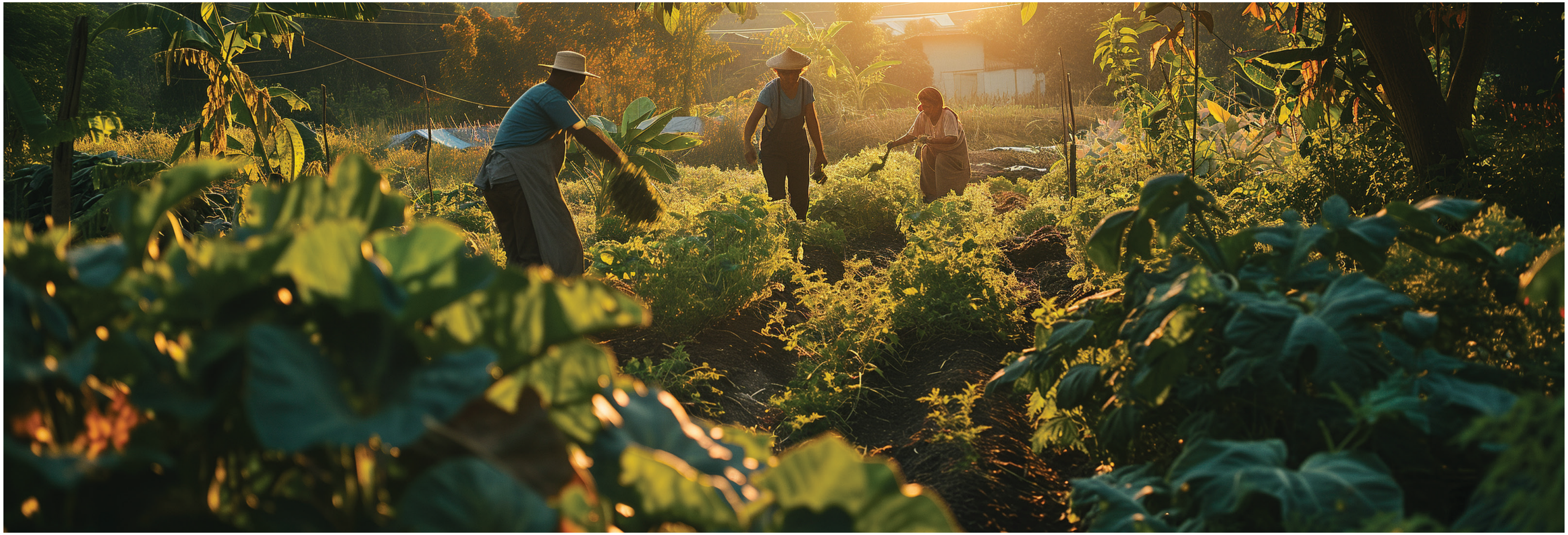
use changes over time. In addition to verification, continuous monitoring is essential to maintain the integrity of carbon credits over the long term. While many projects rely on one-time audits, we ensure ongoing reassessments and model recalibrations to detect any deviations, preventing over-crediting and ensuring that carbon storage remains stable. This combination of science, technology, and farmer-led participation creates a system that is both scientifically credible and socially fair. At Alberami, we are committed to ensuring that carbon finance does not just function as a corporate offset mechanism but as a genuine driver of regenerative agriculture and climate resilience, where farmers and local communities share in the benefits of a more sustainable future.

Are there existing programs or frameworks you believe set the gold standard in carbon credit verification for agriculture?

Several existing frameworks set a high standard for carbon credit verification in agriculture, with Verra's VM0042 methodology being one of the most robust for soil carbon sequestration and regenerative practices. The European Union's climate finance mechanisms also provide strong verification structures, particularly in ensuring environmental integrity and compliance with science-based targets. However, despite these frameworks' strengths, the challenge of additionality remains a major concern in the agricultural carbon market.

Emerging methodologies for low-carbon and regenerative agriculture show significant promise but also introduce challenges due to the complexity of measuring soil management improvements, carbon sequestration, and biodiversity benefits. Unlike industrial emissions reductions, which are more straightforward to quantify, agricultural carbon sequestration requires long-term soil monitoring, robust sampling techniques, and high-frequency data validation. This is where better harmonization of standards is essential, and where organizations like CIWP (Carbon Integrity Working Principles) could play a key role in refining additionality criteria and fostering methodologies that maintain high environmental integrity.

A major issue is that in large agricultural economies like Brazil, France, Germany, and the USA, sustainable farming techniques such as zero tillage and preci-



sion agriculture have been widely implemented since the 1970s, long before the carbon market expanded into agriculture.

Many of these projects do not depend on carbon credit revenues to sustain regenerative practices, raising serious concerns about additionality—a fundamental principle in carbon crediting that ensures a project would not have happened without carbon finance. If a farm is already practicing no-till farming, cover cropping, or crop rotation for decades, does it truly qualify for carbon credits? Furthermore, many of these projects do not provide clear evidence of reductions in pesticide and nitrogen-based agrochemical use, making it difficult to validate their claimed climate benefits.

For the agricultural carbon market to maintain credibility, it is essential that additionality criteria evolve, particularly for large-scale farms that have already integrated sustainable practices independently of carbon finance.

The CIWP, Verra, and EU regulatory bodies must refine baseline assessments to ensure that credits only reward new and genuinely additional carbon sequestration efforts. At Alberami, we align our AgroEcology_Italy project with these principles, ensuring that each carbon credit issued reflects real, additional, and long-term climate benefits.

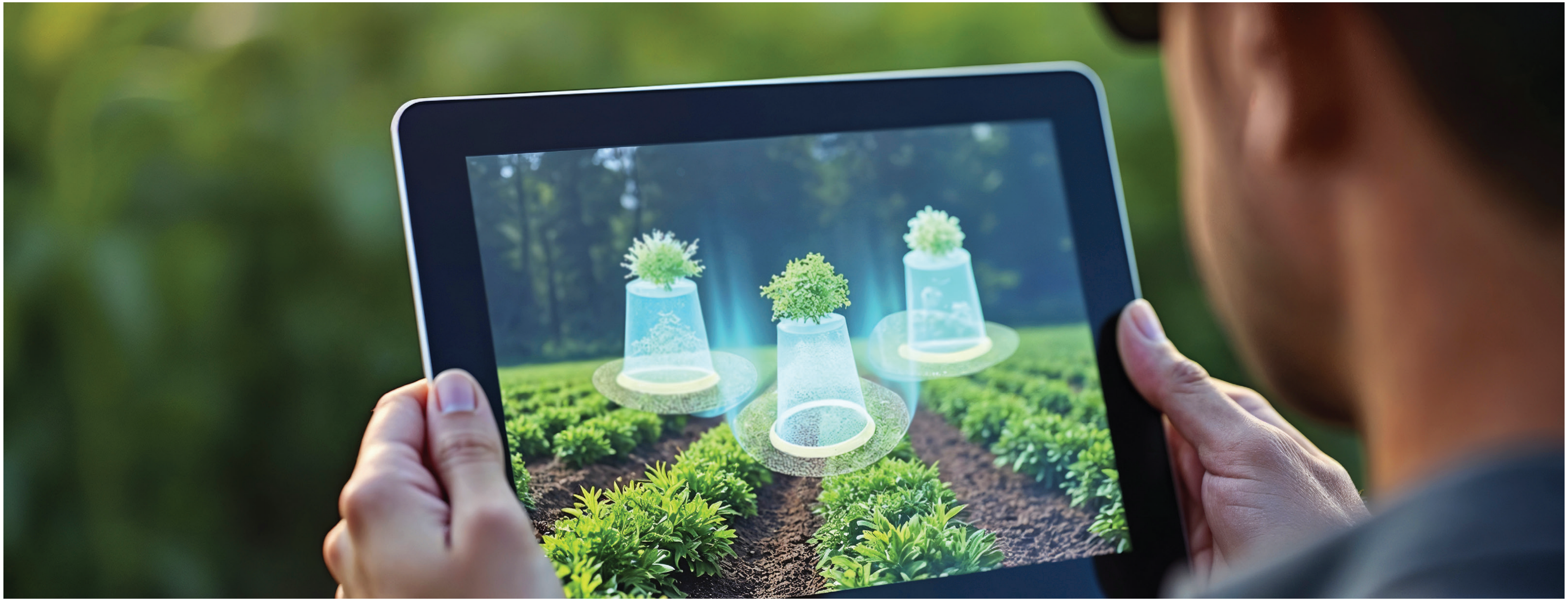
By incorporating stringent MRV (Monitoring, Reporting, and Verification) standards, along with advanced soil sampling, remote sensing, and independent model validation, we aim to ensure that regenerative agriculture projects remain scientifically credible and financially fair for farmers. Moving forward, the focus must be on harmonizing agricultural carbon credit methodologies with stricter additionality criteria while ensuring that smallholder farmers—who often lack the financial means to implement regenerative practices without carbon finance—receive priority support.

This will prevent carbon credits from simply subsidizing existing large-scale agricultural operations, reinforcing true environmental integrity in the carbon market.

How can these projects complement farming operations without reducing land for food production?

Carbon credit projects in regenerative agriculture are designed to enhance productivity and ecosystem resilience rather than compete with food production. At Alberami, through our AgroEcology_Italy project, we have developed a model where carbon sequestration and sustainable farming work together to increase yields, improve soil health, and generate carbon finance, all without taking land away from food production.

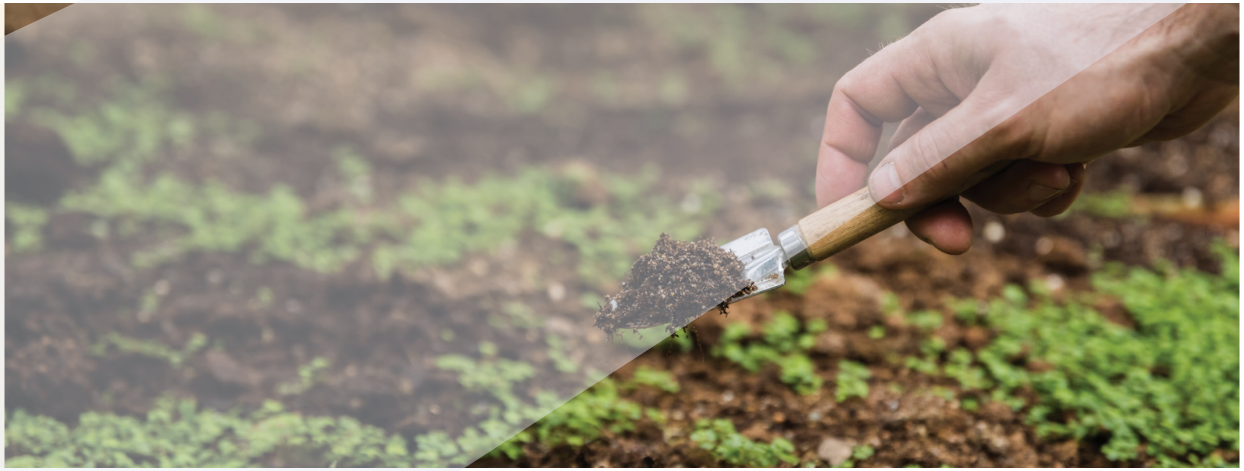
One of the key strategies is integrating carbon-focused practices within existing agricultural systems, rather than replacing food crops with carbon-credit-driven land use changes. Agroforestry, for example, allows farmers to grow tree species that sequester



carbon while improving soil structure, retaining water, and providing additional income through fruit, nuts, or timber, all within the same land used for food crops. Cover cropping and intercropping further enhance soil organic carbon while maintaining or even increasing productivity, as these practices boost nutrient cycling, water retention, and pest control. Reduced tillage and organic soil amendments (such as compost or biochar) increase soil carbon storage while reducing input costs, improving long-term farm profitability.

Another important approach is enhancing land-use efficiency rather than expanding agricultural footprints. Many carbon credit methodologies incentivize improving soil health and fertility rather than converting land for carbon projects. Healthier soils produce higher yields, meaning that regenerative practices not only capture carbon but also help farmers grow more food on the same land. This approach is particularly critical in regions where land availability is a concern, ensuring that carbon credit projects remain complementary to food security objectives.

Furthermore, precision agriculture and climate-smart farming can optimize productivity while reducing emissions, allowing farmers to claim carbon credits without altering their main food production areas. Using data-driven land management techniques, such as remote sensing, AI-based soil monitoring, and rotational grazing systems, enables farmers to enhance their efficiency, reduce greenhouse gas emissions, and generate carbon credits without reducing their cultivated area. At Alberami, we ensure that all carbon finance initiatives align with food production priorities, recognizing that carbon markets should support, not displace, agricultural productivity. The key to success is harmonizing food security with carbon sequestration by incentivizing better land management, rather than restricting land use. Well-designed carbon credit projects do not require a trade-off between food and climate goals; instead, they serve as a financial mechanism to support farmers in producing more food sustainably, while simultaneously enhancing soil carbon storage and biodiversity.



ABOUT TECHSCI HEALTHCARE

TechSci Agriculture vertical offers market research & consulting services in the agriculture industry with a major focus on Agri-commodities, seeds, Agri-machinery and equipment, fertilizers, feed and animal nutrition, alternative farming, and digital agriculture. TechSci Research also focuses on providing market intelligence on emerging technologies and niche industries that have the potential to cause a high level of disruption in the market in the next few years. We excel in conducting market viability analysis for technologies that are still in the nascent stages of their lifecycle.

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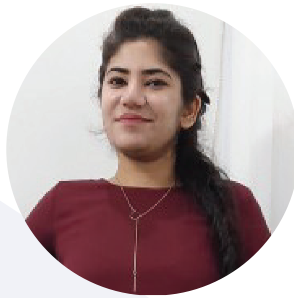

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