CIRCULAR BIONUTRIENT ECONOMY NETWORK

ANNUAL NEWSLETTER

2025

Building Africa's Circular Bionutrient Future

THE BIOCHAR ACADEMY IN AFRICA: ENHANCING SKILLS AND PROMOTING CLIMATE-SMART AGRICULTURE

"BEYOND 'SAFE': RETHINKING BIOCHAR QUALITY FOR PURPOSE, PERFORMANCE, AND IMPACT"- PG 19

"A circular bio-nutrient economy reconnects organic residues to the land, transforming waste streams into regenerative inputs for resilient food systems."

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A MESSAGE FROM OUR CHAIRMAN: SAM THUO

As we close out an extraordinary year, I am delighted to welcome you to the CBEN 2025 Annual Newsletter — a reflection of how far our network has come and a glimpse into the momentum carrying us forward.

2025 has been a year of growth, depth, and collaboration. From 2024–2025, CBEN welcomed 50 new members, expanding a truly interdisciplinary community of farmers, researchers, entrepreneurs, policy thinkers, and practitioners committed to circular bio-nutrient solutions. Together, we hosted three dynamic convenings, blending in-person and virtual spaces where ideas turned into action, partnerships were forged, and regional leadership was strengthened.

A defining milestone this year was the first Biochar Academy in Africa, co-hosted with the International Biochar Initiative. This landmark event positioned Africa not as a passive adopter of innovation, but as a global shaper of biochar practice — rooted in local realities, farmer-led solutions, and scalable climate impact.

Across Kenya, Rwanda, Ethiopia, and Burundi, CBEN partnerships have continued to empower smallholder farmers, support entrepreneurship, and advance high-integrity carbon and soil health initiatives. Equally significant is CBEN's formal registration in Kenya as the Circular Bionutrient Economy Association(CBEA) — a foundational step toward stronger governance, sustainable financing, and deeper regional and global collaboration as we head into 2026.

This newsletter captures the spirit of CBEN: member-driven, practice-oriented, and future-focused. Thank you for your expertise, leadership, and energy. The work ahead is ambitious — and together, we are more than ready to meet it.

MESSAGE FROM CBEN PROGRAMS MANAGER: BELLA CULOTTA

Happy end to a great 2025 year! From 2024-2025, we've gained 50 new members and hosted 3 wonderful events, in-person and online. As we grow CBEN, I am so grateful to all CBEN members. You make this community possible.

From member-led mini-seminars in our monthly calls, to our event leadership teams, to our whatsapp threads, members provide the juice of CBEN. And as the administrative team, we are ever-inspired to keep building the scaffolding that facilitates this member-led, member-served organization.

As we formalize the association in Kenya for administrative purposes in 2026, our priority remains to fuel this community culture. So thank you all for your expertise, volunteer support, and most importantly great vibes:) And cheers to another great year ahead!

IN THIS ISSUE

Step inside this year's CBEN Annual Newsletter—a vibrant showcase of innovation, collaboration, and impact. From compelling photo stories and milestone projects to insightful conversations with biochar pioneers, every page reflects the passion driving our network forward. Go behind the scenes as ideas take shape, stories unfold, and CBEN's vision connects communities, research, and action across the globe.

Erick O. Abala
Editor In Chief & Head of Communications, CBEN

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Why Biochar Academy in Africa: Shaping Sustainable Agriculture Practices

By Valeria Aracio & Dr Luica Marina

The first Biochar Academy in Africa, held In June 2025, marked a defining milestone for the continent's transition toward climate-smart agriculture. Organized by the International Biochar Initiative (IBI) in collaboration with the Circular Bioeconomy Network (CBEN), the program brought together farmers, researchers, entrepreneurs, carbon project developers, carbon-market actors and non-profits from across Africa and beyond. Although the Biochar Academy has proven successful in multiple regions of the world, hosting it in Africa for the first time was both timely and deeply strategic.

Across the continent, biochar is gaining momentum at an unprecedented pace. From East to West Africa, new projects are emerging in agriculture, carbon markets, and decentralized clean cooking solutions. Africa represents one of the richest biomass regions in the world, yet agricultural landscapes continue to face severe soil degradation, declining yields, and economic pressure on smallholder farmers. Bringing the Biochar Academy to Africa was therefore not simply about technical training; it was about empowering people and strengthening entire value chains aligned with sustainability, profitability, and resilience.

A key reason for hosting the Academy in Kenya was leadership from within the region. CBEN and its partners ensured that the agenda, case studies and discussions reflected African realities rather than imported models

Under the scientific guidance of Pro. Johannes Lehmann, a long-time IBI Board member, a founding figure in the global biochar movement and a driving force behind CBEN, and with the on-the-ground coordination of CBEN's Program Manager, Isabella ("Bella") Culotta, the Academy was intentionally designed around local contexts, challenges and opportunities. Their leadership, together with a broader group of Kenyan and regional collaborators, helped ensure that participants saw themselves not as recipients of a global program, but as co-creators of its content and outcomes.

Participants consistently emphasized that biochar offers a unique opportunity for farmers across the Global South: a soil-enhancing solution derived from residues that are often burned or wasted. In regions where agriculture supports most livelihoods yet remains highly vulnerable to climate shocks, these benefits translate into real income, food security, and healthier ecosystems.

The Biochar Academy experience in Kenya validated that the demand for practical learning is high. Many participants described the hands-on approach as "mind blowing" because it enabled them not only to understand biochar, but to produce meaningful change immediately. Several attendees have already applied knowledge from the Academy to pilot projects, deploy new kilns, design business models, and strengthen carbon-readiness strategies. Some of the most compelling feedback came from those working directly with farmers: the Academy gave them confidence and technical skill to train others.

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One participant from Ethiopia highlighted how, upon returning home, they were able to produce biochar using biomass available locally, cotton stalks and maize stalks, and apply it to teff crops with immediate positive results. Their organization supported 120 smallholder farmers to adopt biochar production and application, demonstrating how capacity building can ripple into community-wide transformation.

Another attendee from Kenya shared how the visit to a pioneering biochar-based fertilizer facility reshaped their project vision. After purchasing bags of granulated biochar fertilizer and testing it on a potato farm, they witnessed clear yield improvements and have now scaled to a five-acre trial. They credit the Academy not only with practical learning, but with new professional relationships that enabled logistics, procurement, and technical upskilling.

Beyond agriculture, participants recognized the broader potential of biochar in carbon markets, water purification, animal feed, and construction materials. Several companies reported strengthened partnerships or new collaborations after the Academy. One business founder summarized it simply: ***"I gained skills, knowledge, and especially networks."*** Others emphasized that the community formed at the Academy has become as valuable as the technical modules themselves.

For IBI, the partnership with CBEN has become one of our most meaningful alliances. CBEN's role in convening local stakeholders, curating relevant site visits, and grounding discussions in African policy and market realities was essential to the Academy's success. The combination of CBEN's regional leadership and IBI's global perspective created a powerful platform for shared learning and long-term collaboration.

The success of the Biochar Academy in Africa demonstrates that the continent is not just adopting biochar technology, it is shaping it. African organizations and entrepreneurs are modeling scalable, community-driven solutions that combine soil restoration, climate mitigation, and local economic development. The Academy's role is to accelerate this momentum by equipping practitioners with technical knowledge, business insight, and a global network, so that biochar does not remain a promising idea but becomes widespread practice.

Looking forward, the need is clear: more access, more affordability, and more tailored learning opportunities for African farmers, developers, and scientists. Africa is ready to scale biochar, and continued capacity building will be decisive for that growth.

The first Biochar Academy on African soil proved what many already believed: Africa is not waiting to be taught biochar, Africa is shaping what biochar will become. The Biochar Academy simply accelerated what was already rising: locally led innovation, community-driven adoption, and a new generation of practitioners who see biochar not just as a product, but as a pathway to resilient agriculture. With leadership from CBEN and champions across the continent, biochar in Africa is no longer an emerging idea, it is a movement.

African Biochar Academy Feedback

Hadley Malema, Associate Director at Eco2librium.

"Attending the Study Tour and Biochar Academy was a truly inspiring experience that deepened my understanding of biochar and its role in sustainable agriculture. The hands-on demonstrations and field visits showed how farmers are turning simple agricultural residues into high-value biochar using practical, low-cost technologies. Seeing these solutions work at community level resonated strongly with our own work at Eco2.

I learned how different feedstocks, moisture levels, and pyrolysis techniques influence the quality of biochar and its long-term carbon sequestration potential. The sessions on integrating biochar with composting and organic fertilizers were especially relevant to our C-Sink model, where farmers produce biochar and incorporate it into a fertilizer matrix for soil restoration. It also strengthened my appreciation of bamboo as a scalable, renewable feedstock for our Artisan Pro biochar line.

Overall, the experience reshaped how I view sustainable agriculture. I left with a clearer understanding that soil health, climate action, and farmer livelihoods are deeply interconnected. The Biochar Academy reaffirmed that our work in Western Kenya is not just about carbon projects - it is about building resilient farming systems, improving productivity, and creating long-term environmental and economic benefits for communities."

Study Tour 2025

By Erick Abala

The Western Region Study Tour 2025, organized in collaboration with ECO2LIBRIUM Company, Bio-Kenya through IRD (French National Research Institute for Sustainable Development), and Carbon Standards International (CSI), brought together practitioners and stakeholders committed to advancing sustainable value chains in Kenya. The tour focused on ECO2LIBRIUM's new bamboo-based biochar project in Kakamega, Western Kenya, while also highlighting practical demonstrations of digital Monitoring, Reporting, and Verification (dMRV) tools for biochar and carbon sequestration. Additional learning sites included Bio-Kenya's Tanga Kona project, which produces biochar from sugarcane bagasse, and initiatives integrating biochar with Black Soldier Fly (BSF) systems at Magnet Academy School in Nambale, Busia, and Kisumu Young Agripreneurs. The study tour was conducted under the broader vision of CBEN, a dedicated network working to advance bamboo and biochar innovation, knowledge exchange, and credible climate solutions.

The tour began at ECO2LIBRIUM Company, where participants observed the large-scale cultivation of three bamboo species: Dendrocalamus giganteus (Giant Bamboo), Bambusa balcooa, and Yushania alpina (African Alpine Bamboo). Once mature, the bamboo stalks are acquired by ECO2LIBRIUM after harvesting by We Do Bamboo—Kenya's leading manufacturer of sustainable bamboo building materials. Depending on species and size, each bamboo culm is valued at approximately USD 2–4. The bamboo is then dried to a moisture content below 15%, verified using a moisture meter, before being pyrolyzed in a Kon-Tiki kiln at temperatures exceeding 650–675°C. Following pyrolysis, the biochar is charged using decomposing cow dung to enhance its agronomic value. ECO2LIBRIUM is now implementing a C-Sink biochar production model aimed at strengthening community livelihoods through sustainable carbon removal. The deployment of a dMRV tool is central to this process, enabling accurate tracking of production, quality assurance, and farmer incentive mechanisms.

The study tour also visited Tanga Kona Cooperative, a key beneficiary of the Bio-Kenya project implemented through IRD, where participants observed biochar production using sugarcane bagasse—a widely available agricultural by-product. Rather than treating bagasse as waste, the cooperative has adopted a vertical carbonizer to convert this residue into high-quality biochar. By closing nutrient and carbon loops at the community level, the initiative not only supports sustainable crop production but also creates new economic opportunities for farmers while contributing to climate-smart agriculture and carbon sequestration efforts.

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A key partner throughout the study tour was Carbon Standards International (CSI), a member of the CBEN network. CSI holds a critical position within CBEN and its membership by championing credibility, transparency, and integrity in carbon removal markets. Through its robust certification frameworks and strategic partnerships, CSI ensures that biochar produced by CBEN partners undergoes rigorous testing, verification, and quality assurance. CBEN—bringing together artisanal and industrial biochar producers, researchers, and policymakers—provides a unique platform to amplify CSI's presence across Africa's growing biochar ecosystem by showcasing its tools and standards to both existing and emerging producers.

This support is vital in enabling producers to access high-value carbon and commercial markets while strengthening trust in authentic carbon-removal solutions. CSI's engagement positions it strongly to develop reliable standards and digital systems for certified biochar production and the delivery of credible climate services through carbon sinks.

The study tour also highlighted the integration of Black Soldier Fly (BSF) systems with biochar, reinforcing circular economy principles. At Magnet Academy School in Nambale, Busia, chicken waste is efficiently converted into BSF protein and nutrient-rich frass. The large-scale BSF production supports waste reduction while generating protein-rich animal feed and organic fertilizer.The resulting BSF frass is combined with biochar, creating a powerful soil amendment that enhances soil fertility, improves nutrient efficiency, and strengthens regenerative agricultural practices.

Similarly, Kisumu Young Agripreneurs utilize market waste for BSF farming and are already piloting a biochar production project using human waste (fecal matter) pyrolyzed with urine, demonstrating innovation at the intersection of sanitation, waste management, and sustainable agriculture.

The Western Region Study Tour 2025 reaffirmed the growing potential of bamboo, biochar, dMRV systems, certification, and BSF integration as scalable solutions for climate resilience, circular economies, and community-led development in Kenya and beyond.

Through hands-on engagement, participants gained practical experience in bamboo-based biochar production, including farmer compensation models and the role of C-Sink Managers in biochar accreditation and scaling. The tour also strengthened understanding of dMRV tools for effective carbon project monitoring and reporting, while showcasing real-world examples of biochar and BSF system integration to advance regenerative agriculture and sustainable livelihoods.

Biochar Technologies and C-Sink Project Management

By Mercy Ogembo

Biochar Life cools the climate by helping to remove carbon from the atmosphere. In Kenya we mobilize smallholder farmers to convert currently burned crop waste, a huge, previously ignored source of greenhouse gases, into carbon sequestering biochar. We train smallholder farmers to biochar, not burn, their crop waste, certify the amount of carbon removed, provide access to global carbon offset markets for the verified carbon sequestration and ensure immediate payment, thereby encouraging others also to biochar, not burn.

"Turning farm waste into lasting climate solutions—where smallholder farmers become stewards of carbon and champions of a cooler planet."

We utilize pit and trench kiln technology as our primary method for decentralized biochar production. Each trench is excavated following standardized dimensions to ensure efficient pyrolysis, consistent carbonization, and reduced emissions in line with climate-smart production practices. Our main biomass feedstock is cornstalks, an abundant agricultural residue that would otherwise decompose or be burned openly—releasing CO_2 and particulates. By converting this waste into biochar, we transform a climate liability into a long-term carbon sink. To guarantee transparency, traceability, and compliance with carbon-credit requirements, we deploy a team of trained verifiers who conduct digital MRV (dMRV) in real time. Through a GPS-enabled mobile app, every farmer's production cycle is monitored, documented, and validated as part of our robust C-sink management system.

This ensures that every kilogram of biochar produced meets the criteria for measurable and verifiable carbon removal. Since 2019, under our parent organization Warm Heart Worldwide, we have trained more than 7,000 farmers in biochar production and soil application as a climate-resilient agricultural practice. Out of these, 1,200 farmers have already been enrolled in our certified C-sink programme under Biochar Life, where their biochar contributes directly to durable carbon sequestration and the generation of high-integrity carbon credits. Together, these efforts demonstrate how accessible biochar technology, sustainable biomass utilization, and rigorous C-sink management can empower smallholder farmers while delivering real, measurable climate impact.

QUESTIONS & ANSWERS

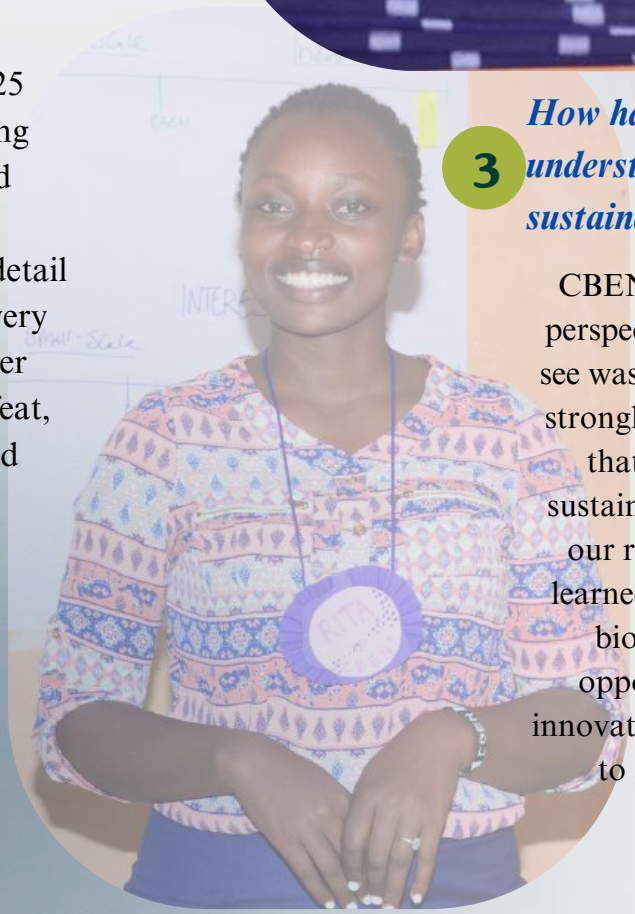
Meet Rita Ellen Opiyo, Head of Strategy and Operations at CBEN. In this Q&A session, Rita reflects on her journey and shares key insights from her first nine months working with CBEN, highlighting lessons learned, milestones achieved, and her vision for strengthening CBEN's impact.

1 *How would you describe your experience so far working with CBEN?*

Working with CBEN has been insightful and rewarding. I truly value the sense of community within the network,where every idea matters, and collaboration feels genuine. The relationships built among members create an environment where learning and innovation thrive. It's inspiring to see how diverse perspectives come together to drive practical solutions for circular bio-nutrient systems.

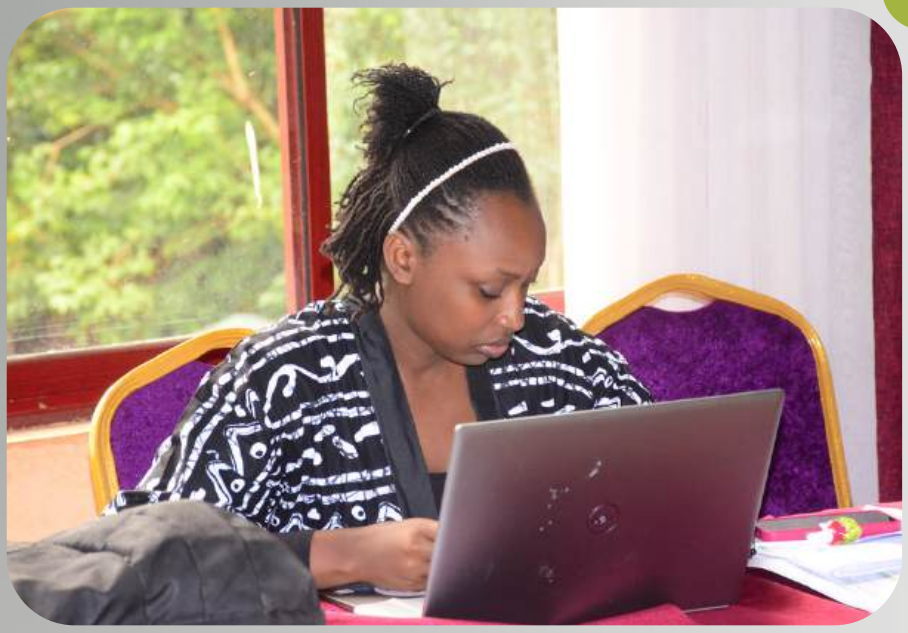
2 *What has been your most rewarding or memorable project?*

The CBEN/IBI Conference 2025 stands out as my most rewarding experience. I led operations and strategy while overseeing the finance sector, ensuring every detail was executed seamlessly and every cent accounted for. Hosting over 100 participants was no small feat, but seeing the event succeed and create meaningful connections made all the effort worthwhile.



3 *How has CBEN shaped your understanding of biochar and sustainability*

CBEN has completely shifted my perspective on sustainability. I now see waste as a valuable resource and strongly resonate with the principle that everything we need for a sustainable future is already within our reach. Through CBEN, I've learned how circular solutions like biochar turn challenges into opportunities, reinforcing that innovation and collaboration are key to achieving lasting impact.



4 *What challenges have you faced, and how have you overcome them?*

One of the key challenges I encountered was ensuring the timely formalisation of CBEN, which required navigating complex government procedures. This process was demanding, but with determination and the support of CBEN's leadership and network, I was able to overcome these hurdles. Their guidance, advice, and connections proved invaluable in meeting deadlines and advancing our goals. I am grateful to be part of such a committed and resourceful community.

5 *What excites you most about CBEN's regional and global collaborations?*

What excites me most is the shared expertise across CBEN's regional and global network. This collective knowledge makes collaborations seamless, particularly in areas such as proposal development and the organization of conferences and seminars. The ability to draw on diverse perspectives and experiences not only strengthens project outcomes but also fosters a spirit of unity and innovation across borders.

6 *As we approach a new year, what are your hopes for CBEN and your role?*

My hope is for CBEN to continue growing its vibrant community and finalize its formal registration, which will strengthen our ability to influence policy and scale impact. In my role as Head of Operations and Strategy, I aim to streamline processes, enhance collaboration, and ensure that our initiatives deliver measurable results. 2026 is about building on our successes and positioning CBEN as a leading voice in circular bio-nutrient solutions.

6 *Any parting words to CBEN?*

I extend my sincere appreciation to CBEN for creating a platform that fosters collaboration, innovation, and shared learning. The network has not only advanced my understanding of sustainability but also demonstrated the power of collective action in driving meaningful change. I look forward to continuing this journey together and contributing to the growth and impact of CBEN both regionally and globally.

Growing Bamboo, Growing Prosperity: A Guaranteed Market Model for Biochar and Climate Resilience in Kenya

By Hardley Malema

Across Kenya, bamboo is rapidly gaining recognition as a high-potential nature-based solution for climate mitigation and rural development. At Ecolibrium, our Kongolo Biochar Project demonstrates how bamboo cultivation paired with innovative carbon-removal technology can strengthen livelihoods and restore degraded ecosystems.

Our model begins with farmers. Eco2 encourages and supports smallholder farmers to grow bamboo with the assurance of a guaranteed market offtake. This commitment reduces risk, builds confidence, and creates a reliable and sustainable income stream for farmers adopting bamboo cultivation.

When farmers harvest bamboo for commercial or domestic use, a significant portion of the plant -leaves, branches, culm sheaths, and other residues remain unused. Instead of letting this material go to waste or be burned, Eco2 collects and converts these residues into high-quality biochar. Farmers do not sell this waste; rather, our project provides a value-adding pathway that turns what was once discarded into a climate solution.

Biochar is produced using improved Kon-Tiki flame-curtain kilns, which allow for low-emission pyrolysis and ensure that carbon is locked into a stable form for more than 1000 years.

Each batch is monitored through Circonomy's digital MRV platform, ensuring traceability, accuracy, and alignment with international carbon standards.

The project is currently undergoing validation, a critical step toward full carbon market integration. This process will verify the methodology, monitoring systems, and long-term climate impact of the project.

More than 1,000 farmers are already involved in the bamboo value chain. Through guaranteed offtake and increased demand for bamboo, communities are gaining new economic opportunities while enhancing soil health, improving water retention, restoring biodiversity, and contributing to long-term carbon sequestration.

The Kongolo Biochar Project illustrates the power of combining community-led action, circular resource use, and carbon finance. As we finalize validation and scale the model, we look forward to continued collaboration with the CBEN community to expand bamboo biochar solutions across Kenya and the region.

dMRV Tool for Monitoring, Verification, and Certification of Carbon Removal Projects

Tracy Amondi

As scrutiny of carbon credits increases, the difference between a promising carbon removal project and a bankable one often comes down to data. Buyers demand traceability. Verifiers demand consistency. Standards demand evidence. And project developers need a system that can deliver all three efficiently and at scale.

This is where digital Monitoring, Reporting, and Verification (dMRV) has moved from a technical upgrade to a commercial necessity. Modern dMRV tools are no longer just data repositories; they are end-to-end operational platforms that enable faster certification, lower verification costs, and stronger buyer confidence. PlantVillage+'s dMRV is one such platform, designed specifically to meet the needs of high-integrity carbon removal projects.

What dMRV Means in Practice

At its core, dMRV is about replacing fragmented, manual workflows with a single digital system that captures, validates, and reports project data in real time. Instead of relying on spreadsheets, email attachments, and retrospective reporting, project teams collect field-level data directly through digital tools that feed into automated carbon accounting and verification processes.

PlantVillage+'s dMRV platform brings this concept into practical, day-to-day operations. It allows project developers to track the full lifecycle of a carbon removal activity from inputs and production through transport, application, and final carbon quantification within one integrated system.

Why dMRV Is a Commercial Advantage

1. **Faster Path to Credit Issuance**

Time to issuance matters. Traditional MRV processes often slow projects down due to missing data, inconsistent records, or lengthy audit cycles. PlantVillage+'s dMRV captures data correctly from the start, producing verification-ready documentation that reduces back-and-forth with auditors and accelerates credit issuance

- Lower MRV and Verification Costs

Verification is one of the largest recurring costs for carbon removal projects. By structuring data in a consistent, auditable format and enabling remote review, dMRV significantly reduces verification effort. PlantVillage+'s platform is designed to minimize manual intervention, allowing verifiers to focus on review rather than reconstruction of project activities.

- Built-In Traceability for Buyers

Carbon credit buyers increasingly conduct their own due diligence. PlantVillage+'s dMRV provides transparent, traceable evidence; geotagged photos, timestamps, and chain-of-custody records that strengthens buyer confidence and supports premium pricing for high-integrity credits.

- Designed to Scale With Your Project

Whether a project involves a single production site or hundreds of distributed operations, dMRV enables consistent data capture at scale. PlantVillage+'s system is particularly well suited for decentralized projects, including biochar and land-based removals, where standardized data collection across multiple actors is critical.

How PlantVillage+'s dMRV Works

- Smart Data Collection at the Source

PlantVillage+ uses mobile and web-based tools to capture data directly from field teams and operators. Smart forms restrict inputs to approved options such as feedstock types, production parameters, or application methods reducing errors and improving data quality from day one.

- Automated Carbon Accounting

Once collected, data flows into automated workflows that apply approved carbon accounting methodologies. The system performs consistency checks, flags anomalies, and calculates net removals, turning operational data into quantified climate outcomes without manual spreadsheets.

- Verification-Ready Reporting

The platform generates standardized MRV documentation, including carbon quantification reports, activity logs, and digital evidence packages aligned with carbon standard requirements. All records are time-stamped, georeferenced, and version-controlled, creating a clear audit trail.

- Seamless Engagement With Standards and Verifiers

PlantVillage+'s dMRV integrates smoothly with third-party verification and certification processes. Auditors can access organized digital records remotely, review data efficiently, and validate removals with confidence. This leads to smoother audits and faster certification cycles.

A Practical Example: Biochar Carbon Removal

In a biochar project, PlantVillage+'s dMRV can track feedstock inputs, production conditions, laboratory analysis results, transport logistics, and land application events in one system. Each step is documented digitally and linked to carbon accounting calculations. The result is a transparent, defensible pathway from biomass to verified carbon credits—without the administrative overhead that typically slows biochar certification.

Why dMRV Is Becoming the Market Standard

As carbon standards tighten requirements around traceability, permanence, and data integrity, projects without robust digital MRV systems risk falling behind. dMRV is increasingly viewed not as an optional enhancement, but as core infrastructure for credible carbon removal.

PlantVillage+ is certified by Carbon Standards International, reinforcing the platform's alignment with recognized verification frameworks. This certification signals to project developers and buyers alike that the system is built to meet today's standards and adapt to tomorrow's.

Turning Data Into Market Value

High-quality carbon credits start with high-quality data. PlantVillage+'s dMRV transforms operational data into verification-ready evidence, reduces certification friction, and builds trust across the value chain. For carbon removal projects looking to scale, attract buyers, and maintain credibility, dMRV is no longer just a technical tool, it is a commercial enabler.

Black Soldier Fly Enterprises ; Complementary Nutrient And Carbon Recovery Solutions.

By Hope Ochieng

A complementary recovery solution refers to a system that adds value and maximizes the benefits of other solutions,Black Soldier Fly (BSF) Enterprises offer a practical and scalable complementary solution for nutrient and carbon recovery by transforming organic waste into valuable agricultural inputs. Through the rearing of the BSF larvae, organic waste such as food scraps, market waste, and agro-residues are rapidly converted into two key products: protein-rich larvae for animal feed and nutrient-dense frass for use as organic fertilizer.

This process recovers essential nutrients such as nitrogen, phosphorus, and potassium thus proving that BSF enterprises are a complementary nutrient recovery solution since they capture, recycle, and reintroduce nutrients from organic - wastes back to into productive agricultural systems instead of letting them be lost through dumping and land filling

From a carbon recovery perspective, BSF enterprises significantly contribute to climate-smart agriculture and circular economy goals. By diverting organic waste from landfills, the system reduces methane emissions, a major greenhouse gas associated with decomposing waste. At the same time, applying BSF frass to soils enhances soil organic carbon, improves soil structure, and increases water retention, leading to more resilient and productive farming systems.

The integration of BSF enterprises complements composting and biochar initiatives, creating a holistic waste-to-resource-recovery model that supports environmental sustainability, youth livelihoods, and sustainable food system.

These are indicators as to why BSF enterprises should be embraced and be used as a complementary nutrient and carbon recovery solution, for it efficiently converts organic wastes into valuable feeds, fertilizer, and soil building inputs, while reducing emissions.

Health and Environmental Safety Standards for Biochar Production

Hibret Demissie Guracha (Ph.D.)

The safety of biochar is largely determined by the feedstock selected and the production methods. Although biochar offers valuable benefits for soil enhancement, carbon storage, and waste management, it can also pose environmental and health risks through toxic emissions and contaminant buildup. To address these concerns, international frameworks such as the International Biochar Initiative (IBI) and the European Biochar Certificate (EBC) set strict contaminant thresholds, promote safe production practices, and require rigorous quality assurance to ensure biochar is produced responsibly and remains safe for long-term soil application.

Biochar presents a range of health and environmental risks that are shaped by feedstock contamination, pyrolysis conditions, and particle size. Major hazards include the release of toxic gases, dust inhalation, and spontaneous ignition if the material is not properly cooled.

The pyrolysis conditions can lead to the formation of Environmentally Persistent Free Radicals (EPFRs), which are capable of inducing oxidative stress, causing damage to lung tissue and DNA, and contributing to the development of respiratory and cardiovascular diseases.

Contaminated feedstocks may also introduce heavy metals and polycyclic aromatic hydrocarbons (PAHs), which can persist in soils, accumulate in plants, and enter the food chain.

Additionally, aged biochar may release previously adsorbed pollutants, further undermining health and environmental safety. Current studies remain limited in this regard, with most focusing narrowly on PAHs rather than the broader spectrum of possible contaminants.

Endogenous pollutants in biochar primarily originate from the raw feedstocks used in its production, with feedstock type, collection site, and pyrolysis conditions playing a major role in determining its properties for its use. For example, municipal solid waste can introduce PAHs and plastics, sewage sludge often contains heavy metals such as lead (Pb), chromium (Cr), and cadmium (Cd), while woody biomass may generate volatile organic compounds (VOCs), PAHs, and EPFRs. These contaminants can be released during production as well as its application, creating risks for human and environmental health. To mitigate such hazards, international safety standards stress the importance of strict quality control, including careful feedstock selection, regulation of contaminants, and certified production practices, ensuring biochar remains safe for long-term use.

Generally, biochar's safety depends on feedstock and production methods. While it offers soil, carbon, and waste-management benefits, poor regulation can lead to health and environmental risks. In this regard, international standards such as IBI and EBC set contaminant limits, require feedstock screening, emission controls, and quality testing. Therefore, risks are minimized through safe raw material selection, controlled production, and strong occupational health measures.

“Beyond ‘Safe’: Rethinking Biochar Quality for Purpose, Performance, and Impact”

Prof Johannes Lehmann

“Quality for what?” may be the appropriate first reaction when reading about quality standards. There have been guidelines for how to assess whether a biochar material is ‘safe’ to apply to soils for over a decade. The ones developed by IBI or EBC mainly list analytical protocols and thresholds when a material can be called a biochar, and whether it is not causing any pollution of soils because of pollutants. But that says very little about whether a given biochar will deliver on an intended purpose or not. Such a conversation may typically need to start with an assessment of what problem a user may be intended to fix,- whether in soil or in a material such as in construction. Whether a particular biochar attribute or biochar material is fit for a certain purpose then needs very specific analytical procedures that may or may not be covered by an off-the-shelf guidelines.

Some efforts have been made to classify biochars in the past, with respect to carbon persistence in the context of climate change mitigation and carbon dioxide removal, or with respect to nutrient contents or liming equivalence in the context of crop production. Such bench-marking is helpful, but often not sufficient for a user to select the suitable biochars for their specific purpose

Matching intended use with a property may also require to think beyond the material property of biochar but into the system-effects,- this is key for climate change mitigation for example, as it does not matter how durable a biochar is if it is made from a tree that would still be growing in 100 years, no biochar production however durable, will generate an emission reduction.

A decision support system that matches an identified soil constraint with a suitable biochar does not yet exist, or not to the extent that it covers a sufficiently wide range of problem. In the age of AI, there may be new options if we had more data to learn from. And therein lies the crux for advancing biochar science for the next generation of quality standards and decision support systems: we need more data. These can often not come from science, as scientific projects may not generate enough data and too slow. Rather, we need to crowd-source these data through our emerging networks and build the databases to allow progress that will benefit everyone in this field. Let’s get started.

CBEN's Formalization into the Circular Bionutrient Economy Association (CBEA) and Launch of Member Registration

By Rita Opiyo, CBEN Head of Strategy and Operations and Bella Culotta, CBEN Programs Manager

As of November, 2025, CBEN has officially registered an association with the Registrar of Societies in Kenya, under the name Circular Bionutrient Economy Association. We are on track to finalize our financial accounts and governance operations by the end of the year. Formalisation enables the network to explore a wider range of fundraising opportunities, foster collaborations with larger organizations, and create a sustainable finance model to ensure continued operations, independent of grants.

Following valuable insights from the 2025 CBEN Conference, it became clear that members value the resources and collaborative structure of CBEN. Formalisation ideas and volunteer roles included grant-writing teams, membership fee willingness-to-pay schemes, and future event locations and partners.

As one step to enact these ideas, of , CBEN will introduce a membership registration model beginning January 31 2026. This model is designed to:

- Support operational costs sustainably
- Foster inclusive and tiered engagement for all members
- Align with CBEN's broader funding strategy by creating a stable, member-driven financial base

Formalized membership will strengthen CBEN's governance, enhance collaboration, and position the network for greater regional and global impact. The table below outlines our membership categories with respective definitions and fees.

Table 1: ***CBEN Membership Registration Model (Effective January 2026)***

Membership Category	Definition	Fee (USD)	Fee (KSh)
Members with Grants (3-year membership)	Any member organization can register for three years (or there grant duration) to use funds in the budget-required	$1,500	KSh 202,000
Annual Membership – Smallholder Farmer	Single member who's primary source of income in their farm. Renews membership yearly.	$12	KSh1,500
Annual Membership – Organization (Start -up)	Individual from regional organizationswhich have been in operation for less than 5 years or has less than 5 staff,	$40	Ksh5000
Annual Membership – Organization	Individual from regional organization with established operations and capacity for collaboration.	$155	KSh20,000
Annual Membership – International Organization	Individuals from organizations based outside the region, budgeting in USD/EUR, seeking global access and	$450	KSh 57,000
Annual Membership – International Individual	A individual living outside Kenya who's budget is majorly in USD/EUR/GBP	$70	KSh 9,000
Network Sponsoring Member	Individuals or Organizations seeking to offer Annual sponsorship to CBEN. Advertising packages and/or	$3,500	KSh 450,000
Voluntary Member (25 hrs, 1–2 outputs)	A contributor offering time and outputs (25 hours) in exchange for full participation.	$0	KSh 0
Honorary Member	A recognized contributor invited to participate in CBEA's mission and events	$0	KSh 0

2025/2026: Strategic Plan

CBEN's 2025-2026 strategic plan sets out a clear roadmap for July 2025 – June 2026. It focuses on strengthening regional collaboration, advancing research in nutrient recovery technologies such as biochar and composting, influencing supportive policy frameworks, and expanding CBEN's global visibility through international engagements.

Operationally, CBEN has already successfully hosted the Artisanal Study Tour in December 2025, showcasing grassroots innovations in nutrient recovery. Looking ahead, the Bio360 Expo, 2026 CBEN Conference, and ongoing hybrid working groups will continue to drive innovation, strengthen partnerships, and expand CBEN's global visibility.

Table 2: CBEN Tenetative Event Dates 2025/2026)

EVENT	DESCRIPTION	TENTETATIVE DATE
CBEN Monthly Calls	Regular virtual meetings held on the first Monday of each month.	Monthly
Hybrid Working Groups Launch	Thematic groups on biochar, policy, and resource mapping meet virtually and in-person	Second Quarter 2026
Artisanal Study Tour	Regional field tour showcasing grassroots innovations in nutrient recovery	Dec 2025
Bio360 Europe Expo (France)	Hosting an exhibition booth at Bio360 Europe Expo (France)	Feb 2026
Bio360 Africa Expo (JoBurg)	Hosting an exhibition booth at Bio360 Africa Expo (JoBurg)	Jun 2026
WasteEng	Participation in the International Waste Engineering Conference to present African-led innovations, share policy briefs, and build global research partnerships (France)	Jul 2026
Webinar Series	Capacity-building sessions for members and partners	Fourth Quarter (2026)
CBEN Conference	A flagship regional convention bringing together CBEN members, researchers, policymakers, and donors.	Fourth Quarter (2026)

By Rita Ellen, CBEN Head of Strategy and Operations

Pictorials


BIO KENYA PROJECT TANGAKONA


BIOCHAR AND INSECT-COMPOSTED ORGANIC FERTILIZERS IN KENYA (BIO-KENYA PROJECT)
OVERALL
Increased Yield


KENYA
RWANDA
SWITZERLAN
BWE

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Rita Ellen is the Head of Strategy and Operations at CBEN.
With a background in Natural Resource Management and Masters in Climate Change and Development at the University of Cape Town. She is also the Executive Treasure to the CBEN Board.

Samuel Thuo Mungai is the founder of Ziada Solutions Kenya and is a sustainability expert, agronomist and entrepreneur championing green innovations & sustainable agriculture. Sam Serves as the Chairperson to the CBEN Board

Tracy Amondi the the Lead Technical and Client Support Officer at PlantVillage +Kenya. She specializes in Biochar Account Management and has a forestry background.

Valeria Araico is the Operations and Programs Senior Manager of International Biochar Initiative. She has over a decade of diverse experience in NGO management, administrative coordination, and project management.

OUR NETWORK


Poverty and Health
Integrated Solutions (PHIS)


ECO2LIBRIUM
Sustainable Solutions


Solidaridad


MASENO
UNIVERSITY


International
Biochar
Initiative


KERE CITY
ECO VILLAGE
A Living Wind Blows


ZIADA
SOLUTIONS


regen organics


LaserArts


Fresh
Life


IITA
Transforming African Agriculture
CGIAR


BIOSORRA


Cornell University


ANABIGREEN Co.Ltd

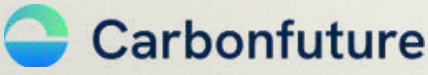

DBFZ


IQQO
Oromia Agricultural Research Institute


PlantVillage


ETH zürich


Centre for Science & Technology Innovations (CSTI)


Carbonfuture


GIVING HOPE
FOUNDATION


KIYA


CIFOR


World
Agroforestry


BiocharLife
An Impact Venture by Warm Heart Worldwide

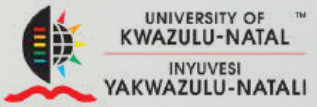

OFIMAK
ORGANIC FERTILIZER & INPUT
MANUFACTURERS ASSOCIATION OF KENYA


JENI-ECO COMPANY
Creativity-Innovation-Solutions


CARBON STANDARDS
international


JIMMA UNIVERSITY


STARTER
STUDI ANALISI E RICERCHE
TERRITORIALI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INYUVESI
YAKWAZULU-NATALI


DARK EARTH
CARBON


SafiOrganics


IRD


AFARINICK


Rejuvenated
Seniors Alliance


EcoFix(k)
GREAT FOR YOU


CARBON
CONNECT


Egima Foundation


CRIOU


CaDev


Pure Plant
Organics
Good for the planet . Good for you


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