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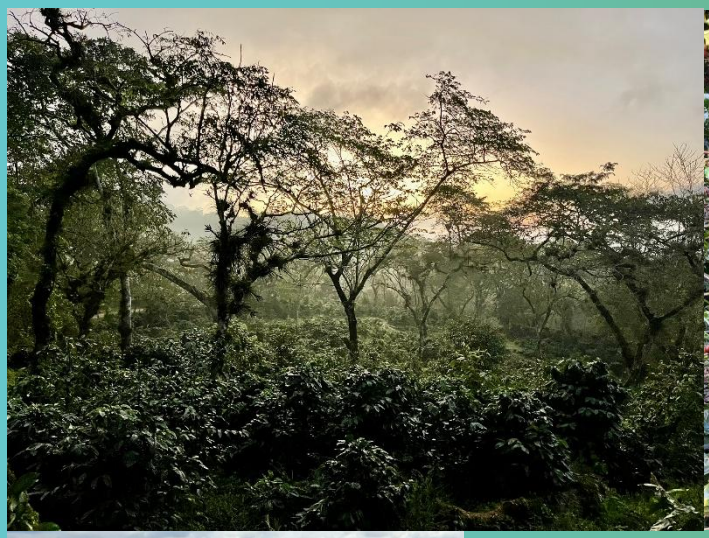

NKG TECHNICAL GUIDEBOOK

REGENERATIVE AGRICULTURE

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1. Glossary

For the purpose of this Guidebook, the term of Regenerative Agriculture below follows definitions of Global Coffee Platform (GCP) and other commonly accepted publications:

Term	Definition
Agriculture / Agricultural use	Land used primarily for permanent or annual crops, meadows/pastures, livestock raising, farm infrastructure, or fallow land.
Agroforestry	Integration of woody perennials, i.e., trees or shrubs with agricultural crops, in our case coffee, and/or animals in spatial or temporal arrangements marked by ecological and socio-economic interactions.
Biochar	Biochar is a stable, carbon rich material produced by heating biomass such as pruning residues, renovation wood or coffee pulp or husk under limited oxygen (pyrolysis).
Carbon removal	The process of removing greenhouse gas emissions from the atmosphere, through natural solutions such as reforestation and soil management or technological solutions. Occurs after the emitted carbon has entered the atmosphere and is not a substitute for cutting greenhouse gas emissions, but it can slow down climate change.
Climate Change Mitigation	refers to actions aimed at reducing greenhouse gas emissions or enhancing carbon sequestration within coffee production and processing systems.
Climate Change Adaptation	refers to adjustments in processes, practices, and production systems that enable coffee farms and supply chains to cope with climate change impacts, reducing vulnerability and strengthening long-term resilience.
Climate Change Resilience	is the ability of farmers, workers and communities and business operations to better withstand changing climatic conditions in both the short and the long- term.
Conversion	Loss of a natural ecosystem as a result of its replacement with agriculture or another land use, or due to a profound and sustained change in a natural ecosystem's species composition, structure, or function.
Coffee Supplier	Any farmer or company that supplies raw, processed, or finished coffee to NKG.
Cut-off date	31 December 2020. "Post-2020 deforestation" means clearing of natural forest after this date.
Deforestation	Loss of natural forest due to conversion to agriculture or other non-forest land use, conversion to tree plantations,

	or severe and sustained degradation.
Farm	A farm is an entity dedicated to the **management of land for agricultural purposes**, including cultivating crops, raising livestock, or forestry. A farm must have one but may have multiple interconnected or geographically dispersed plots. A farm operates under one central management.
Farmer Service Units	NKG's field teams that provide crucial services to farmers, including technical assistance, financing, market access, certification, information services, inputs, renovation (seedlings) and infrastructure.
Forest	Land >0.5 ha with trees >5 m and canopy cover >10%, or trees able to reach these thresholds in situ. Focus is on preventing loss of natural forests.
Global Coffee Platform	A multi-stakeholder initiative of coffee producers, traders, roasters, retailers and other groups involved in the supply chain. GCP seeks to enhance the profitability of coffee production, the improvement of farmers' livelihoods as well as the conservation of nature.
Natural Ecosystem	An ecosystem that substantially resembles — in terms of species composition, structure, and ecological function — one that is or would be found in a given area in the absence of major human impacts. This includes human-managed ecosystems where much of the natural species composition, structure, and ecological function are present.
Natural Forest	A forest that is a natural ecosystem. Natural forests possess many or most of the characteristics of a forest native to the given site, including species composition, structure, and ecological function. Natural forests include:
Non-deforestation	Production, sourcing or investment in coffee that does not cause or contribute to deforestation.
Pyrolysis	The heating of an organic material, such as biomass, in the absence of oxygen.
Regenerative Agriculture in Coffee	Regenerative Agriculture in Coffee is a holistic, outcome-focused approach to sustainable coffee farming that emphasizes improving and restoring resources and services by nature (primarily soil, biodiversity and water) to achieve improved profitability and resilience of coffee farming systems with benefits for farmers and ecosystems, thus ensuring long-term coffee supply.

2. Principles for Implementation

The following principles should guide the planning, implementation and evaluation of Regenerative Agriculture programs and projects in NKG's supply chains and operations.

Farmer Agency

All regenerative agriculture interventions within NKG should strengthen the agency of farmers and farming families, recognizing them as the primary decision-makers over their land, livelihoods, and risk exposure. Measures should be co-developed with farming households and offer genuine choice, enabling them to decide whether, how, and at what pace regenerative practices are adopted, based on household priorities, capacities, and resources. This includes valuing local knowledge, supporting income diversification, and providing accessible information that enables informed decision-making and outcomes such as productivity, resilience, and economic stability.

As regenerative agriculture entails transition costs and uncertainty, farming households should not bear these risks alone. Strengthening farmer agency requires shared responsibility and risk-sharing mechanisms, including technical support, appropriate financing, and fair incentives. NKG contributes by expanding the options available to farming families without prescribing uniform pathways, ensuring continued participation remains a deliberate and voluntary household choice.

Context Sensitivity

Regenerative Agriculture must be grounded in the specific ecological, social, and economic context of each coffee landscape where NKG operates. This is ensured through strong local involvement, particularly by NKG's FSUs and field teams, whose ownership of planning and implementation anchors interventions in local knowledge and experience.

Factors such as climate, soil, water patterns, and altitude, as well as cultural traditions, farmer knowledge, governance, farm size, market access, and resource availability, influence which practices are feasible and sustainable. Respecting these differences ensures that regenerative systems are ecologically appropriate, socially relevant, and economically viable, supporting long-term resilience. Additional guidance may be sought from local coffee institutes and research partners with whom NKG collaborates.

Focus on Climate Change Adaptation

NKG views Regenerative Agriculture as a key means to strengthen climate adaptation and farm resilience. While climate mitigation is important, interventions should not be driven solely by carbon benefits if they conflict with productivity or farmer livelihoods. Where possible, mitigation and adaptation should go hand in hand: well-adapted, diverse shade systems can sequester carbon while improving microclimates, reducing erosion, and strengthening long -term farm resilience.

Alignment with Industry Standards & Guidebooks

The coffee sector already benefits from a wide range of industry standards and technical handbooks that define key principles of regenerative and sustainable agriculture and offer practical recommendations for implementation. NKG promotes and participates in these initiatives to contribute to sector alignment in terms of definition of which practices constitute Regenerative Agriculture, the use of common terminology and common approaches to monitoring of practices and outcomes. A consolidated list of documents is provided at the end of this document.

These resources collectively form a robust body of knowledge that supports the design and implementation of Regenerative Agriculture programs. They are to be consulted by NKG's FSUs, field teams, and suppliers, as references when planning interventions or developing support materials.

Alignment with Regulations & Certifications

All Regenerative Agriculture practices and activities within NKG must comply with applicable local and national laws, as well as relevant international requirements for coffee production and trade. In addition, certification and verification schemes—including NKG's proprietary NKG Verified scheme—address elements of Regenerative Agriculture, either explicitly or implicitly, and coffee produced under these schemes must meet their respective requirements. Together with sector frameworks like the Global Coffee Platform (GCP) Coffee Sustainability Reference Code, the standards not only define criteria for certified or verified supply chains but guide strengthening responsible and regenerative practices in non-certified coffee production.

Safeguards and Do-No-Harm

All Regenerative Agriculture interventions within NKG are guided by a Do-No-Harm lens, ensuring that well-intended actions do not lead to unintended social, environmental, or economic harm.

Socially, interventions must respect land and resource rights, including those of indigenous peoples and local communities, promote equity and inclusion, and ensure that participation in carbon or biodiversity schemes is voluntary, transparent, and based on fair terms. Where relevant, practices such as agroforestry or intercropping should strengthen local food security and household resilience.

Environmentally, interventions must avoid ecosystem degradation, protect soil and water resources, and maintain biodiversity and habitat connectivity. Only coffee varieties and other plant species should be promoted that are suited to ecosystems and conditions. Before new varieties or species are introduced or propagated, the expected added value and potential risks must be assessed.

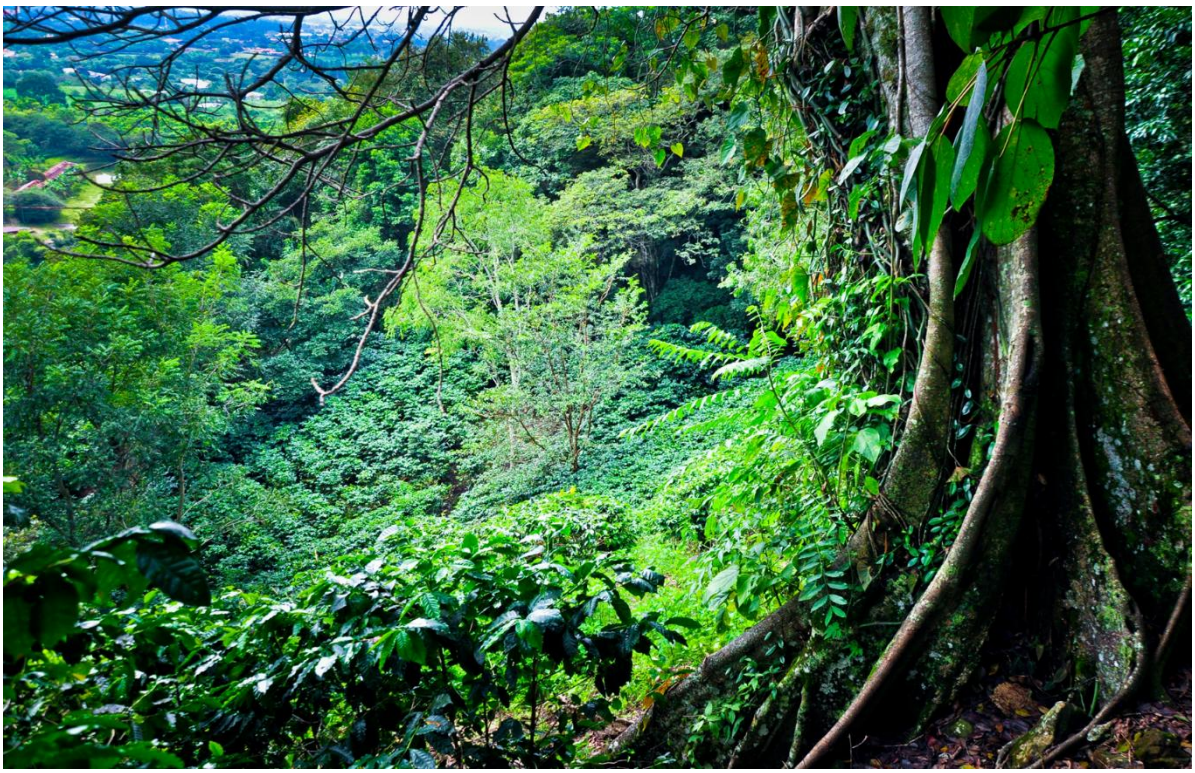
Economically, they should be viable over the medium to long term, avoid dependency on ongoing subsidies, consider transition-phase constraints, and balance productivity, quality, and risk in line with farmer ambitions and market conditions.

Regenerative coffee landscape – Source: Nick Migwi/NKG

3. Objectives

This guidebook provides guidance to NKG employees and partners, particularly those in contact with coffee agronomy and farmer services, in the broad field of Regenerative Agriculture and informs on principles, processes and actions that NKG sees as recommendable. By embracing Regenerative Agriculture in a structured and locally adapted way, NKG aims to:

- Support farmer livelihoods and long-term relationships by helping them adapt to climate change, stabilize yields, and increasing farm resilience.
- Secure long-term supply by supporting farmers in improving the resilience of coffee-growing landscapes against climate change, pests, soil and water degradation.
- Empower NKG Farmer Service Units (FSUs) and field teams to engage and support farmers in adopting regenerative practices through training, extension, and practical guidance
- Reduce environmental and climate-related supply chain risk and its social effects by promoting soil restoration, carbon sequestration, water protection, and biodiversity.
- Guide the development of high-impact projects and partnerships that enhance soil health, biodiversity, climate resilience, and farmer livelihoods across our supply chains.
- Enhance coffee quality and consistency through improved soil health and water use, diversified shade systems, and regenerative farming practices that boost quality over time.
- Cater customer needs for regenerative and resilient sourcing.
- Align with suppliers and partners to ensure shared goals, common standards, and collaborative implementation of Regenerative Agriculture across our sourcing regions.
- Foster strategic alliances and multi stakeholder initiatives that strengthen sector-wide transformation, unlock funding opportunities, and scale regenerative solutions at landscape level to the benefit of all actors involved.



Regenerative coffee landscape – Source: Alice Olrdenburg/NKG

4. Technical Guidance

"Regenerative Agriculture in coffee is a holistic, outcome-focused approach to sustainable coffee farming that emphasizes improving and restoring resources and services by nature (primarily soil, biodiversity and water) to achieve improved profitability and resilience of coffee farming systems with benefits for farmers and ecosystems, thus ensuring long-term coffee supply". (GCP 2025)

The following sections outline approaches and interventions, which NKG sees as most promising with regards to achieving three overarching goals:

- Promoting a gradual, locally adapted Regenerative Agriculture transition within NKG's supply chains
- Achieving scale and impact through Regenerative Agriculture where it matters most
- Creating impact in the most pragmatic and economic way.

Approaches and interventions are structured according to the four pillars of Regenerative Agriculture as defined by GCP:

- Soil
- Biodiversity
- Water
- Resilient Farmer Livelihoods

Each section highlights the overarching importance for NKG. Based on that, a more detailed description of approaches with specific importance or suitability for NKG supply chains is presented.

Regenerative coffee landscape – Source: NKG

4.1 Soil

"Sustainable management of soil is essential to maintain, restore and build soil health to support productivity and soil capacity to optimize its ecological functions." (GCP 2025)

Soil health is a fundamental pillar of Regenerative Agriculture and underpins the long-term- productivity and resilience of coffee farming systems. Soil health refers to the soil's capacity to perform its ecological functions—sustaining plant growth and biodiversity, providing habitat for soil biota, regulating water, cycling and supplying nutrients, buffering pollutants, and contributing to the natural regulation of pests and diseases.

NKG's Priorities in Soil Management

NKG advocates a structured approach to soil health, grounded in a deep understanding of a farm's soil, crop condition, and overall farm system. This knowledge forms the foundation for any targeted action. Soil is viewed by NKG as the critical starting point for Regenerative Agriculture — the area where meaningful impact can be achieved most quickly and at scale. To realize these objectives, NKG identifies the following key activity areas as most relevant:

- Integrated Nutrient Management
- Soil Cover and Integrated Weed Management
- Integrated Pest Management
- Biochar

4.1.1 Integrated Nutrient Management

Integrated Nutrient Management is a core regenerative practice that aims to optimize plant nutrition while safeguarding soil fertility, reducing input costs, and minimizing environmental impacts.

NKG prioritizes:

- Applying the 4R principle for fertilization by ensuring the **R**ight Rate, **R**ight Time, **R**ight Source and **R**ight Place guides fertilizer application
- Conducting thorough soil analysis where possible and useful
- Choosing a balanced source of nutrients from organic sources and mineral fertilizer
- Enabling access to high-quality fertilizers

NKG encourages and supports farmers to apply the 4R principle and i) select appropriate nutrient sources, ii) apply only the necessary amount, iii) time applications according to crop demand, and iv) place nutrients where plants can absorb them effectively. NKG's FSUs and field teams can support determining the specific recommendations on farm level, drawing on support from local coffee institutes and research organizations, where suitable and applicable.

Soil analysis should be conducted on a regular basis to understand nutrient availability and to assess the soil's current condition, and potential limitations. This applies where the economic feasibility and cost-benefit of the analysis indicate a potentially positive return on the investment. Soil analyses can be complemented by leaf analyses, following the same cost-benefit logic. Soil analyses should consider macro-, meso-, and micronutrients as well as soil properties such as pH, organic matter, soil texture and overall fertility indicators to provide a comprehensive understanding of the soil's status and guide informed nutrient management decisions.

NKG develops own technological capacities to conduct soil analyses and provide tailored fertilization

recommendations and engages in partnerships to avail soil analyses and suitable inputs to producers at broader scale.

Choosing a balanced source of nutrients is key for productive coffee farms. Organic fertilizers produced from biomass and organic waste—through composting, mulching or anaerobic digestion of husk, pulp, or other residues—contribute to long-term soil fertility and improved soil structure. In standard farming systems, organic input alone typically is not sufficient to meet full crop nutrient

Soil sampling/analysis equipment – Source: NKG

requirements. Potential competition for available biomass/organic waste should be considered. Sustainable productivity often requires mineral fertilizers, which should be chosen based on plant needs and procured from renown quality input providers. As excessive mineral fertilizer application can harm soil health, disrupt microbial life, and lead to greenhouse gas emissions, the use should be within suggestions for optimal crop growth and balanced with organic fertilizer. NKG's farms cooperate with external partners on improved fertilization and act as innovation hub within NKG.

NKG can enable access to high quality fertilizers, by leveraging its networks, engaging in direct distribution or providing input financing, where farmers have difficulties accessing high-quality mineral fertilizers. Availing mineral fertilizers to farmers should not be a stand-alone service but always be integrated into holistic set of farmer services.

4.1.2 Soil Cover and Integrated Weed Management

Soil cover and Integrated Weed Management are closely interlinked practices that aim to maintain soil health, foster biodiversity and managing weeds in a selective and preventative manner.

NKG prioritizes:

- Soil cover with cover crops adapted to local conditions or mulch
- Integrated Weed Management to keep weed pressure below defined thresholds
- Preventative and cultural measures over chemical application

Maintaining soil cover is a key principle of soil conservation. It protects soil from water and wind erosion, regulates soil temperature, improves water infiltration and retention, and supports soil biological activity. Increasing water infiltration and maintaining soil moisture thereby are key, particularly as part of active climate change adaptation. These effects are achieved primarily through cover crops and mulching with organic residues. Cover crops (living mulch") may be established between coffee trees where conditions allow and where bare soil would otherwise increase erosion risk while having limited water infiltration and high evapotranspiration.

Species selection for cover crops should be adapted to local agroecological conditions and prioritize compatibility with coffee, soil protection and biomass production. In addition, and where appropriate, additional functions such as nitrogen fixation can be considered. Basic cover crops, e.g. grass varieties, are recommended above leaving bare soil, where adapted cover crops are not available or economically not suitable. Cover crop biomass should be retained on-site through cutting or mulching to ensure continuous soil cover and organic matter restoration. In erosion-prone environments such as steep slopes, high-rainfall areas, or full-sun systems, erosion control measures and contour planting can be relevant additional measures.

Cover crops in Brazil and Uganda – Source: Nick Migwi/NKG

Integrated Weed Management addresses soil-moisture-nutrient-biodiversity-weed interactions. It is an integral component of soil conservation and cover cropping. It is based on understanding the weed species present, their life cycles, and their potential effects on coffee productivity, soil resources, and pest and disease dynamics, allowing non-competitive or beneficial ground-cover species to remain as they contribute to soil protection and ecosystem function.

Preventative and cultural measures should be prioritized over chemical application. To limit weed introduction and spread, preventive measures incl. maintaining soil cover through cover crops and mulching, optimizing plantation design (e.g. shade and planting density), contour planning, and minimizing soil disturbance should be promoted. Where weed control is necessary, physical measures such as manual weeding, slashing, mowing, or targeted removal of aggressive species are preferred, often combined with mulching using organic residues to suppress regrowth over time. Chemical weed control is limited as much as possible and only used when other measures fail.

4.1.3 Integrated Pest Management

Integrated Pest Management combines ecological prevention, careful monitoring, and selective intervention to manage pests and diseases while minimizing pesticide use and reducing risks to people and the environment.

NKG prioritizes:

- Integrated Pest Management to prevent and manage pests and diseases through ecological, preventive, and knowledge-based approaches
- Using chemical pesticides only after preventive, cultural, and biological measures have proven insufficient
- Reducing environmental contamination and harm from pesticides as much as possible
- Always ensuring farmer and worker safety
- Monitoring, evaluation, and learning systems that improve decisions and reduce unnecessary treatments

Integrated Pest Management aims to prevent and manage pest and disease pressures through ecological, preventive, and knowledge-based approaches. Preventive measures form the foundation of Integrated Pest Management and include maintaining plant vigor through good agronomic practices, soil health management, adequate shade regulation, balanced nutrition, and water management. The use of resistant or improved coffee varieties, recommended by local research institutions and suited to evolving climate and pest conditions, can further reduce the need for chemical plant protection products. Measures that protect and enhance populations of beneficial insects, such as diversified shade canopies, floral resources, and reduced disturbance, contribute to natural pest control and ecological balance on the farm. Pest and disease monitoring is essential for understanding pest dynamics and determining whether and when intervention is required. Regular field observations help distinguish between acceptable pest presence and thresholds where economic or agronomic damage may occur.

Biological pest control – Source: NKG

Chemical pesticides should be used only as a last resort, after preventive, cultural, and biological measures have been exhausted or proven insufficient. Where chemical applications are unavoidable, the minimum effective quantity and frequency should be applied using targeted, precise techniques that limit off target contamination. Selection of pesticides must follow recognized good agricultural practice, including alignment with the pesticide approaches of prevalent third-party certification schemes (such as Rainforest Alliance, Fairtrade) and the Good Practice recommendations of the GCP. GCP maintains lists of prohibited pesticides, which must not be used and a Phaseout List of pesticides that should be progressively reduced and replaced. They serve as important reference for the coffee industry to determine acceptable and responsible

pesticide choices. Restricted or high-risk substances should be avoided, and application must comply with regulations, approved active substances, and international safety standards.

Reducing environmental contamination and harm from pesticides is a crucial part of Integrated Pest Management. Measures include avoiding applications near watercourses, maintaining riparian buffer zones, and minimizing spray drift through appropriate nozzles, low drift equipment, and weather aware application timing. Maintaining permanent soil cover and organic mulches helps reduce runoff and leaching, while shade management and diversified agroecosystems enhance natural enemies and reduce pest outbreaks, lowering the overall need for chemical control. Soil health, biodiversity, and water quality are protected by minimizing repeated applications of the same active ingredients, avoiding unnecessary tank mixes, and ensuring proper cleaning, storage, and disposal of pesticide containers and residues away from fields and water bodies.

Farmer and worker safety is central to responsible pesticide management in NKG's supply chains. Appropriate use and cleaning of personal protective equipment (PPE), safe handling, safe storage, and correct disposal of pesticide containers are essential elements of this approach. Measures are taken to minimize direct exposure to farmers and farm workers, reduce drift or runoff into water bodies, and avoid contamination of soils, biodiversity, and downstream communities. Training and awareness-raising for farmers, farm workers, and field technicians are essential to ensure correct selection of approved substances, safe and proper use and application, understanding labels and preharvest intervals, and recognition of hazards. NKG's FSUs and field teams play a key role in ensuring farmers' awareness on allowed products, their safe and sound application within the larger context of Integrated Pest Management and subsequent waste handling.

Monitoring, evaluation, and learning must inform overall pest control decisions. This can ensure proper use, avoid misapplication and enable the identification of opportunities to replace chemical controls with ecological or mechanical alternatives. Monitoring involves regular documentation of pest and disease incidence, crop damage, and environmental conditions to understand trends and thresholds reached with locally available means. Evaluation focuses on assessing the effectiveness of any control measures applied—biological, cultural, or chemical—avoiding ineffective or unnecessary treatments. Learning occurs through the systematic review of field observations enabling refinement of preventive practices and recalibration of pest thresholds. Feedback loops with local research institutions and other partners can ensure that emerging pest and disease risks, new scientific insights, and changing climatic conditions are incorporated into practical decision making.

4.1.4 Biochar

Biochar is a practical way for coffee farmers to add value to coffee by-products and other available biomass, while enhancing soil structure, improving draught resilience and contributing to climate mitigation.

NKG prioritizes:

- Using biochar where the agronomic benefits are clear and outweigh investment costs
- Choosing the right kind of technology depending on the farmer context and objectives
- Investing time to assess feasibility due to the complexity of technology and context

Biochar offers a variety of significant agronomic benefits with focus on soil improvements. Biochar can boost soil health by raising soil pH, which is beneficial for soil structure and nutrient availability. Biochar's physical structure can improve nutrient retention and release, improve water-holding capacity, and contribute to long-term productivity. As it fixes atmospheric carbon in a stable form for decades to centuries and can reduce the need for mineral fertilizer over longer periods of time, it contributes to climate mitigation. NKG emphasizes its direct, agronomic benefits on coffee farms and promotes biochar as a puzzle piece within the larger transition to Regenerative Agriculture instead of a stand-alone activity. NKG does not promote biochar interventions where the business case is exclusively built on carbon revenues.

Exemplary pyrolysis technology – Source: NKG

Technology and process to produce biochar must match farmer profile, farm requirements and available biomass. Biochar can be produced using artisanal kilns, mobile or semimobile reactor units, or largescale, stationary industrial reactors. Artisanal kilns or mobile reactors are typically simple pyrolysis systems suitable for agricultural residues like pruning wood and decentralized use. At the other end of the spectrum, industrial reactors enable highly controlled, large-volume production with consistent quality and strong carbon removal potential, making them additionally suitable for commercial carbon-credit oriented operations. To leverage the most benefits for farmers, choosing adequate technology ensuring a good cost-to-benefit ratio for farmers always depends on farmer willingness, farm size, availability of biomass and labor, operational setting and desired outcomes.

Biochar technology is evolving quickly. NKG commits resources to assessing feasibility, choosing appropriate technologies, and designing sound, context specific biochar interventions before implementation. NKG leverages its coffee farms to actively research on the topic and disseminates these findings into the group and the sector.

4.2 Biodiversity

"Sustainable management of the land and natural resources ensures the long-term health and resilience of ecosystems by enhancing the variety and variability of plants, animals and microorganisms." (GCP 2025)

Biodiversity encompasses the diversity of life at multiple levels—genetic diversity, species diversity, ecosystem diversity —that provide essential ecosystem services such as pollination, nitrogen fixation, or decomposition. Coffee depends on these ecological functions for long-term productivity, including natural pest and disease regulation, nutrient cycling, water filtration, and the maintenance of soil health. When managed sustainably, coffee farms can conserve and enhance biodiversity on- farm and across surrounding landscapes by maintaining- habitat structures and ecological corridors that support a wide range of organisms.

NKG's Priorities in Biodiversity

NKG promotes a systematic approach to biodiversity management that strengthens ecological functions on coffee farms and across landscapes by combining resilient and productive farm-system design with the protection and restoration of natural habitats on and around coffee farms. NKG recognizes biodiversity as a foundation of productive and climate-resilient coffee systems. Farming coffee in a productive and sustainable way, reduces pressure to further expand cultivation into natural ecosystems. NKG sees the following areas as most relevant to achieve the goals mentioned above:

- Planned, cyclical and gradual renovation, rejuvenation and rehabilitation
- Productive agroforestry and intercropping that maximizes coffee ecosystem benefits
- Holistic ecosystems and biodiversity conservation

4.2.1 Renovation, Rejuvenation and Rehabilitation

Renovation, rejuvenation, and rehabilitation are essential practices to maintain healthy, productive, and resilient coffee ecosystems over time. The measures help to restore plant vigor, address aging or diseased tree stocks, and ensure that coffee farms can sustain yields, quality, and climate resilience without expanding cultivation areas into natural ecosystems, incl. forests.

NKG prioritizes:

- Production of high-quality seedlings in own nurseries, using the Ecopil methodology where suitable, and seedling distribution embedded with other relevant farmer services
- Regular coffee farm rejuvenation to ensure constantly high productivity and reduce pressure for area expansion
- Planned, cyclical renovation with high-quality seedings adapted to local conditions
- Gradual farm renovation to ensure constant production and income

NKG operates own nurseries to produce coffee (and other tree) seedlings under controlled conditions. These seedlings should be availed to farmers within NKG supply chains. Seedlings are not distributed as stand-alone activity but accompanied by services needed to ensure good survival rate and growth. They can include technical assistance, inputs or financing. NKG can leverage networks and partnerships to subsidize seedlings, where economic viability is not given. NKG

promotes the use of the Ecopil methodology, which uses biodegradable planting bags to promote better root growth and plant vigor, while reducing plastic waste and transportation emissions. NKG promotes the exchange of lessons learned and best practice on Ecopil within the group and beyond.

Rejuvenation and rehabilitation restore productivity and increase yields through cyclical pruning and stumping of coffee trees. By restoring productivity on existing plots, these practices help safeguard surrounding forests and natural areas by reducing pressure to expand coffee cultivation, while simultaneously strengthening on farm biodiversity and ecosystem function. Rejuvenation reduces the time and resource requirements compared to full renovation with new coffee plants and helps stabilize farm income during transition periods. Under certain circumstances, an intentional zero-harvest year (in Brazil known as Safra Zero – "Zero Harvest") involving drastic pruning or stumping may be implemented as a planned crop management strategy.

Renovation involves the planned, cyclical replacement of aging, diseased, or poorly developed trees with new planting material. NKG selects improved coffee varieties based on local agroecological conditions, climate risks, pest and disease pressure, and recommendations from national research institutes or trusted local institutions.

Grafting and stumping – Source: NKG

Where available, varieties with improved resistance or tolerance to major pests and diseases, and with good yield and quality potential, are prioritized to enhance long-term farm resilience, reduce production risks, and limit dependence on external inputs. Economic aspects must be considered.

NKG promotes renovation and rehabilitation in a phased manner renovating only a part of a coffee farm (e.g. 15-20%). This gradual approach maintains production and income and reduces farmers' economic risk. Where appropriate, renovation may include grafting techniques to combine resilient or tolerant rootstocks with scions that meet quality and productivity requirements, allowing adaptation to local soil conditions and pest pressures while preserving desirable cup characteristics.

4.2.2 Agroforestry

Agroforestry and intercropping are central components of Regenerative Agriculture and prevalent in many coffee producing countries. They buffer climate stress, stabilize yields and quality, enhance biodiversity and ecosystem services and support diversified farmer livelihoods.

NKG prioritizes:

- Direct farm resilience and climate change adaptation benefits of agroforestry and intercropping against a sole focus on carbon sequestration
- Promotion of prevalent systems together with adapted and farm-specific interventions to maximize synergies between coffee, trees, soils, water, and livelihoods
- Active shade management and accompanying practices to maximize agroforestry-coffee system productivity and benefits

Agroforestry and intercropping can increase ecosystem, farm and household resilience in light of climate change. Agroforestry cushions the impacts of climatic extremes, helps maintain consistent yields and quality, foster richer biodiversity and ecosystem functions, and contributes to more resilient and varied livelihoods for farming households. Intercropping is recognized as an integral component or subtype of many agroforestry systems, contributing to soil protection, water regulation, biological pest control, and income or dietary diversification where appropriate. NKG promotes agroforestry and intercropping as context specific system approaches, highlighting the positive effects of agroforestry regarding increased farm, household and ecosystem resilience against climate change. Climate change mitigation through carbon sequestration is recognized as an important co-benefit but should not be a primary driver for interventions.

Regenerative coffee landscape – Source: NKG

NKG recognizes that agroforestry in coffee must reflect local agroecological, farm-system, socioeconomic, and cultural conditions. Systems may range from scattered or structured shade, row-planted multipurpose trees, and multi-strata designs to traditional rustic models or livestock-integrated approaches. Promotion and design emphasize understanding existing farm systems, drawing on local research and extension guidance, and prioritizing species that deliver functional benefits—such as shade regulation, biomass, nitrogen fixation, habitat, or fodder—while remaining manageable over time and, where relevant, providing complementary livelihood options without compromising coffee performance.

Establishment and management should minimize competition, maintain sufficient light and airflow, and avoid heightened pest or disease risks. Invasive or poorly adapted species and unsuitable designs must be avoided.

Regenerative coffee landscape (Coffee/Inga) – Source: NKG

Any agroforestry expansion or modification near natural forests must be assessed for deforestation and land-use change risks and align with due-diligence procedures; NKG does not promote conversion of natural ecosystems.

For NKG, agroforestry is not only about establishing trees in coffee systems but about actively managing it to maximize performance of the entire system. Active shade management in agroforestry system is a means to optimize system productivity. Shade moderates heat stress, reduces evapotranspiration, and stabilizes microclimates, while canopy density and structure must be locally calibrated to sustain coffee vigor, quality, and yields.

Active management prevents excessive shading and the associated trade-offs in productivity or disease pressure. This should go hand in hand with active coffee canopy management and pruning and other complementary practices that promote system health and resilience—such as mulching, cover crops, contouring, and riparian buffers. Where feasible, diverse tree species are promoted to enhance ecosystem services, improve risk buffering, and generate additional farm benefits. Implementation is supported through NKG's FSUs and field teams, which can provide locally adapted training, planning support, and practical guidance to farmers.

4.2.3 Ecosystems & Biodiversity Conservation

Healthy ecosystems and flourishing biodiversity provide essential environmental services that underpin resilient and productive coffee landscapes and have direct effects on coffee productivity climate resilience and farmer livelihoods.

NKG prioritizes:

- Integrated conservation measures both on farm and across the wider landscape
- Balanced solutions that combine land sparing and land sharing approaches
- Efficient measures that deliver tangible ecological benefits within productive farm systems

NKG promotes an integrated approach to conservation that recognizes farms as part of larger, interconnected ecosystems. Integrated approaches to conservation are being promoted to recognize farms as part of larger, interconnected ecosystems. Ecological processes such as pollination, natural pest regulation, water filtration, nutrient cycling, and microclimate regulation extend beyond individual farm boundaries and depend on healthy habitats across entire landscapes. NKG therefore supports conservation measures both at the farm level—such as maintaining shade trees, habitat diversity, and ecological corridors—and at the wider landscape scale to ensure ecological connectivity and resilience.

Wherever feasible, integrated landscape approaches should be pursued to coordinate agricultural and conservation land uses across mosaics of farms and landholders through inclusive dialogue and shared responsibilities among farmers, communities, and other stakeholders. Strengthening habitat heterogeneity and conserving natural areas helps maintain ecological stability while supporting consistent coffee productivity and quality. Areas formally or informally recognized as environmentally or culturally sensitive - including protected areas, wetlands, riparian zones, and cultural sites—must be fully respected, with applicable land-use restrictions and buffer requirements observed and, where possible, implemented collaboratively with local stakeholders.

Pollinator promotion – Source: NKG

NKG encourages a portfolio of complementary conservation approaches that combine land sparing and land sharing within the local context. Protecting pristine or near-natural ecosystems and areas of high conservation value - such as habitats critical for threatened species, key ecosystem services like water provision or erosion control, or areas of cultural significance—remains a priority. NKG establishes structured biodiversity assessments throughout all coffee producing countries, complemented by local assessments ideally coordinated with local communities and relevant authorities, to identify hotspots and priority areas of intervention. At the same time, NKG recognizes that maintaining strong productivity on existing coffee plots is essential to enable land sparing by reducing pressure for agricultural expansion. Within working landscapes, NKG therefore promotes the integration of conservation features directly on farms, building on practices that are often already present in traditional coffee systems.

Coffee agroforestry, diversified shade structures, and permanent ground cover are key approaches that enhance habitat diversity, support ecological functions, and strengthen climate resilience while

Regenerative coffee landscape – Source: Nick Migwi/NKG

sustaining productive coffee systems.

Ecosystem functions and biodiversity are enhanced where measures fit into productive farm systems and can be implemented in an economically viable way. NKG encourages a set of measures that can be tailored to local conditions and farmer preferences.

Priority is given to the establishment and maintenance of linear and ground-based elements – especially hedges, live fences and permanent ground cover - that improve habitat quality, stabilize microclimates, and support ecological connectivity across farms. These elements can be combined with native or well-adapted species to form windbreaks, boundaries, and movement corridors for wildlife and beneficial insects. Complementary measures may include the creation of flower-rich patches and understory refuge zones to enhance floral resources and soil biodiversity, as well as context-specific water-related interventions such as wetland restoration or small-scale water-retention features. Together, these approaches contribute to resilient, multifunctional coffee landscapes while remaining compatible with productive farming systems.

4.2.4 Non-deforestation

NKG prioritizes:

- Preventive and risk-based approach to prevent deforestation and conversion
- Intensive farmer support and focused stakeholder engagement in regions with elevated deforestation risk
- Clearly documented remediation and restoration of past deforestation, where permitted under national regulations or certification frameworks

Avoiding deforestation and ecosystem conversion is a prerequisite for Regenerative Agriculture and in the long-term self-interest of the coffee sector. Forest ecosystems provide essential environmental services—such as climate regulation, water provision, soil protection, and biodiversity—that sustain the viability of coffee cultivation and the resilience of farming communities.

NKG recognizes that preventing deforestation and the conversion of natural ecosystems require forward-looking and preventive action. Continued loss of forests increases climate risks, undermines biodiversity, and threatens the long-term suitability of coffee production. NKG seeks to go beyond purely regulatory or backward-looking compliance approaches by proactively identifying areas where future deforestation risks may emerge and prioritizing engagement accordingly. To guide preventive action, NKG aims at a risk-based monitoring approach across its supply chains.

The approach foresees initial jurisdictional screening that uses the best available forest cover and deforestation data to identify producing regions with recent or ongoing forest loss and to prioritize areas for engagement. Where elevated risks are detected, more detailed geospatial assessments at plot or polygon level will follow. These analyses can consider forward-looking risk factors—such as proximity to remaining forests, accessibility, or climate pressures—to focus preventive measures and targeted support where they can have the greatest impact.

Bio-corridors on coffee farm – Source: NKG

Addressing deforestation risks depends on targeted interventions that tackle the underlying economic and social drivers of forest loss. Strengthening sustainable rural livelihoods, improving productivity on existing farmland, and supporting viable regenerative transitions are therefore central to NKG's approach to preventing deforestation. Engagement efforts are prioritized and adapted according to the level and nature of identified risks, as well as the structure of the supply chain. In directly managed supply chains, NKG seeks to work closely with farmers to support improved farm management, sustainable intensification, and practices that reduce pressure on surrounding ecosystems.

In supply chains where coffee is sourced through third parties, or where relevant levers to tackle risk is identified on sector or policy level, NKG may prioritize other engagement models with suppliers and collaborate with a broader set of stakeholders—such as sector initiatives, local authorities, or civil society organizations. NKG chooses engagement over disengagement, choosing to work in higher risk contexts to improve rather than cut ties. This enables NKG to address systemic drivers of deforestation and promote enabling conditions for sustainable land use. Through this combination of farmer support and broader stakeholder engagement, NKG aims to foster forest-conscious supply chains while meeting growing expectations for transparency and responsible sourcing.

Regenerative coffee landscape – Source: Arnold Mugasha/NKG

NKG recognizes the importance of addressing past deforestation through clearly documented remediation and restoration efforts. This only can materialize where permitted under national regulations or applicable certification frameworks. Enabling farmers to restore degraded areas or compensate for past forest loss can contribute to rebuilding ecosystem functions, improving landscape resilience, and reducing pressure for further expansion into natural ecosystems. Where relevant, NKG encourages restoration measures such as reforestation, agroforestry integration, or the rehabilitation of riparian zones and other sensitive areas. These actions should be implemented transparently, documented appropriately, and aligned with local legal requirements and recognized standards. By supporting responsible remediation and restoration, NKG aims to contribute to long-term forest recovery while helping farmers transition toward more sustainable and resilient production systems.

4.3 Water

"Sustainable management of water includes efficient and sustainable water use, integrated water resource management, and protection of water-related ecosystems." (GCP 2025)

NKG's Priorities in Water Management

NKG promotes a systematic approach to water management that safeguards water resources, enhances water efficiency, and protects aquatic ecosystems across coffee landscapes. NKG recognizes water as a critical foundation of productive, climate-resilient coffee systems and emphasizes that sustainable water use reduces pressure on rivers, wetlands, and groundwater while supporting farm resilience under increasing climate variability. NKG sees the following areas as most relevant to achieve the goals mentioned above:

- Freshwater Management
- Wastewater Management

Coffee has a significant water footprint, with water being critical for coffee plant growth, post-harvest processes and wet processing. Water availability varies greatly across regions, and its availability has critical importance to agricultural productivity while the amount of water withdrawn, and the quality of its discharges can have impacts on ecosystems and people. Climate change intensifies water-related risks for coffee production by increasing droughts, floods, and irregular rainfall.

4.3.1 Freshwater Management

Efficient freshwater management in coffee production focuses on minimizing water use, protecting natural water bodies, and applying irrigation and processing water only when necessary and in the most resource efficient- manner.

NKG prioritizes:

- Implementation of structural farm system measures to reduce water need and runoff
- Responsible use of water resources on a need's basis using modern technology

Water efficient coffee cultivation relies on cultural and structural practices that reduce runoff and evaporation and improve soil infiltration and moisture retention. Key measures promoted by NKG through its FSUs and field teams include selecting drought tolerant varieties or rootstocks, optimizing shade through intercropping and agroforestry, and maintaining soil cover with cover crops or mulching. Soil structure and organic matter influence water infiltration and retention, which are enhanced through organic inputs or deep rooting cover crops. Additional measures can include rainwater harvesting via reservoirs, basins, contour ditches, or multifunctional ponds that collect and store water for later use.

Responsible and efficient water use in coffee production, and processing is key to managing and safeguarding water sources under increasing pressure. As most coffee is rainfed, irrigation should be applied only when necessary and aligned with agroecological conditions, crop requirements, and local water availability. When irrigation is required, efficient systems such as drip irrigation, micro-sprinklers, or other low volume delivery methods are to be prioritized. Water consumption for processing can be reduced through the adoption of water saving equipment such as eco pulpers, demucilager, hidro-washers and improved cherry transport channels and water recirculation systems that enable multicycle reuse of process water. Training farmers and processing staff on the correct

operation, maintenance, and calibration of this equipment is essential to ensure that its water saving potential is fully realized and consistently sustained, while also improving processing efficiency and product quality. NKG encourages the installation of water meters to monitor water usage where suitable.

4.3.2 Wastewater Management

Wastewater treatment and the prevention of water contamination are integral to regenerative coffee production and aim to close nutrient and biomass cycles on and around coffee farms, reduce environmental and health risks, and protect water resources.

NKG prioritizes:

- Minimizing wastewater production, while increasing recycling and reusage of nutrient heavy wastewaters for further use
- Treating unavoidable wastewater through natural or engineered systems

Wet processing should be managed with the objective of minimizing water use and recovering as many nutrients as possible. Reducing the volume of water used during pulping and wet processing is a priority to reduce water withdrawal from ecosystems and to limit effluent loads and overall pressure on local water resources. Residual process water, including nutrient-rich "honey waters," can be treated and reused for irrigation where conditions allow, for example through fertigation, provided application rates, timing, and terrain are managed to prevent runoff and groundwater contamination.

Fertigation Equipment– Source: NKG

Where direct reuse is not appropriate, NKG promotes wastewater treatment through natural or engineered systems. These can include green filters, sedimentation and filtration systems, constructed wetlands, or oxidation ponds, allowing organic matter and nutrients to be safely broken down before being reused or discharged. Vegetated buffer zones and riparian protection areas are maintained along waterways to act as natural filters, reduce erosion, and protect aquatic ecosystems. Land application of organic residues or treated effluents considers slope, soil conditions, rainfall patterns, and proximity to water bodies to prevent transport of nutrients or contaminants into surface or groundwater.

Green filter– Source: NKG

4.4 Resilient Farmer Livelihoods

"Regenerative Agriculture enhances the resilience of farmers' livelihoods by improving their income and food security, while improving farmers' capacity to withstand/manage adverse events or conditions such as climate change." (GCP 2025)

Coffee is the main or an important source of income for a large number of coffee producers. Regenerating, safeguarding and future-proofing coffee production through Regenerative Agriculture, hence, has a significant implication for farmer livelihoods.

NKG's Priorities Regarding Farmer Livelihoods in the Context of Regenerative Agriculture

NKG views Regenerative Agriculture primarily as a practical approach to strengthening the long-term resilience of coffee farmer livelihoods, particularly in the face of climate change. Through improved agronomic practices and more resilient farm systems, Regenerative Agriculture can help stabilize or increase productivity while reducing reliance on external inputs, thereby improving farm profitability. More stable yields and lower production costs translate directly into more reliable producer incomes, which are essential to keep coffee farming an attractive livelihood for current and future generations. NKG sees as most relevant:

At the same time, NKG approaches farmer livelihoods holistically. While Regenerative Agriculture provides the methodological framework for agronomic and farm-level interventions, these efforts must be complemented by initiatives that strengthen farm management as a viable business, support diversified household income opportunities, and contribute to broader sector efforts toward more equitable value distribution.

For NKG, farmer livelihoods are inseparably intertwined with nearly every measure or intervention associated with Regenerative Agriculture. Livelihood considerations therefore form the starting point for any regenerative action. Farmers ultimately manage their farms as businesses that require inputs, labor, maintenance, and long-term investment. Regenerative Agriculture must therefore be approached not only as a set of agronomic practices, but as a framework that helps farmers understand costs and benefits, assess risks, make informed decisions, and allocate resources in ways that secure the future viability of their production systems. This includes understanding climate and market risks, identifying opportunities to improve productivity and efficiency on existing land, and evaluating which investments in farm regeneration are economically sound.

At the same time, a realistic and transparent dialogue about long-term prospects is essential. In some regions, climate change or structural constraints may significantly challenge the future suitability of coffee production. In these cases, Regenerative Agriculture must also include open discussions about diversification strategies and alternative income opportunities, that strengthen overall farm and household resilience. This logic applies to smallholder farmers particularly, but also holds true for larger farms, including NKG-owned farms. NKG's FSUs and field teams play a central role in fostering a business-oriented perspective. Through continuous engagement, training, and advisory, they work closely with farmers to strengthen farm management skills, encourage forward-looking planning, and build the foundation for effective and economically viable regeneration of coffee farming systems.

5. Related documents

Internal Sources: NKG Pesticide Factsheets

Buyinza, J.; Ongodia, G.; Mudondo, S.; Fungo, B.; Natwaluma, G. 2025. *Coffee agroforestry: Training handbook – Most suitable for Training of Trainers.* CIFOR; ICRAF. Bogor, Indonesia; Nairobi, Kenya. https://www.cifor-icraf.org/publications/pdf/manuals/Agroforestry-Coffee-Handbook.pdf

Del Castillo, K. 2024. *How coffee value chains foster climate-resilient livelihoods: The FAO–Slow Food Coffee Coalition experience.* Food and Agriculture Organization of the United Nations (FAO); Slow Food.
https://openknowledge.fao.org/handle/20.500.14283/cd1308en

FAO. 2017. *Agroforestry coffee cultivation in combination with mulching, trenches and organic composting in Uganda.* Edition 1. Food and Agriculture Organization of the United Nations (FAO). Rome, Italy. 7 p.
https://openknowledge.fao.org/items/c3d26f20-5e4b-445b-a591-958d1a04374a

Global Coffee Platform. 2025. *GCP RegenCoffee Guidance: A framework for Regenerative Agriculture in coffee production.* https://www.globalcoffeeplatform.org/our-work/tools/regencoffee/

Koutouleas, A.; Waswa, B.S.; Ocimati, W.; Notenbaert, A.M.O.; Rahn, E.T. 2023. *Regenerative Agriculture in coffee farming systems: A handbook for practitioners in Kenya.* 80 p.
https://hdl.handle.net/10568/131410

Koutouleas, A.; Waswa, B.; Ocimati, W.; Notenbaert, A.; Rahn, E. 2023. *Regenerative Agriculture in coffee farming systems: A handbook for practitioners in Uganda.* Bioversity International; International Center for Tropical Agriculture (CIAT). Kampala, Uganda. 80 p.
https://hdl.handle.net/10568/131914

Martini, E.; Riyandoko; Roshetko, J.M. 2017. *Guidelines for establishing coffee-agroforestry systems.* World Agroforestry Centre. Bogor, Indonesia. ISBN: 978-979-3198-97-2.
https://www.worldagroforestry.org/publication/guidelines-establishing-coffee-agroforestry-systems

Pulleman, M.M.; Rahn, E.; Valle, J.F. 2023. *Regenerative Agriculture for low-carbon and resilient coffee farms: A practical guidebook.* Version 1.0. International Center for Tropical Agriculture (CIAT). Cali, Colombia. 181 p. https://hdl.handle.net/10568/131997

TechnoServe. 2025. *The Regenerative Coffee Investment Case.* TechnoServe.
https://www.technoserve.org/regenerative-coffee-investment-case/