# Regenerative practices in palm oil production

## A practical framework and lessons from the field

Working in partnership with independent smallholder farmers in North Sumatra, Livelihoods Venture and SNV are demonstrating the progress that can be made in the palm oil sector through regenerative agriculture. By joining forces with industry players, governments, and financial institutions, the same approach could contribute to change across the sector.





# Executive summary

The palm oil sector has made significant progress in building the foundations for responsible production. Traceability, certification and supply chain accountability have created an essential baseline for addressing deforestation, social risks and market access. The next challenge is more practical: how can palm oil production become more resilient for both farmers and ecosystems, particularly in smallholder landscapes?

This paper explores one answer: a pragmatic approach to regenerative palm oil that combines changes at farm level with the institutional and landscape conditions needed to make those changes viable at scale. Regenerative practices should not be understood as a fixed checklist, nor as a replacement for certification. They are a way of progressively improving soil health, biodiversity, resource efficiency and farmer resilience, while adapting the transition to local conditions and economic realities.

Our experience through the Biodiverse and Inclusive Palm Oil Supply Chain (BIPOSC) project in North Sumatra, implemented by Livelihoods Venture and SNV with local and private-sector partners, provides practical evidence of how this can work. This collaboration combines the perspectives of those who finance transitions and those who implement them on the ground. It draws on years of joint work between Livelihoods, an initiative that funds and co-designs large-scale nature-based projects with companies, non-governmental organisations (NGOs), and rural communities, and SNV, a global development partner with field presence across palm oil landscapes. Since 2021, the project has supported around 3,000 smallholders across approximately 5,000 hectares of degraded palm farmland. The experience suggests that the practices themselves are only part of the solution. Adoption depends equally on affordable local inputs, robust farmer organisations, continuous coaching and peer learning, diversified sources of income, and coordination beyond the farm.

The approach is therefore structured around three interconnected levels:

- **Farm**
  Progressively improve soil health, biodiversity, water management, and nutrient cycling through practices such as cover cropping, mulching, composting, agroforestry, and integrated pest management.

- **Institutional and social**
  Create the conditions for farmers to adopt and sustain these practices through stronger farmer organisations, access to finance and services, local input production, income diversification, and meaningful inclusion of women and young people.

- **Landscape**
  Address challenges that cannot be solved farm by farm, including forest and peatland protection, watershed management, biodiversity corridors, and coordination between communities, companies, and public authorities.

The BIPOSC experience provides encouraging evidence. Project monitoring has recorded increases of up to 80% in soil organic matter, a 70% increase in earthworm populations, and a 25% increase in pollinators and natural predators. Participating farmers have also recorded 14%-30% higher yields compared with conventional practices, while agroforestry has generated additional income of USD 830-2,000 per hectare per year. A community-managed composting unit has generated USD 43,200 in profit while supplying organic fertiliser at significantly lower cost.

These results are indicative rather than conclusive: BIPOSC is one experience, in one landscape, and not a universal blueprint. But it provides useful evidence that regenerative practices can move beyond principles and be translated into an operational model for smallholders. By restoring productivity on existing plantations, these practices also help contain production on land already under cultivation and reduce the pressure on forest areas that declining yields would otherwise create. It also highlights an important lesson: transitions are more likely to succeed when they deliver tangible benefits in the short term — such as lower input costs or additional income — while building longer-term environmental resilience.

The implication is not that the sector needs another standard definition of "regenerative". It needs more practical transition models that can be adapted to local contexts, financed over time, implemented with farmers, and measured against meaningful outcomes.

This creates a role for different actors. Companies and buyers can help finance transitions within their supply chains and build longer-term partnerships with farmers and suppliers. Financial institutions can help develop capital structures that recognise the cost and duration of transition. Governments can align incentives and replanting programmes with regenerative outcomes. Practitioners and NGOs can test, adapt, and share what works.

Our intention is therefore not to prescribe a model, but to share what we have learned from implementation: what appears to work, what requires enabling conditions, and where further evidence is still needed. Our three-level framework — farm, institutional-social, and landscape — provides a practical roadmap for integrating regenerative practices into palm production. It is adaptable to local contexts and grounded in implementation.

We hope this contributes to a more grounded conversation on how palm oil can become more productive, resilient, and inclusive — while restoring the ecosystems on which its long-term future depends. For companies managing supply chain risk, financiers seeking investable transition models, governments designing incentive structures, and practitioners working in the field, we hope this paper offers something concrete and replicable.

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## About BIPOSC

The Biodiverse and Inclusive Palm Oil Supply Chain (BIPOSC) is an initiative under the Livelihoods Fund for Family Farming (L3F) Impact Investment Fund. It collaborates with smallholder farmers and farmer associations in the Labuhanbatu District of North Sumatra, Indonesia, to strengthen the institutional framework and enhance the implementation capacity for regenerative practices throughout the palm oil supply chain. Launched in 2021, BIPOSC is a 10-year partnership (2021-2031) between Livelihoods Venture, SNV, and Musim Mas, with support from Danone, Mars, L'Oréal, and L'Occitane Group. The partnership engages 3,000 smallholder farmers to promote the transition to regenerative practices, aiming to revitalise approximately 5,000 hectares of degraded palm farmland for healthier ecosystems and improved farmer livelihoods.

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# Introduction

## The promise of regenerative agriculture

Palm oil is used in roughly half of all consumer goods, supports the livelihoods of millions of smallholder farmers across Southeast Asia and West Africa, and remains the world's most productive source of vegetable oil per unit of land. It is also a crop with deep sustainability challenges, from soil degradation and biodiversity loss to climate vulnerability and social inequity, that certification schemes alone have not resolved. Regenerative agriculture is gaining momentum across global food systems as a holistic response to these compounding pressures.

This paper explores a practical question: what does regenerative agriculture look like when applied to palm oil production? Not as an abstract set of principles, but as a concrete set of practices, implemented with real smallholders, generating measurable outcomes. To answer it, we draw on experience from North Sumatra, where Livelihoods and SNV have been working jointly since 2021 on the Biodiverse and Inclusive Palm Oil Supply Chain (BIPOSC) project — testing, refining, and documenting what a transition to regenerative palm production involves in practice.

Recognising that no single model fits all contexts, we provide a framework built from the ground up, a set of lessons learned through implementation, and an honest account of what has worked, where we had to adjust, and what the conditions for success appear to be. We share these findings to advance the conversation and to invite others working in this space to build on them.

The paper first outlines the challenges facing palm oil production, then introduces regenerative agriculture as a practical approach to sustainable palm oil production, along with our joint framework, and closes with the framework in practice.

# The challenges facing palm oil production

## Global importance and growth

Palm oil is a cornerstone of the global food system, from food to cosmetics and cleaning products. With global consumption exceeding 75 million tonnes in the 2025/26 marketing year and forecast to reach 78 million tonnes by 2026/27, its economic and social importance is undeniable (U.S. Department of Agriculture, Foreign Agricultural Service [USDA FAS], 2026). Palm oil plantations occupy roughly 27 million hectares globally, with Indonesia, Malaysia, and Thailand as the largest producers. Despite representing only 8% of vegetable oil farmland, palm oil contributes 39% of the world's vegetable oil output, reflecting its high oil yield per hectare (UN Trade and Development [UNCTAD], 2026). However, only around 21% of production is currently classified as sustainable under the Roundtable on Sustainable Palm Oil (RSPO) certification (RSPO, nd).

Together, independent and scheme smallholders account for approximately 40% of global palm oil production. Independent smallholders alone contribute about 27% (Ayompe et al., 2024), making them key players in the sector despite their lower yields. In Indonesia alone, independent smallholders manage about 38% of the country's palm oil plantation area, with research modelling land-use dynamics projecting this could grow to cover around 60% of the total area by 2030 (Pusat Data dan Sistem Informasi Pertanian, 2024; Schoneveld et al., 2019; Williamson, 2025).

Palm oil cultivation provides stable and predictable income for smallholders — making it a primary livelihood source for many. Farm households benefit from palm oil through direct income from harvest sales, high returns to land and labour, and indirect income from farm and off-farm employment. In Ghana, for example, palm oil contributes up to 75% of total household income for farmers who produce this crop (Sibhatu, 2023).

## Current sector constraints

Despite its economic importance and growing demand, the palm oil sector faces interconnected environmental, climatic, and social challenges that threaten its long-term viability. These pressures can undermine fresh fruit bunch (FFB) quality, although their effects vary across production contexts:

- **Soil degradation and environmental pressures**
  Overreliance on synthetic fertilisers, imbalanced nutrient management, intensive monoculture, and limited cover cropping contribute to soil depletion and erosion. A study covering more than 400 commercial oil palm fields in Peninsular Malaysia found low soil organic carbon content of 1.6%-2.0%, with particularly low levels in recently planted and young plantations, highlighting the importance of protecting and rebuilding soil organic matter (Golicz et al., 2025). Expansion into forests and fragile peatland ecosystems has contributed to biodiversity loss and ecosystem degradation. Peatland drainage and land-clearing fires generate significant greenhouse gas (GHG) emissions, constraining national and global climate targets. Fertiliser and pesticide run-off has also been linked to freshwater pollution, affecting riverine and downstream ecosystems.

- **Climate vulnerability**
  Erratic rainfall, extended dry periods, flooding and rising temperatures disrupt production and exacerbate water and nutrient limitations. Smallholders, in particular, often have limited resources to adapt.

- **Ageing palms and replanting barriers**
  Palms older than 25 years typically yield less. Replanting is costly and often delayed because it requires high upfront investment, causes several years of lost income, and is constrained by limited access to appropriate finance.

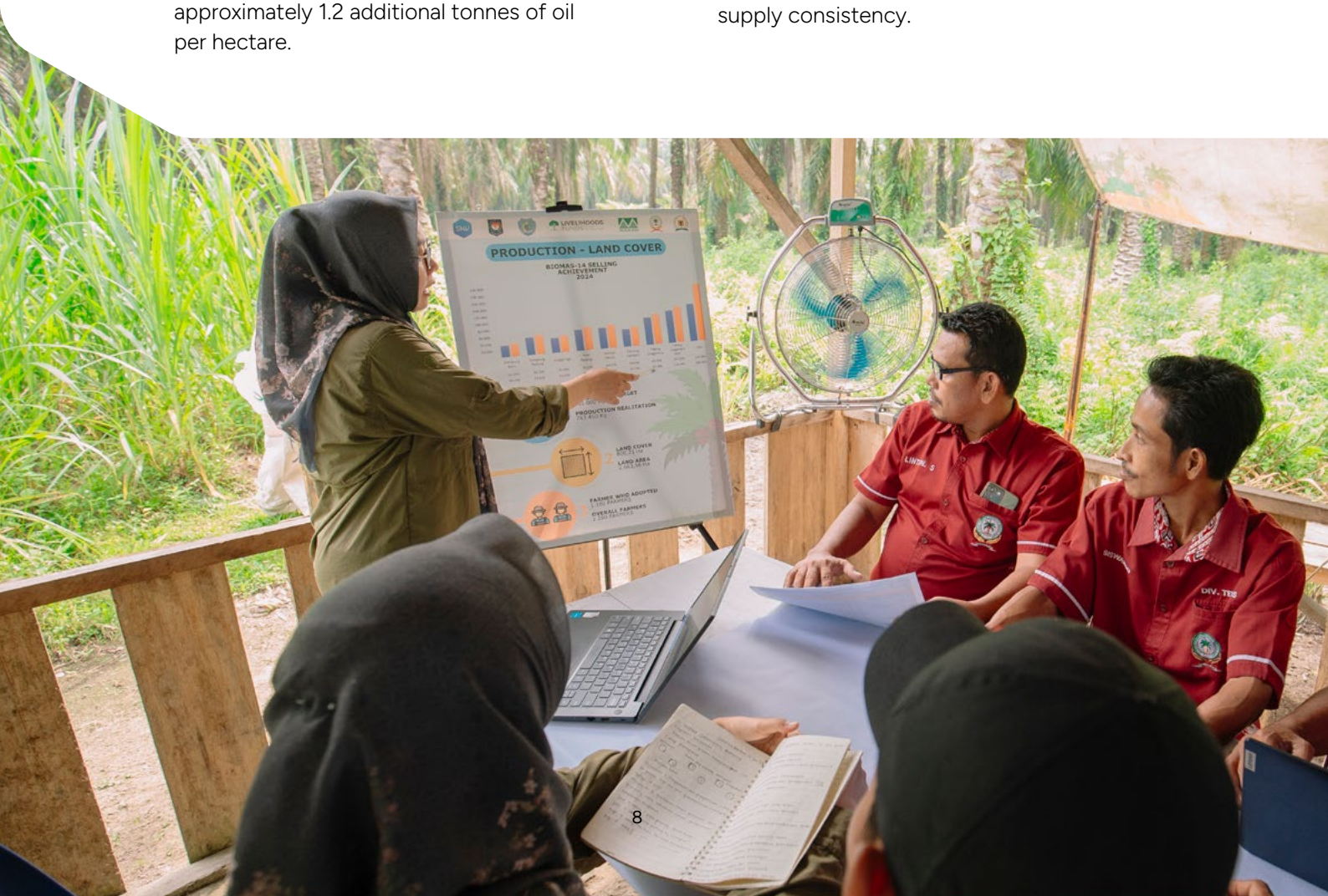
- **Social and livelihood challenges**
  Labour rights issues, land tenure insecurity, and economic vulnerability persist, particularly for women, young people, and migrant workers. Poverty and limited access to education and healthcare reduce human capital and productivity, often forcing farmers to prioritise short-term survival over long-term investment.

Beyond these sector-wide challenges, independent smallholders face specific but interconnected constraints that affect their livelihoods and ability to adopt sustainable production practices:

- **Access to inputs and investment**
  Restricted access to credit, quality seedlings, and appropriate inputs limits farmers' ability to improve productivity and rejuvenate farms. Poor or uncertified planting material, improper planting patterns and inadequate pest and disease management further widen yield gaps. Sugianto et al., (2023), found that fields with sufficient nitrogen, phosphorus, and potassium yielded 47% more than deficient fields, equivalent to approximately 1.2 additional tonnes of oil per hectare.

- **Gaps in service delivery and extension**
  Ineffective service delivery models and limited training restrict access to sustainable inputs, knowledge of good agricultural practices and market requirements. Conventional best management practices (BMP) training helps improve basic agronomic practices, but challenges remain in addressing long-term soil health and efficient nutrient use. Affordable organic or biological alternatives are often unavailable without technical or financial support. Reliance on manual labour and unsafe agrochemical use also creates health and safety risks.

- **Farmer organisation and market access**
  Without strong institutions and good governance, cooperatives and farmer organisations struggle to improve their bargaining power. Independent smallholders face barriers to direct and traceable market relationships, certification, and compliance with sustainability standards, while associated costs increase the risk of market exclusion. Variable FFB quality and quantity also affect processors' extraction rates and supply consistency.



- **Income dependence and suitability of production models**

  Reliance solely on palm oil income leaves households vulnerable to market fluctuations and pest or disease outbreaks. Large-plantation models that rely heavily on external chemical inputs are often poorly suited to family farms with limited resources. Independent smallholders prioritise household labour productivity and reducing dependence on costly inputs, optimising rather than maximising yields at any cost.

## A sector ready for the next step

Certification has established an essential baseline for responsible palm oil production. Initiatives such as RSPO, ISPO (Indonesian Sustainable Palm Oil), and MSPO (Malaysian Sustainable Palm Oil) have created traceability, monitoring, farmer engagement, and accountability mechanisms across supply chains. They remain an important part of the sector's sustainability architecture.

But certification and regenerative transition address different questions. Certification primarily establishes whether defined requirements are being met. Regenerative approaches ask how production systems can progressively become healthier, more resilient, and less dependent on external inputs.

The opportunity is, therefore, not to replace certification but to build on it — moving from risk mitigation towards active restoration, stronger farmer resilience, and production systems better aligned with climate, biodiversity, and livelihood goals.

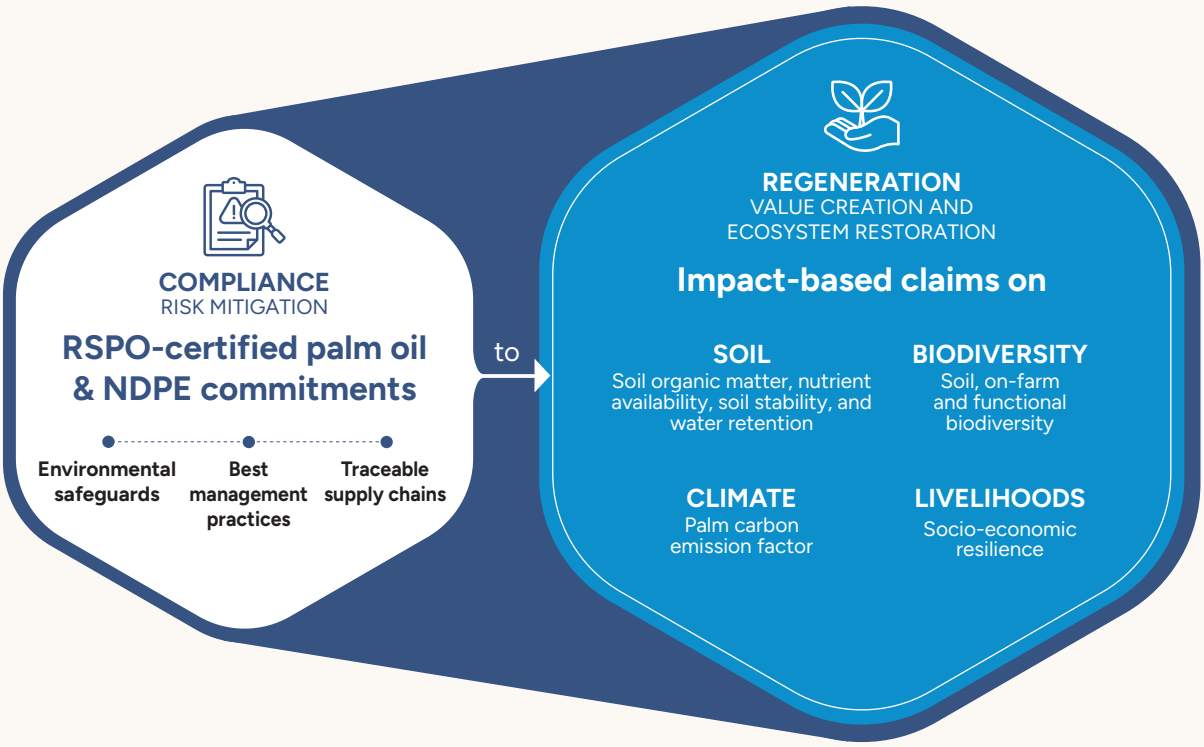



**Figure 1: From compliance to regeneration: advancing palm oil production beyond certification**
*Source: Own elaboration.*

N.B. The transition to regenerative palm builds on the foundation of compliance with RSPO standards and No Deforestation, No Peat, No Exploitation (NDPE) commitments to move towards regenerative production systems that deliver measurable environmental and socio-economic outcomes. While certification establishes safeguards against deforestation and poor practices, regeneration focuses on restoring soil health, reducing emissions, enhancing biodiversity and strengthening income resilience. This represents a shift from risk mitigation to actively generating long-term value for ecosystems, farmers, and supply chains.



## Regenerative agriculture:

# A sustainable approach for palm production

### What is regenerative agriculture?

Regenerative agriculture offers a promising approach to addressing the challenges facing the palm oil sector, filling gaps in conventional approaches and promoting more resilient, sustainable production systems.

Definitions vary, but regenerative agriculture encompasses farm and land management practices, principles and processes that restore and rebuild ecosystem health, resilience, and biodiversity. It emphasises soil health as the foundation of a sustainable food system, alongside biodiversity enhancement, water management, crop diversity, carbon sequestration, circularity, optimum use of resources and inputs, and renewable energy (SNV, 2024).

In this paper, we approach regenerative palm oil production within a wider landscape, aiming to improve ecological health while supporting crop profitability and the social and economic well-being of communities and workers. Socially inclusive approaches offer women and young people agency in the transition, while locally produced fertilisers provide alternative income opportunities and help close nutrient loops.

It is not a single fixed set of practices, but an adaptive approach informed by local conditions and oil-palm farmers' realities. Practices such as composting, mulching with palm residues, cover cropping, intercropping, agroforestry, and integrated pest management are selected according to their contribution to these objectives. The emphasis is on long-term ecosystem health, viable productivity, and farmer livelihoods, with progress measured and practices adapted over time.

Transitioning towards these objectives requires investment, adaptation support, and time. The approach supports a phased transition, with farmers introducing practices as they gain experience and confidence that their farming system is economically viable, technically manageable, and institutionally supported.





## A practical framework for regenerative palm production

To operationalise regenerative practices in palm production, Livelihoods and SNV have developed an integrated framework[1] that structures actions across three interconnected levels: farm, institutional and social, and landscape. This framework is practical, flexible, and inclusive, capturing outcomes across economic, social, environmental, and governance dimensions.

[1] The full framework is detailed in Annex 1.

**The framework uses a four-step participatory process:**

1. **Understand the context**
   Assess environmental, social, and economic conditions to identify challenges and opportunities.
2. **Define goals and priorities**
   Select the most relevant outcomes for the specific farm or landscape context.
3. **Implement practices**
   Support farmers to adopt regenerative practices tailored to local conditions.
4. **Track outcomes and adapt**
   Monitor key indicators, evaluate progress, and refine practices to ensure continuous improvement.

## Farm-level practices

At the farm level, regenerative practices directly tackle soil degradation, pest and disease vulnerability, GHG emissions, and water resource risks. Practical measures such as composting, cover cropping, agroforestry, and biological pest management are implemented progressively to balance ecological recovery, farmer learning, and economic stability.

- **Soil regeneration**
  Composting, mulching with palm fronds, and permanent multi-species cover cropping to enhance soil organic matter, structure, and biological activity.
- **Biodiversity enhancement**
  Palm-based agroforestry systems, intercropping with nitrogen-fixing species, and pollinator and predator habitat support to improve ecosystem resilience.
- **Water management**
  Efficient fertiliser use, permanent cover cropping, and riverbank restoration to improve water quality and retention.
- **Circular economy**
  Valorising mill by-products (empty fruit bunches, palm oil mill effluent, boiler ash) and livestock manure to produce organic fertilisers, reducing dependence on synthetic inputs.

## Institutional and social-level mechanisms

Enabling mechanisms ensure smallholders can adopt and sustain regenerative practices over time.

- **Income diversification**
  Supporting on- and off-farm activities, such as agroforestry, livestock integration, and microenterprises to reduce reliance on palm oil as a single income source.
- **Circular resource use**
  Producing high-quality organic fertilisers from local resources and promoting collective resource-use efficiency.
- **Farmer empowerment**
  Strengthening cooperatives, providing access to finance, and embedding gender and youth inclusion.
- **Transparent reporting**
  Aligning with RSPO, ISPO, European Union Deforestation Regulation (EUDR), and Human Rights and Environmental Due Diligence requirements to build trust and market access.

## Landscape-level restoration

Regenerative practices extend beyond individual farms to restore forest corridors, safeguard biodiversity, manage watersheds, and create jurisdictional systems for deforestation-free supply chains. They also work preventively: healthier soils and longer-lived plantations reduce the incentive to expand into forested areas. Multi-stakeholder collaboration is essential to align community needs, corporate commitments, and government policies.

- **Biodiversity conservation**
  Restoring degraded land, enhancing forest corridors, and protecting peatlands to improve habitat connectivity and reduce GHG emissions.
- **Watershed management**
  Collective and participatory watershed planning, riparian buffer restoration, and co-management of peat domes to maintain optimal water tables.
- **Community engagement**
  Establishing multi-stakeholder platforms and strengthening accountability links to ensure inclusive governance.



## The framework in action:

# BIPOSC in North Sumatra

The BIPOSC project in Labuhanbatu District, North Sumatra, demonstrates the framework in practice. Launched in 2021, BIPOSC is a joint initiative by Livelihoods, SNV, and Musim Mas, supported by Danone, Mars, L'Oréal, and L'Occitane Group, and is part of the Livelihoods Fund for Family Farming (L3F) impact investment fund. The project supports 3,000 smallholder farmers in transitioning to regenerative practices across approximately 5,000 hectares of degraded palm farmland.

## Challenges

Independent smallholders in North Sumatra operate within increasingly vulnerable production systems. Years of conventional palm oil production practices have degraded soil health, reduced productivity, and increased dependence on external chemical inputs. Higher input prices, combined with the removal of government subsidies, have raised production costs beyond what many farmers can absorb. Limited access to technical advice, affordable finance, and strong farmer institutions further constrains their ability to transition.

## Approach

BIPOSC uses a regenerative and inclusive landscape approach designed around farmer needs and local context. It centres on restoring soil health and reducing reliance on external inputs as the foundation for more resilient palm oil systems, and prioritises diversified production systems to help farmers manage climate-related risks. Income diversification and resilience are strengthened through institutional linkages that improve access to services, markets, and longer-term economic opportunities.

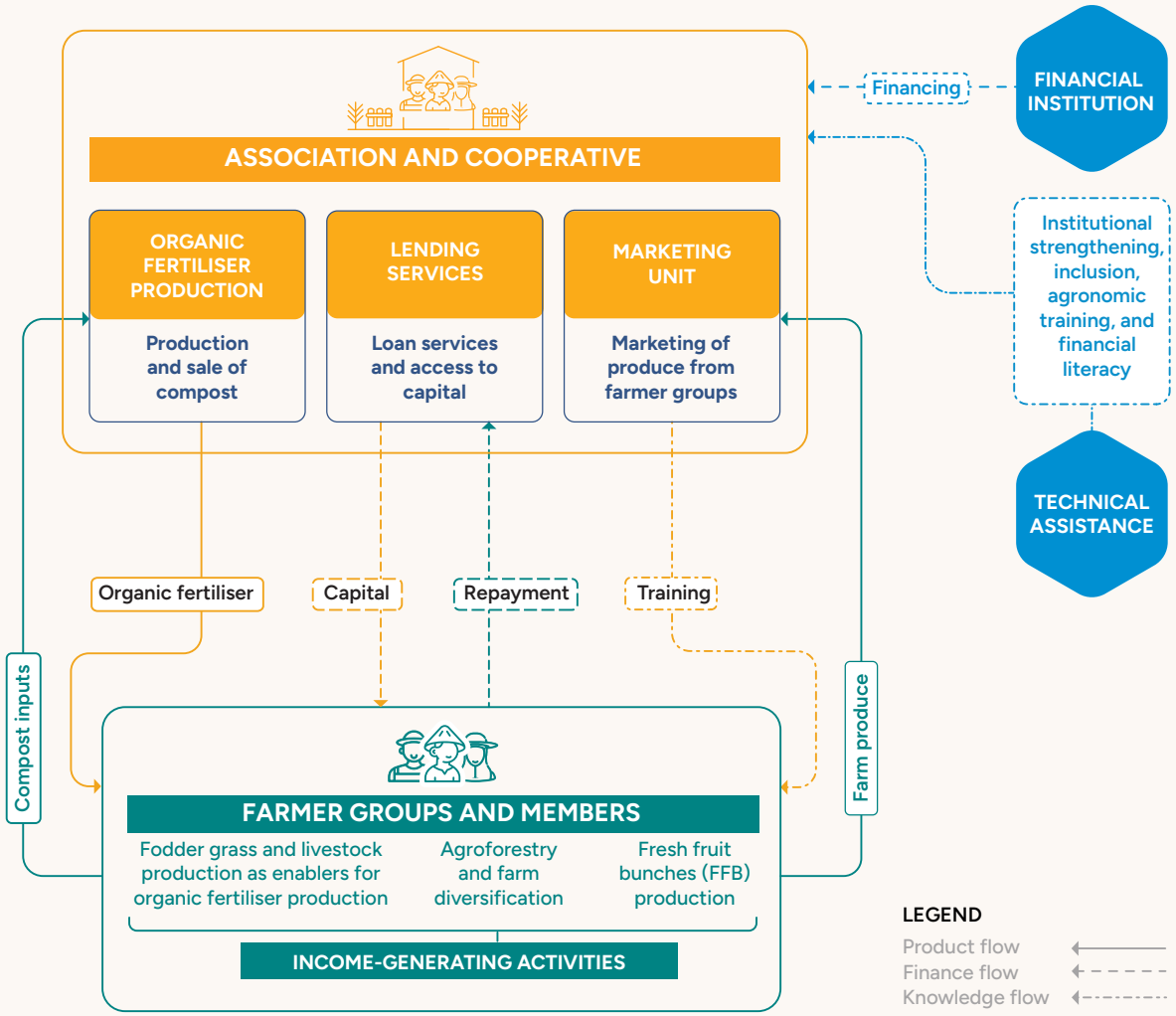



**Figure 2:** BIPOSC's inclusive and integrated model
*Source: Own elaboration.*

N.B. The BIPOSC (Livelihoods-SNV) model shows how farmer organisations build a regenerative rural economy around cooperative business units. Farmer associations and cooperatives coordinate farmer groups, support access to finance and services, and manage several business functions including organic fertiliser production, lending services, and marketing activities. The composting unit, owned by the farmers' association, converts locally sourced organic inputs into organic fertiliser that is sold to farmers. Lending services provide farmers with access to capital through a revolving fund that enables farmers to purchase inputs and invest in additional income-generating activities. These activities include oil palm cultivation, livestock production, fodder cultivation, agroforestry, and other forms of farm diversification that strengthen the regenerative production system. The marketing unit supports farmer groups in bringing farm produce to market. By combining production, financing, and marketing functions within farmer-owned institutions, the model strengthens local value chains, supports diversified livelihoods, and enables regenerative practices to scale.

"Our cooperative manages the composting unit and distributes fertiliser fairly among members. Selling compost at 62% below market price helps everyone while generating income for our community enterprise."

**APSKS**
LB Cooperative Representative

## Core elements

- **Farmer-centric design**
  Co-designed with smallholders to integrate local knowledge and traditional techniques.
- **Capacity building and institutional strengthening**
  Training, continuous coaching, peer learning, and demonstration plots to support adoption and reduce transition risks.
- **Gender and youth inclusion**
  Embedded from design to delivery to ensure meaningful participation, voice, and leadership.

## Core regenerative components

- **Soil regeneration**
  Minimal soil disturbance, mulching and cover cropping to build soil organic matter, improve water retention, and support soil carbon sequestration.
- **Biodiversity and ecosystem enhancement**
  Habitat restoration and integrated pest management to support functional biodiversity, promote ecological balance, and reduce reliance on chemical pesticides.
- **Improved water management**
  Contour planting and riparian zone restoration to slow surface water flow, reduce run-off, and improve infiltration.
- **Circular economy**
  Closing nutrient and resource loops through community-managed composting units and local input production.
- **Diversified production systems**
  Agroforestry, intercropping and, where appropriate, livestock integration to diversify farm production and income sources, and strengthen resilience.

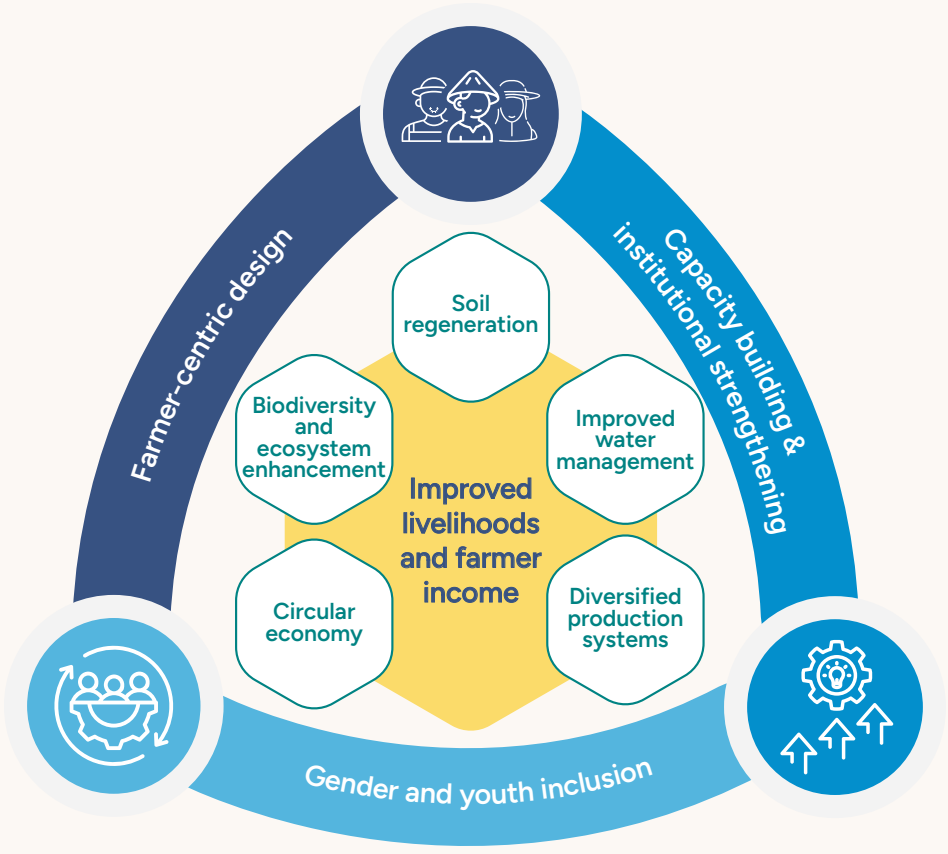



**Figure 3:** Core elements and components for regenerative oil palm farming landscapes
*Source: Own elaboration.*

## Results

Project monitoring indicates encouraging results across environmental, economic, and social dimensions. The impacts of our approach are measured through practice-based and outcome-based indicators at farm, farm household, and landscape levels. Assessments and analyses also examine the drivers of adoption and non-adoption of regenerative practices at various levels. This includes analysing individual, community, organisational, and systemic factors that influence decision-making and behaviour change. These assessments are supported by field-level digital data collection and monitoring. The figures below should be read as evidence from the project rather than as universal outcomes for regenerative palm production.

### Environmental

**Soil health**

Soil organic matter increased by up to 80%, with a 70% rise in earthworm populations.

**Biodiversity**

A 25% increase in pollinators and natural predators, 130 hectares of farmland transitioned to actively managed agroforestry; 8,000 hectares of forest protected through the restoration and conservation of buffer zone in the villages border to protected forest.

**Yields**

14%-30% higher yields compared to conventional methods, alongside improvements in soil quality: higher pH and increased availability of nitrogen, phosphorus, potassium, and magnesium.

### Economic

**Composting unit**

A community-managed composting unit generated IDR 741 million (USD 43,200) in profit, supplying organic fertiliser to 1,927.50 hectares and engaging 1,338 smallholders, 11 local staff, and 41 marketing agents. Compost is sold at 62% below market price, significantly reducing input costs.

**Agroforestry**

Income increases of USD 830–2,000 per hectare per year, strengthening income resilience and reducing reliance on palm oil as a single income source.

**Farmer economic empowerment**

Eight farmer groups received seed funding for cattle fattening and fish farming. A further 12 farmer groups, comprising 804 farmers, received financial literacy training and support to prepare for RSPO certification. In addition, 1,227 smallholders achieved RSPO certification.

### Social

**Gender inclusion**

Over 400 women received gender awareness and financial literacy training; 18 women's groups supported to establish and manage microenterprises.

**Institutional strengthening**

Farmer organisations reinforced, improving service delivery capacity and peer learning structures at community level.



> **"After learning about composting, I began producing my own organic fertiliser. My soil is healthier and I've reduced my input costs significantly. With the savings, I can invest in cover crops and diversify my income through agroforestry."**

**Bahrun**
Smallholder farmer champion

## Lessons learned

Five practical lessons emerge from BIPOSC's implementation experience. These lessons point to transferable design principles rather than fixed interventions. Approaches that combine local input production, phased adoption pathways, sustained advisory support, and motivated local facilitators and farmer champions are more likely to succeed across diverse palm oil landscapes. By anchoring learning and support within communities, local facilitators help translate regenerative concepts into practice, build trust, and accelerate adoption through peer learning. While implementation must remain context-specific, the underlying model — linking farmer-centred regenerative practices with enabling economic and institutional conditions — offers a practical reference for replication in other smallholder-based commodity systems.

1. **Affordable inputs enable adoption**
   Local production of compost and bio-inputs reduces dependence on external markets and strengthens farmer self-sufficiency.

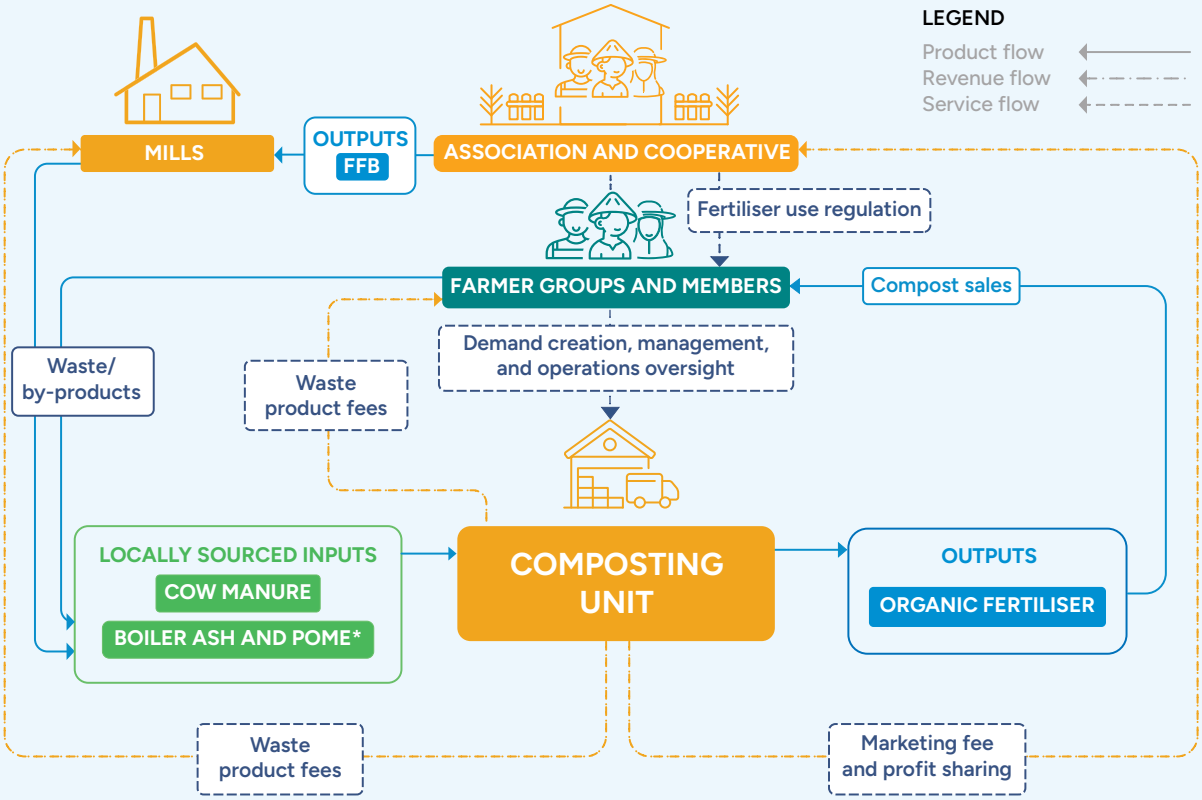
2. **Sustained engagement outperforms one-off training**
   Continuous coaching, peer learning, and farmer champion hubs consistently outperform one-off training models.

3. **Phased transitions work best**
   Combining organic and mineral fertilisers—for example, 50% compost and 50% chemical — is more economically viable for smallholders during the transition period.

4. **Short-term incentives matter**
   Immediate cost savings, such as reduced herbicide use, motivate farmers to commit to longer-term soil regeneration and practice change.

5. **Adaptive management is essential**
   Initial strategies may need adjustment based on local constraints — for example, uptake of bio-inputs was lower than expected mainly due to a strategy focused on promoting commercial products and limited farmer understanding of Trichoderma's role. To provide access to reliable and affordable bio-inputs, the project initiated the local production of Trichoderma[2] at the composting unit level.

[2] Trichoderma is a genus of beneficial soil fungi used in agriculture to suppress plant diseases, enhance nutrient uptake, and improve composting processes.




*Palm oil mill effluent

**Figure 4: Incoming generation through composting**
*Source: Own elaboration.*

## Income generation through composting

The transition to organic fertiliser is supported by a community-managed composting unit, which provides affordable organic fertiliser and generates income too. The composting unit converts locally available organic waste (boiler ash, dried decanter solids from Musim Mas's mill, and cow manure from participating farmers) into high-quality compost for use by smallholders. It uses standardised processes — mixing, fermentation, stirring, curing, and packaging. The unit is managed by the farmers' association and cooperative, who oversee equitable distribution (based on land size and number of trees) and operate transparently.

Smallholders engage in a savings scheme to ensure regular purchase of compost, which is sold at as much as 62% below market price. This significantly lowers input costs, while improving soil health and productivity, and generating revenue so the unit is self-sustaining. Over 1,000 hectares are already treated with compost from this unit, over 40% of participating farmers are using it, and in one year it yielded a profit of over USD 31,000 — demonstrating that composting can be environmentally restorative, financially rewarding, and socially inclusive.

## How BIPOSC is financed: The L3F model

The transition to regenerative practices is pre-financed by the Livelihoods Fund for Family Farming (L3F), a corporate impact investment fund created in 2015 by Livelihoods, Mars, and Danone, later joined by dsm-firmenich and Veolia (which exited in 2025). The fund's shareholders are companies that buy agricultural commodities. L3F provides upfront capital covering the cost of the transition and is then refinanced by these buyers, who are committed over the long term and pay a premium on the commodities sourced from the project — a premium linked to verified results on the ground.

In BIPOSC, Danone and Mars have been investors and buyers from the start, later joined by L'Oréal and L'Occitane Group as the project grew. Alongside the fund, implementation partner and mill operator, Musim Mas, anchors the project on the ground, providing independent smallholders with technical training, mill by-products for organic fertiliser, and direct access to global, sustainable palm oil markets.

The result is a self-sustaining mechanism: companies invest, farmers transition, results are measured, and buyers pay for verified outcomes — helping committed brands move towards sustainable sourcing while smallholders improve their livelihoods without carrying the financial burden of the change.




## Conclusion:

# Enabling the transition and inviting collaboration

Our experience in North Sumatra suggests that regenerative transition is most credible when three dimensions move together:

- better practices at farm level,
- the economic and institutional conditions that enable adoption, and
- landscape-level coordination where individual farms cannot address systemic risks alone.

BIPOSC is one experience, not a universal blueprint. But it demonstrates that measurable progress is possible and provides practical lessons on how to approach the transition: start from farmer realities, create early economic benefits, move progressively, invest in long-term support, measure outcomes and adapt when implementation challenges emerge — and recognise that productive existing plantations are an important defence for standing forests.

The shift to regenerative palm production requires collective action, innovative financing, and a supportive enabling environment. Based on our experience, different actors have distinct and complementary roles to play.

**We invite:**

## COMPANIES AND BUYERS

**Engage in co-financing structures and supply chain transition partnerships.**

Consumer goods companies and downstream players are exposed to supply chain risk from soil degradation, climate disruption, and regulatory pressure, including EUDR due diligence requirements. Regenerative practices can help address these risks at source. Practical entry points include:

- Co-financing transitions within supply chains by bundling commitments in shared platforms, reducing per-company cost.
- Partnering with suppliers to expand farmer service delivery models — community composting units, for example — that create shared value across supply chains.
- Mapping supply chain exposure and identifying where BIPOSC-style approaches could be applied to existing sourcing relationships.

## GOVERNMENTS AND REGULATORS

**Align policy and incentive structures with regenerative outcomes.**

Policy alignment is one of the main conditions for scaling up. Specific opportunities include:

- Integrating regenerative criteria into replanting subsidy programmes, so the transition period becomes an investment rather than a cost.
- Aligning ISPO incentive structures with regenerative outcomes, building on the certification infrastructure that already exists.
- Establishing multi-stakeholder platforms at jurisdictional level to coordinate landscape-scale implementation.

## DEVELOPMENT FINANCE INSTITUTIONS AND IMPACT FUNDS

**Explore the Livelihoods-SNV model as a basis for investable transition finance.**

The Livelihoods-SNV model offers a structured, investable entry point into smallholder transition finance. Blended capital from Danone, Mars, L'Oréal, and L'Occitane through L3F suggests that corporate co-investment can help reduce the risks of transitions for smallholders. Opportunities include:

- Providing concessional capital to de-risk farmer transitions, replanting programmes, and adaptive research.
- Designing outcome-based incentives — premium pricing linked to verified regenerative outcomes — that create direct revenue streams for farmers.
- Funding cost-of-transition analysis to build the evidence base for scaling to larger smallholder populations.

## PRACTITIONERS AND NGOs

**Adopt and adapt the framework, and to share results so the evidence base grows.**

The palm oil sector has the compliance infrastructure, the corporate commitments, and the urgency to take the next step. What it needs now are replicable models that work for smallholders — models that are financeable, implementable, and grounded in field experience.

BIPOSC offers one such model. It is not a pilot or a research project. It works at scale and is co-financed by the companies that buy palm oil. It has recorded results at farm, community, and landscape level. We share it so that others can test, adapt, and build on it.

By working together, companies, financiers, governments, and practitioners can help palm oil producers contribute to climate, biodiversity, and livelihood goals — for the farmers who grow it, the ecosystems that support it, and the companies and consumers who depend on it.

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# Annex

## Guiding framework: Detailed indicators

The following tables provide the full indicator set for each level of the framework, for use as reference material by practitioners. The framework is a flexible guide rather than a rigid or linear sequence, as conditions in palm production vary greatly according to estate/smallholder ratios, deforestation trends, mineral soils or peatland characteristics among others. Regenerative practices often overlap and interact across scales, generating dual benefits across levels. Indicators include biophysical condition metrics, performance indicators, and governance measures reflecting different dimensions of progress.

***Farm-level practices***

| Challenges | Proposed solutions | Outcomes | Indicators |
|---|---|---|---|
| **Soil fertility decline and soil degradation**<br><br>**High production costs** | Organic fertilisers and bio-inputs (ideally, locally produced)<br>Livestock integration<br>Permanent, multi-species cover cropping with selective or no weeding and promotion of multi-species cover crops (nitrogen-fixing)<br>Mulching with palm fronds<br>Avoid soil disturbance or compaction during replanting<br>Avoid herbicides (favour biological and/or manual weeding) | Enhanced organic soil matter and fertility regeneration<br>Improved soil structure and resistance to compaction<br>Increased soil biological activity and microbial diversity<br>Enhanced carbon sequestration<br>Reduced dependence on synthetic fertilisers and chemicals<br>Lower production costs | Soil organic carbon (SOC) (%)<br>Nutrient availability (nitrogen [N], phosphorus [P], potassium [K], calcium [Ca], magnesium [Mg] balance)<br>Soil pH stability<br>Microbial biomass and earthworm density or population<br>Soil compaction<br>Infiltration rate or run-off<br>Yield per hectare (t/ha)<br>% adoption of practices (organic inputs, cover cropping, mulching, low or no tillage) |
| **Pest and disease vulnerability, and functional biodiversity decline** | Integrated pest and disease management<br>Biological pest and disease management[3] and controls<br>Palm-based agroforestry systems, intercropping with nitrogen-fixing species<br>Livestock integration<br>Pollinator and predator habitat support | Enhanced on-farm biodiversity<br>Reduced pest and disease incidence<br>Improved natural pest regulation (predators, pollinators, beneficial species)<br>Increased ecosystem resilience | On-farm biodiversity index (species richness, abundance)<br>Pest and disease incidence rates<br>Functional species richness (predators, pollinators, N-fixers)<br>% adoption of biodiversity-supportive practices (agroforestry, intercropping, habitat provision) |

[3] Examples of pests: rodents, weevils, rhinoceros beetles, herbivore caterpillars, termites, etc. Examples of diseases: bud rot, crown disease, soil pathogen such as *Ganoderma*, and basal stem rot.

| Challenges | Proposed solutions | Outcomes | Indicators |
|---|---|---|---|
| **GHG emissions** | Palm-based agroforestry<br>Diversified tree species at farm and landscape level (palm-based agroforestry models)<br>Replace synthetic fertilisers with locally produced organic alternatives<br>Manage peatland responsibly to minimise carbon loss<br>Avoid extensive soil compaction during replanting<br>Increase nutrient use efficiency and reduce losses, especially nitrogen | Reduced farm-level GHG emissions<br>Increased carbon sequestration in soils and trees<br>Improved fertiliser use efficiency<br>Minimised peatland carbon losses | SOC (%)<br>GHG emissions/ha ($CO_2$eq/ha)<br>Fertiliser use efficiency<br>Tree cover and biomass carbon (tC/ha)<br>% adoption of low-emission practices (organic inputs, agroforestry, peatland management) |
| **Water resource management** | Efficient use of fertilisers and bio-inputs<br>Permanent cover cropping and moisture maintenance<br>Soil health and fertility practices (see above)<br>Riverbank restoration | Improved water quality<br>Reduced nutrient run-off and erosion<br>Increased soil moisture retention<br>Enhanced infiltration and groundwater recharge | Soil moisture content (%)<br>Infiltration rate (mm/hr)<br>Nutrient and pesticide concentration in water run-off samples<br>Sediment load in run-off<br>% adoption of water-conserving practices (cover cropping, mulching, efficient fertiliser use) |

### *Institutional and social level*

| Challenge | Proposed solutions | Outcomes | Indicators |
|---|---|---|---|
| **Dependence on a single income source** | Income-generating activities (on- and off-farm)<br>Agroforestry<br>Sale of RSPO credits<br>Reduce input costs (compost, bio-inputs, and livestock integration)<br>Fair benefit-sharing scheme and premium pricing | Diversified income streams for farmers (especially during replanting)<br>Increased income resilience and reduced vulnerability to price shocks<br>Reduced production costs through local resource use<br>Fair benefit-sharing and access to premium pricing (RSPO credits, sustainable markets) | Net farm income (USD/ha/year)<br>Share of income from alternative sources (%)<br>Cost of production per hectare<br>Share of farmers accessing RSPO credits or premium pricing (%) |
| **Local resource leakage and inefficient resource use** | Produce high-quality organic fertilisers<br>Efficient land use (agroforestry and/or intercropping), increase land productivity without expansion, reduce deforestation and land-use change<br>Valorise mill by-products (e.g., palm oil mill effluent [POME], empty fruit bunches [EFB], and boiler ash to produce high-quality organic fertiliser<br>Valorise local livestock manure<br>Biomass use through mulching (e.g., fronds)<br>Promote collective resource use efficiency | Efficient and circular use of local resources (closing nutrient loops)<br>Increased land productivity without expansion or deforestation<br>Reduced dependence on external or synthetic inputs<br>Increased production of high-quality organic fertilisers | Share of mill waste recycled (%) (POME, EFB, boiler ash)<br>Share of livestock manure valorised (%)<br>Quantity of biomass mulched (fronds/ha)<br>Cost savings from fertiliser substitution<br>Land productivity (yield/ha) |

| | | | |
|---|---|---|---|
| **Weak farmer organisations and representation, and lack of transparent certification** | Leadership and capacity development, cooperative management, financial literacy, and management support<br>Promote fair labour conditions (decent wages, safe working conditions, workers' rights)<br>Community engagement via forums for farmers, companies, and communities to co-design and monitor initiatives<br>Enhance farmer agency (capacity building on negotiation skills, market literacy, and peer-to-peer learning networks)<br>Participatory compliance monitoring (joint audits-RSPO and agreed regenerative standards)<br>Feedback and grievance mechanisms<br>Transparent certification processes | Strengthened farmer organisations with leadership and management capacity<br>Improved governance, transparency, and farmer agency<br>Transparent and inclusive certification processes<br>Increased adoption of regenerative practices<br>Fair labour conditions and participatory monitoring systems | Number of agribusinesses or cooperatives created<br>Number of certified farms<br>Share of farmers engaged in cooperatives or producer groups (%)<br>Existence and use of grievance or feedback mechanisms<br>Traceability level of supply chains |
| **Exclusion of women and young people** | Peer-to-peer learning and mentorship<br>Develop soft, business and life skills, and leadership capacity to give agency and voice for meaningful participation<br>Create space for participation, influence, and leadership from diverse voices<br>Address harmful social norms | Equitable participation of women and young people in decision-making and leadership<br>Increased access to resources (finance, markets, inputs, energy, water, land)<br>Improved skills, voice, and agency of women and young people<br>Inclusive community engagement and leadership opportunities | Share of women and young people in leadership roles within cooperatives or community organisations (%)<br>Participation rates of women and young people in training and capacity development activities<br>Access rate to resources (finance, markets, inputs, assets), by gender and age group<br>Perception of inclusiveness (survey-based index) |

### *Landscape-level restoration*

| Challenge | Proposed solutions | Outcomes | Indicators |
|---|---|---|---|
| **Deforestation and habitat loss** | Community-based biodiversity conservation in forested landscapes adjacent to palm production areas<br>Restoration of degraded land and sensitive areas (e.g., riparian buffers) with non-palm agroforestry systems<br>Forest corridor enhancement for habitat connectivity<br>Co-management of natural resources<br>Peatland protection | Protection of standing forest<br>Restored degraded lands and sensitive areas (e.g., riparian buffers, peatlands)<br>Enhanced habitat connectivity through forest corridors<br>Increased biodiversity and species richness<br>Reduced landscape-level GHG emissions from deforestation and degradation<br>Stronger co-management of natural resources | Share of area under conservation (% of ha protected)<br>Share of area under restoration (% of ha restored)<br>Forest cover change (annual deforestation and reforestation rates)<br>Species richness index (flora and fauna)<br>Share of peatland under protection or management (%) |

| | | | |
|---|---|---|---|
| **Weak community engagement in landscape governance** | Active and inclusive multi-stakeholder platforms<br>Strengthen accountability links (farmer group integration into multi-stakeholder landscape governance platforms)<br>Include marginalised smallholder groups in decision-making | Strengthened accountability links between farmer groups and landscape bodies<br>Increased leadership roles for marginalised groups (women, young people, Indigenous communities)<br>Improved transparency and inclusiveness in decision-making | Number of multi-stakeholder platforms established or operational<br>Share of marginalised groups (women, young people, Indigenous groups) in leadership roles (%)<br>Share of farmer groups represented in governance structures (%)<br>Existence of accountability mechanisms (grievance systems, public reporting) |
| **Water resource depletion and pollution** | Collective and participatory watershed management and planning (inclusive water governance)<br>Riparian buffer restoration and wetland conservation<br>Co-manage peat domes (maintain optimal water tables)<br>Equitable water distribution between estates, smallholders, and communities | Improved water quality and ecosystem services<br>Restored riparian buffers and conserved wetlands<br>Stabilised peat water tables and reduced peat degradation<br>Equitable water access across estates, smallholders, and communities<br>Collective and participatory watershed management | Share of riparian zones restored or maintained (%)<br>Water quality indicators (nutrient concentration, sediment load, pesticide residues)<br>Peat water table depth (cm below surface)<br>Existence of water-sharing agreements or watershed governance bodies<br>Share of communities reporting fair water access (%) |
| **Single-commodity dependence** | Landscape diversification<br>Integration of livestock beyond palm oil | Diversified rural economies and reduced reliance on palm oil<br>Integration of alternative value chains (livestock, non-timber products, agroforestry crops)<br>Improved household income resilience at landscape level | Share of households with income from non-palm sources (%)<br>Number of new value chains developed within the landscape<br>Share of non-palm income in total household income (%) |




## About the authors

**SNV** is a global development partner, deeply rooted in the countries where we operate. Driven by a vision of a better world where all people live with dignity and have equitable opportunities to thrive sustainably, SNV strengthens capacities and catalyses partnerships that transform agri-food, energy, and water systems. We help strengthen institutions and effective governance, reduce gender inequalities and barriers to social inclusion, and enable adaptation and mitigation to the climate and biodiversity crises. With 60 years of experience and over 90% of our team coming from and working within the countries where we operate, we support our partners in more than 20 countries in Africa and Asia, tailoring our approaches to different contexts to achieve large-scale impact and create more equitable lives for all. Learn more: snv.org

**Livelihoods Venture (Livelihoods)** is a global initiative that funds and co-designs large-scale nature-based projects with companies, NGOs, and rural communities. Backed by 20 committed companies, its expertise in regenerative agriculture, ecosystem restoration, and climate resilience helps companies transition to sustainable sourcing and contribute to global climate action. Since 2009, Livelihoods has launched 47 large-scale projects, delivering 5.4 million tonnes of $CO_2$ avoidance and removals, planting 160 million trees, and improving life for 2.4 million people in Africa, Asia, Europe, and Latin America. In the palm oil sector, Livelihoods has pioneered coalitions that bridge community needs and corporate commitments. Learn more: livelihoods.eu



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