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How can the combination of Innovative financial instruments support smallholder farmers adopt a truly regenerative agriculture businesses that ensure long-term financial, economic, and ESG sustainability?

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ABSTRACT

Smallholder farmers are at the forefront of significant challenges stemming from climate vulnerability and soil degradation. However, they frequently struggle with limited access to the capital necessary for transitioning to regenerative agriculture, which is essential for restoring degraded soils, enhancing yields, and ensuring economic sustainability. Recent studies have identified a "bakability gap," a critical misalignment between financial and ecological outcomes that can yield viable investments. This thesis addresses this gap by proposing an innovative integrated financial model that combines blended finance, pay-for-results mechanisms, and reverse factoring. The aim is to strategically harness these three cutting-edge instruments to empower smallholder farmers in building regenerative agriculture businesses that achieve long-term financial viability, as well as robust environmental, social, and governance (ESG) sustainability—without compelling stakeholders to overextend their traditional mandates. Using a mixed-methods approach, the study combines institutional reports, real-world case studies in Africa and Europe, and ESG financial data. A comprehensive conceptual model has been developed and rigorously tested, supported by an extensive review of the literature, comparative analysis, and detailed mapping of the role of stakeholders. Success criteria are based on measurable improvements in revenue, improved access to credit, increased yields, and compliance with ESG criteria. Each of these mechanisms, when used in isolation, is still effective in solving critical problems: blended finance supports risk reduction and stimulates private investment; pay-for-results creates strong incentives for verifiable climate and soil outcomes; and reverse factoring increases the financial liquidity of smallholding producers and their inclusion in the value chain. The combination of these financial tools creates synergy in the flow of money that effectively reduces structural risks, fosters ESG-oriented verification, and reduces transaction cost, thus significantly advancing the bankability of regenerative agriculture. Empirical experiences in pilot projects reveal striking revenue increases of as much as 35% for the smallholders, in addition to yield increase or improvement in the health of the soil from 20% to 50%. The proposed model presents a holistic and scalable solution to the financial gap in regenerative agriculture, thus making it applicable in various geographical contexts and adaptable in diverse institutional capacity. While each instrument works best independently, the strategic combination of these tools in public-private partnerships and in existing financial systems offers a transformative pathway towards climate-resilient, inclusive food systems, as well as securing sustainable financial and economic stability for the smallholder farmer.

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"If you want to go fast, go alone. If you want to go far, go together." — African Proverb

Acronyms and Abbreviations

AI: Artificial Intelligence

CDP: Carbon Disclosure Project

CO_2: Carbon dioxide

COP: Conference of the Parties (UN climate conferences)

CSR: Corporate Social Responsibility

DFIs: Development Financial Institutions

DLT: Distributed Ledger Technology

EEA: European Environment Agency

ESG: Environmental, Social, and Governance

EU: European Union

FAO: Food and Agriculture Organization

FDI: Foreign Direct Investment

GHG: Greenhouse Gas

GRI: Global Reporting Initiative

IFC: International Finance Corporation

IFRS: International Financial Reporting Standards

IMF: International Monetary Fund

IPCC: Intergovernmental Panel on Climate Change

IoT: Internet of Things

IRR: Internal Rate of Return

KPI: Key Performance Indicator

LEDS: Low-Emission Development Strategies

NGO: Non-Governmental Organization

NPV: Net Present Value

OECD: Organisation for Economic Co-operation and Development

PPP: Public-Private Partnership

PRI: Principles for Responsible Investment

ROI: Return on Investment

SBTi: Science Based Targets initiative

SCF: Supply Chain Finance

SDG: Sustainable Development Goals

SME: Small and Medium-sized Enterprise

SRI: Socially Responsible Investment

TCFD: Task Force on Climate-related Financial Disclosures

UN: United Nations

UNDP: United Nations Development Programme

UNEP: United Nations Environment Programme

UNFCCC: United Nations Framework Convention on Climate Change

UNGC: United Nations Global Compact

WBCSD: World Business Council for Sustainable Development

WEF: World Economic Forum

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Chapter 1: Introduction and Problem Statement

1.1 Background and Global Context

Agricultural practices form the crucial intersection of critical global challenges facing the 21st century. Global food systems face fundamental threats from climate change in combination with land degradation and resource shortages.[1] Research shows that 24 billion tons of fertile soil get lost each year because of erosion and degradation processes.[2] Should existing trends continue without intervention the Earth could face soil degradation in over 90% of its regions by 2050 which poses a serious threat to food production according to United Nations Environment Programme [UNEP], 2024; Food and Agriculture Organization [FAO], 2015. Population expansion and dietary shifts are driving global food demand upward and estimations predict a 60% increase by 2050 according to the Rockefeller Foundation (2024). The combined pressures means that *"business-as-usual"* in farming no longer viable.[3] Experts agree that changing to regenerative agriculture practices will help restore ecosystems and create climate resilience. Regenerative agriculture encompasses a comprehensive climate-conscious methodology for food production which focuses on maintaining soil health while

[1] Sridhar, P. (2024, November 5). *To save our soil, invest in smallholder farmers.* https://earth.org/to-save-our-soil-invest-in-smallholder-farmers/

[2] Sridhar, P. (2024, November 5). *To save our soil, invest in smallholder farmers.* https://earth.org/to-save-our-soil-invest-in-smallholder-farmers/

[3] Rockefeller Foundation, TIFS, & Pollination Group. (2024). Financing for Regenerative Agriculture. https://www.rockefellerfoundation.org/reports/financing-for-regenerative-agriculture/

enhancing water retention and ensuring farm resilience as well as biodiversity.[4] Regenerative practices that align with natural processes change farms from carbon producers into carbon absorbers while bringing new life to rural areas[5]. The world's current situation demands urgent redesign of agricultural systems to simultaneously heal the environment and feed an expanding population.

The recognition of world food producers and their exposure to global challenges remains essential. Most developing countries rely on smallholder farmers who make up the essential foundation of their agricultural systems. Hundreds of millions of small farms operate worldwide and these farms usually work on less than a few hectares of land. Latest data reveals that small farms account for five of every six agricultural holdings worldwide with sizes below 2 hectares.[6] Their individual sizes may be small but together they create an enormous impact. Smallholder farmers generate approximately one-third of global food supplies and produce up to 70% of food within low- and middle-income countries according to the International Fund for Agricultural Development (IFAD) 2023 report. Family farms operate 70–80% of global farmland although most remain small-scale operations.[7] Small-scale farmers maintain vital roles in producing food security and protecting soil health along with water resources and biodiversity within agricultural environments. The farmers who protect the world's natural resources face the highest vulnerability to climate and economic disruptions. Farming communities face growing vulnerability from recurrent droughts and floods while extreme weather events destroy harvests and incomes in one fell swoop (UNEP, 2024). Smallholders who already face poverty and limited resources deal with new difficulties from climate change which adds uncertainty and risk. The precarious situation worsens due to the ongoing volatility in the global markets and geopolitical disruptions. The COVID-19 pandemic along with the Ukraine conflict triggered sharp increases in input prices while causing supply chain disruptions that disproportionately affected small-scale farmers.[8] In summary, the global backdrop for this study is one of mounting environmental stress and

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[4] Pollination. (2024, June 11). *Pollination, TIFS, Rockefeller Foundation release catalogue of regenerative agriculture financing instruments.* https://pollinationgroup.com/media_post/pollination-tifs-rockefeller-foundation-release-catalogue-of-regenerative-agriculture-financing-instruments/

[5] Sridhar, P. (2024, November 5). *To save our soil, invest in smallholder farmers.* https://earth.org/to-save-our-soil-invest-in-smallholder-farmers/

[6] Food and Agriculture Organization of the United Nations. (2021). Small family farmers produce a third of the world's food [News article]. https://www.fao.org/newsroom/detail/small-family-farmers-produce-a-third-of-the-world-s-food/en

[7] Food and Agriculture Organization of the United Nations. (2021). Small family farmers produce a third of the world's food [News article]. https://www.fao.org/newsroom/detail/small-family-farmers-produce-a-third-of-the-world-s-food/en

[8] Vásquez Neyra, J. M., Cequea, M. M., & Schmitt, V. G. H. (2025, January 22). Current practices and key challenges associated with the adoption of resilient, circular, and sustainable food supply chain for smallholder farmers to mitigate food loss. https://www.frontiersin.org/journals/sustainable-food-systems/articles/10.3389/fsufs.2025.1484933/full

inequality in the food system: The world requires sustainable agricultural practices that enable smallholder farmers to become central players in food production.

1.2 Significance of Smallholder Farmers

Smallholder farmers occupy a crucial position for realizing worldwide sustainability objectives. Smallholder farmers and their families total over 500 million worldwide according to the FAO (2021), yet their influence extends far beyond as nearly 2 billion people depend on these small farms for their livelihood according to IFAD (2023). In terms of food security smallholders generate much more output than their land size would suggest. According to FAO research small farms that utilize less than 2 hectares generate approximately 35% of global food production on roughly 12% of agricultural land.[9] In developing regions their role is even more dominant: Small-scale farms produce up to 70% of the food supply across Africa, Asia, and Latin America according to IFAD (2023). These farmers stand as the main source of local staple foods that support billions of people in both rural and urban areas. Efforts to eradicate hunger and secure food must focus first on supporting smallholder farmers.

In addition to food production smallholders carry essential weight in agricultural environmental and social achievements. They cultivate multiple crop species and preserve heirloom plant varieties which helps maintain biodiversity on their land and conserves genetic resources in their seeds. Smallholder farmers utilize agroforestry as well as mixed farming and various traditional methods which bring improvements to ecosystem services according to FAO research from 2024. As such, empowering small farmers to adopt truly regenerative practices could have cascading benefits: Soils that capture carbon become healthier along with protected pollinators and biodiversity while landscapes gain resilience to endure extreme climate conditions.[10] Smallholder agriculture maintains strong connections with rural development initiatives and equitable resource distribution. The majority of people living in poverty reside in rural areas where agriculture remains their primary source of income while small farms supply jobs and sustenance in these impoverished regions (IFAD, 2023). By strengthening smallholder businesses we tackle rural poverty (SDG1) while also reducing forced migration through the creation of sustainable livelihoods on the land. Small-scale farming practices

[9] Food and Agriculture Organization of the United Nations. (2021). Small family farmers produce a third of the world's food [News article]. https://www.fao.org/newsroom/detail/small-family-farmers-produce-a-third-of-the-world-s-food/en

[10] Pollination. (2024, June 11). *Pollination, TIFS, Rockefeller Foundation release catalogue of regenerative agriculture financing instruments.* https://pollinationgroup.com/media_post/pollination-tifs-rockefeller-foundation-release-catalogue-of-regenerative-agriculture-financing-instruments/

preserve traditional wisdom and maintain community connections because many small farmers are women and indigenous people whose empowerment supports broader development progress. Smallholders produce food while protecting rural ecosystems and ensuring socio-economic stability.

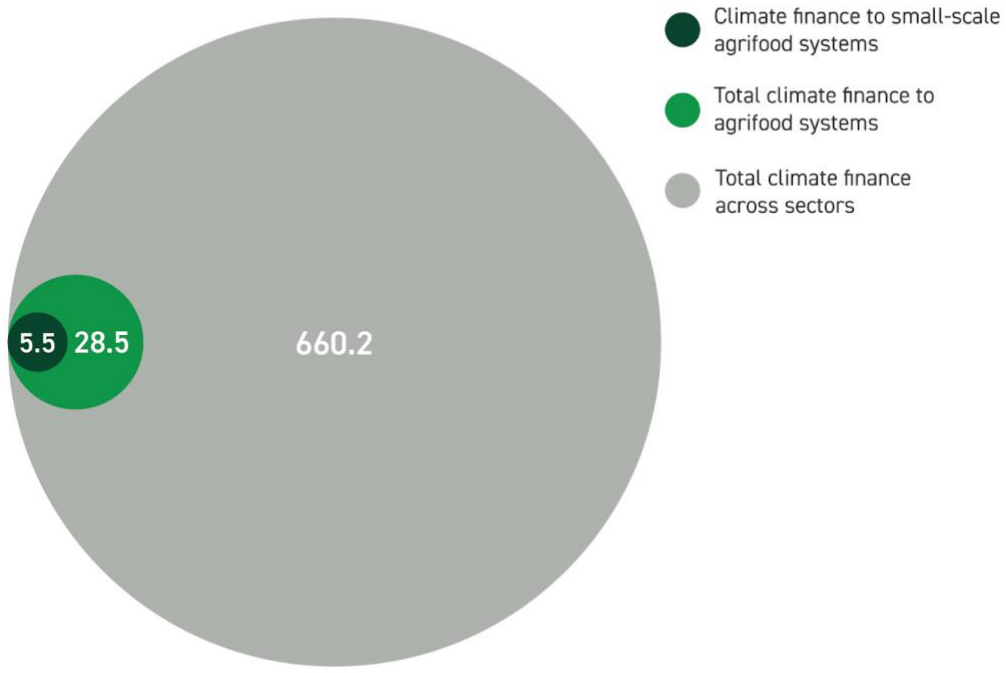
Smallholder farmers face severe constraints that negatively impact both their productivity and well-being even though they hold significant value. Basic agricultural resources and services are usually unavailable to them while larger commercial farmers access them easily. Smallholder farmers generally face limited access to essential agricultural resources like quality seeds and fertilizers along with irrigation infrastructure and modern equipment. Smallholders encounter market access problems since their isolation through poor rural roads and exploitation by middlemen prevents them from effectively selling their produce. The most critical challenge smallholder farmers face involves their limited access to financial resources. Traditional banking and credit providers do not typically serve small farmers because transaction costs remain high, and these farmers represent perceived financial risks. The IFAD report reveals that small-scale farmers only receive $0.06 for each dollar worth of produce they create which indicates their marginal status in value chains and weak negotiation capabilities (IFAD, 2023). These limitations leave smallholders highly vulnerable: A farming family without savings or safety measures can face ruin from just one poor harvest or market price collapse. Smallholders need empowerment through improved financial support and market integration along with technical assistance to successfully shift from subsistence livelihoods to sustainable enterprises. These smallholders serve as key contributors to global objectives but require extensive support to become full-fledged drivers of regenerative agriculture.

1.3 Limitations of Existing Sustainability Models

Based on the information presented one would expect global sustainability initiatives and financial resources to focus heavily on smallholder farming. The current models have shown themselves to be insufficient for smallholders' needs and incapable of achieving broad-scale regenerative change. The promised sustainability initiatives fail to deliver necessary resources to farmers operating in the field. Existing agricultural development programs alongside climate finance mechanisms have failed to connect current practices with necessary improvements.

Figure 1.3 Climate finance to small-scale agrifood systems vs. total climate finance (annual average 2019/20, USD billions). Dark green = climate finance benefitting small-scale agrifood systems (≈$5.5 B); light green = total climate finance to all agrifood systems ($28.5 B); grey = total global climate finance across sectors ($660.2 B). Source: Climate Policy Initiative (2023).

Figure 1. Climate finance to small-scale agrifood systems, agrifood systems and all sectors in 2019/20 (USD billions)



Source: Climate Policy Initiative

Figure 1.3 demonstrates how global climate finance includes only a small portion directed toward small-scale agricultural enterprises. During 2019–2020 the total climate finance across all sectors was around $660 billion annually while agrifood systems received only 4% of this amount which totaled approximately $28.5 billion.[11] A closer examination reveals that a mere 0.8% of climate finance which amounts to just $5.5 billion funds small-scale farmers and agricultural SMEs.[12] Although experts concur that agriculture and land management play essential roles in climate mitigation and adaptation strategies, the bulk of climate financing continues to support energy and transport sectors (CPI, 2023; IFAD, 2023). This pattern indicates a major limitation of current sustainability efforts: Financial backing for climate initiatives aimed at smallholders remains far below necessary levels. Climate Policy Initiative (2023) states that the financial resources dedicated to small-scale agrifood systems must grow tenfold to reach conservative projections of necessary funding. A collaborative study from FAO and CPI estimates that agrifood systems require $680 billion in annual climate financing until 2030

[11] Food and Agriculture Organization of the United Nations. (2024). FAST Partnership bridges climate funding gap in agrifood systems [News article]. https://www.fao.org/europe/news/detail/fast-partnership-bridges-climate-funding-gap-in-agrifood-systems/en

[12] World Economic Forum. (2024). Why small-scale farmers can teach us a lot about climate change [Article by A. Lario]. https://www.weforum.org/agenda/2024/02/small-scale-farmers-climate-change/

compared to the current $28 billion mobilization (FAO & CPI, 2025). This demonstrates a massive "financing gap" that hinders the development of sustainable agriculture at large scale.

The difficulties that smallholders face across the globe make it clear that this financing gap has significant consequences. The majority of small farmers are unable to finance enhancements such as drought-resistant crops and agroforestry systems because they lack affordable credit and insurance options. Regenerative agriculture requires initial investments which later produce long-term rewards such as enhanced soil fertility and carbon capture. The advantages of regenerative agriculture such as better soil fertility and carbon capture appear after several years. Current sustainability frameworks based on temporary projects and uneven government support have not supplied the necessary long-term financial resources for these transitions. Traditional banks view smallholders as risky borrowers because they lack collateral and face unstable incomes which leads to inadequate private investment unless risk mitigation steps are implemented (Rockefeller Foundation, 2024). The scale of public and donor funding falls significantly short of what's needed despite its importance. The Overseas Development Assistance (ODA) program provides just 4% of its funds to agriculture-related projects and only a tiny portion reaches small farmers according to IFAD's 2023 report. Existing financial models fail to include smallholders in green finance and agricultural investment flows which threatens global sustainability objectives.

An existing problem with current methods is their tendency to function in isolated silos while maintaining a top-down approach. Numerous sustainability initiatives target specific problems such as carbon emissions or yield improvement rather than addressing the comprehensive needs of farming communities. Smallholders need comprehensive support systems that simultaneously enhance productivity while promoting environmental regeneration and social well-being. While historical initiatives such as the Green Revolution did improve crop yields, they also damaged soil health and disproportionately favored larger agricultural operations. Current corporate sustainability initiatives have established challenging sourcing goals such as zero-deforestation commitments. Corporate sustainability programs set ambitious sourcing targets like zero-deforestation commitments yet fail to establish support mechanisms for farmers tasked with meeting these goals. A 2023 analysis by the FAIRR Initiative exposed this disconnect in corporate sustainability efforts: Of 50 major agri-food companies that have recognized the importance of regenerative agriculture 64% did not set any specific objectives or strategies for its implementation while only 8% gave financial support to their supply chain farmers to transition to regenerative practices.[13] The FAIRR report from 2023 indicates that most corporate sustainability pledges exist only as declarations rather than demonstrable advancements since they remain lofty paper goals lacking adequate operational support. Smallholders cannot manage the expenses for adopting regenerative methods without support through financial incentives along with technical training and market access. FAIRR (2023) identifies the absence of a

[13] FAIRR Initiative. (2023). Food sector making "more promises than progress" on regenerative agriculture [Press release]. https://www.fairr.org/news-events/press-releases/food-sector-making-more-promises-than-progress-on-regenerative-agriculture

global standard definition for "regenerative agriculture" as a complication which impedes setting standards and enforcing accountability.[14]

In summary, today's sustainability models fall short in two major ways: Small producers suffer from both insufficient financial backing and inadequate practical assistance at their business locations. Current systems direct minimal financial resources toward the neediest while failing to synchronize worldwide market incentives with sustainable farming methods. The current constraints establish a systemic obstacle which prevents smallholders from developing regenerative business models. Small farmers face three persistent problems which trap them in low-input farming methods that produce minimal output and often harm the environment: financing shortfalls, lack of knowledge and services, and insufficient market inclusion (CPI & FAO, 2025). We need to rethink how we mobilize capital along with designing support mechanisms to close these gaps within sustainable agriculture. The present research is driven by the core challenge presented by the triple gap affecting small farmers.

1.4 Problem Statement

The foregoing discussion highlights a critical problem at the heart of sustainable development: Smallholder farmers face the dual responsibility of feeding populations worldwide and protecting the environment but fail to meet these expectations because financial and support models are inadequate. Traditional lenders and investors view smallholders as high-risk entities despite their essential role which leads to their continued financial exclusion. Traditional agricultural financing and assistance programs fall short in providing necessary funds for widespread implementation of regenerative agricultural methods that enhance soil health and promote biodiversity and climate resilience. The present situation shows a sharp divide between worldwide sustainability goals and actual conditions for small farmers. What steps must farmers take to establish regenerative agriculture businesses that achieve ecological sustainability while maintaining economic viability and social fairness within today's existing system? The core problem is a structural one: Current financial tools and incentives do not meet smallholder requirements enabling investment in regenerative agriculture to obtain its benefits. Without innovative solutions smallholders will persist in a pattern of inadequate investment and vulnerability which prevents them from achieving sustainable financial and economic growth together with ESG standards in agriculture (FAO & CPI, 2025).

The problem exists because current market systems and policies fail to provide appropriate incentives for sustainable agricultural practices by small-scale farmers. Many smallholder farmers pay for sustainable practices that create public benefits like carbon sequestration but receive no financial return for these services in today's systems. Insufficient enforcement and subsidies enable unsustainable practices to be more profitable for the short term while worsening land degradation and

[14] FAIRR Initiative. (2023). Food sector making "more promises than progress" on regenerative agriculture [Press release]. https://www.fairr.org/news-events/press-releases/food-sector-making-more-promises-than-progress-on-regenerative-agriculture

greenhouse gas emissions. Our primary objective needs to be to modify financial incentives and risk-sharing agreements so that ethical choices become economically viable for farmers. Implementing cover crops alongside production diversification and reduced agro-chemical use while preserving forests turns into a financially sound choice for small farmers. The study suggests the adoption of innovative financing mechanisms has the potential to revolutionize outcomes in this field. The precise methods for designing and merging financial instruments to assist smallholder farmers remain unclear. The problem statement guiding this thesis is thus: The current financial models are insufficient for smallholder farmers to move towards regenerative agriculture which necessitates the creation of innovative financial tools to bridge this deficiency. We must solve this problem to support millions of farmers and to reach international objectives related to climate action and sustainable food systems.

1.5 Purpose of the Study and Research Question

This study aims to investigate and offer solutions on how innovative financial mechanisms can enable smallholder farmers to establish sustainable businesses through regenerative practices. The research aims to discover financial methods and tools that create effective connections between economic benefits and environmental and social results in smallholder farming. The research investigates three potential solutions – blended finance, pay-for-results models and reverse factoring – to see how they can collectively solve small farmers' unique challenges. When these new financial tools are used strategically, they can help smallholders lower investment risks and reward positive results while enhancing cash flows which enables them to pursue regenerative farming methods without endangering their economic stability. The research seeks to establish a framework or roadmap for financial leverage in sustainable smallholder agriculture through examination of successful and failed cases and design principles with stakeholder perspectives.

The research investigation revolves around a single primary research question.

"How can the combination of innovative financial instruments – specifically blended finance, pay-for-results mechanisms, and reverse factoring – support smallholder farmers in creating truly regenerative agriculture businesses that ensure long-term financial, economic, and ESG sustainability?"

This central question will be addressed by breaking it down into several components: The study first examines smallholder financial obstacles to adopting regenerative practices. This analysis aims to provide academic understanding as well as actionable guidance based on its findings. The main objective is to demonstrate how small-scale farmers can evolve from struggling subsistence operations into successful regenerative enterprises through innovative financing solutions that offer economic benefits for sustainable practices.

1.6 Structure and Methodology Overview

The thesis structure features six chapters to achieve the study's objectives. The first chapter presents the research topic together with its background context as well as the problem statement and research question while explaining the study's significance. Chapter 2: The Literature Review will examine academic and policy literature across three domains: (1) regenerative agriculture principles and farming sustainability models, (2) smallholder farmers' engagement in sustainable development using FAO's, IFAD's and UNEP's findings as a basis. This section explores innovative financial mechanisms such as blended finance and pay-for-results financing while offering definitions and practical illustrations from agriculture and additional sectors. The literature review identifies both theoretical foundations and existing knowledge gaps addressed by this thesis.

Following the literature review, Chapter 3: The methodology section will outline the research framework including the study's design methods and data sources. The research question's exploratory nature requires the study to implement a qualitative approach using multiple methods. The analysis will examine existing projects or pilot programs that use blended finance, results-based payments, or reverse factoring with smallholder farmers including documented examples from the Climate Policy Initiative and the Rockefeller Foundation. The study will conduct interviews with key stakeholders including impact investors and development finance practitioners. The purpose of these interviews and focus group discussions is to obtain information about the challenges encountered during implementation and the factors that lead to success when using specific financial instruments. The methodology will include analysis of reports and data from international organizations such as FAO 2025, UNEP 2024 and the World Bank among others. The research methodology combines reports from international organizations to ensure its analysis reflects current statistics and policy trends. The research methodology ensures comprehensive understanding of the topic through triangulation of literature information with case studies and expert perspectives.

The following chapters will provide an analysis and presentation of the research findings. Chapter 4: The chapter Analysis and Findings will systematically present the results from case studies and stakeholder interviews while organizing these findings according to the main research themes. The chapter will probably be organized into subsections that focus on each type of financial instrument including blended finance, pay-for-results and reverse factoring while analyzing their practical performance and effect on the sustainability of smallholder operations. The analysis will examine the strengths and weaknesses of each mechanism when utilized independently. The analysis will investigate new models that integrate these financial tools to determine how combined methods can address the limitations of individual approaches. Chapter 5: The discussion section will integrate the results by connecting them to existing scholarship and theoretical models. The thesis establishes a conceptual model for financing regenerative smallholder agriculture and explains how various tools work together to amplify benefits including blended finance risk-sharing that attracts private investment and pay-for-results which ensures farmer accountability through verified outcome payments together with reverse factoring that enhances smallholders' cash flow through accelerated

payments and reduced value-chain transaction costs. The discussion will examine obstacles like accurate ESG measurement and poorest farmer inclusion and identify success factors including supportive policies and capacity-building while utilizing evidence from the Rockefeller Foundation (2024) and CPI (2023).

Finally, Chapter 6: The thesis will reach its conclusion in Chapter 6 by summarizing essential insights and providing answers to the research question. The findings will demonstrate their impact on policymakers and development finance institutions as well as agribusiness corporations and farmer cooperatives. The report will offer specific recommendations for developing and executing financial strategies that incorporate blended finance with pay-for-results and reverse factoring to help smallholder farmers across various environments. The chapter identifies study constraints such as case study range and result applicability while recommending future research directions including pilot tests and quantitative assessments of financial models.

While the study utilizes rich qualitative data sources it remains possible some regional subtleties are overlooked thereby necessitating further localized research. The thesis aims to provide visionary and practical contributions through an integration of worldwide data with detailed case studies. The financial ecosystem concept treats smallholder farmers as valuable partners for investments in sustainability instead of charity beneficiaries or high-risk entities and utilizes innovative finance to link global capital with grassroots transformation.

Chapter 2: Literature Review

2.1Regenerative Agriculture and ESG

Regenerative agriculture focuses on sustainable land management and ecosystem restoration to enhance farmer livelihoods. This approach supports Environmental, Social, and Governance (ESG) goals through its promotion of climate resilience and biodiversity while advancing social equity. Studies show that regenerative practices (e.g. The implementation of cover cropping, agroforestry and reduced tillage practices results in higher levels of soil carbon and biodiversity while sustaining or enhancing farm yields.[15] A Spanish pilot study backed by Unilever demonstrated a 37% drop in greenhouse gas emissions for each kilogram of tomatoes produced while soil organic matter improved from 1.0% to 1.27% across two years and pollinator numbers increased by 173% on farms that planted

[15] Unilever. (2023, September 15). *Impact results from Unilever's first set of regenerative agriculture projects.*

https://www.unilever.com/news/news-search/2023/impact-results-from-unilevers-first-set-of-regenerative-agriculture-projects/

wildflower strips.[16] The results show that regenerative practices support environmental ESG metrics through climate action and ecosystem services while they enhance farm productivity levels.

Social benefits are likewise significant. The practice of regenerative agriculture which strengthens soil health and climate resilience helps increase food security and incomes for smallholder farmers over time. Results from African case studies reveal that farmers who implement regenerative agricultural practices witness both higher crop yields and income growth. A Kenyan agroforestry project involving 21,500 farmers led to 25,000 tonnes of CO_2 sequestration while participants experienced increased crop production and a fertilizer usage reduction of 20–40% which improved farm profitability.[17] The combined effect of environmental restoration together with improved farmer incomes demonstrates effective ESG synergy.

Many corporations and their investors now recognize regenerative agriculture as a pathway to fulfill their ESG objectives. Food industry leaders along with investment firms promote regenerative farming practices in their supply chains to mitigate Scope 3 emissions and lessen supply chain vulnerabilities.[18] Starbucks encourages coffee growers to adopt sustainable production practices through support and financial assistance which helps suppliers meet environmental standards.[19] These projects align with ESG standards by creating sustainable supply chains for buyers which produce lower carbon emissions and reduce deforestation risks while providing suppliers with financial advantages and improved market access. Regenerative agriculture offers an integrated ESG value proposition that impacts environmental sustainability (carbon sequestration and biodiversity) and social well-being (farmer income and community resilience) while supporting governance aspects (traceability and transparent supply chains), which draws growing attention from impact investors and development agencies as well as sustainability-focused corporates.

2.2 Financial Vulnerability and Smallholders:

Chronic financial vulnerabilities prevent smallholder farmers from adopting regenerative practices. These farmers function with minimal profit margins while struggling to find affordable credit options

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[16] Unilever. (2023, September 15). *Impact results from Unilever's first set of regenerative agriculture projects.*

https://www.unilever.com/news/news-search/2023/impact-results-from-unilevers-first-set-of-regenerative-agriculture-projects/

[17] Farm Africa. (2025, March 21). *Agroforestry and carbon markets transform farming in eastern Kenya.* https://www.farmafrica.org/agroforestry-and-carbon-markets-transform-farming-in-eastern-kenya/

[18] Patel, K. (2022, June 6). *Reinventing reverse factoring for the era of ESG.* https://www.theglobaltreasurer.com/2022/06/06/reinventing-reverse-factoring-for-the-era-of-esg/

[19] Xia, Y., Long, H., Li, Z., & Wang, J. (2022). *Farmers' credit risk assessment based on sustainable supply chain finance for green agriculture.* https://www.mdpi.com/2071-1050/14/19/12836

along with insurance and savings solutions. The strict financial limitations these farmers endure make them extremely vulnerable to unexpected disruptions such as climate-related incidents and market price changes which also stop them from pursuing sustainable farming investments. High lending risks and transaction costs are a root issue: Traditional lenders view smallholders as high-risk borrowers because their production yields are unpredictable, they lack collateral and operate in remote areas. The estimated $240 billion financing needs of African smallholders receive only ~25% fulfillment which results in an extensive funding shortfall. Private banks focus their capital allocation on large-scale agribusinesses and safer sectors which leaves millions of small farmers without access to formal financial systems.[20] The financing gap creates a continuous loop of low agricultural output and increased vulnerability for small-scale farmers.

The financial instability of smallholders connects directly to wider environmental, social, and governance challenges. Financial constraints prevent smallholders from investing in regenerative farming methods which need initial capital expenditures. purchasing cover crop seeds or better storage). The absence of credit options leaves many farmers to depend on exploitative middlemen or to sell their crops immediately after harvest at low prices which harms their long-term financial stability (a social sustainability issue). The disadvantages faced by many small farmers intensify due to inadequate infrastructure and market access problems which result in post-harvest losses because of insufficient storage and transport facilities. The Nigerian horticulture program showed that implementing value chain infrastructure improvements reduced post-harvest losses by 83% while tripling smallholder incomes but the substantial initial costs made these solutions inaccessible without financial help from external sources. Effective solutions to decrease smallholder vulnerability require combining technical support with financial assistance.

The public and private sectors are forming partnerships to lower the financial risks associated with smallholder financing. Through public-private collaboration Nigeria's NIRSAL (Nigerian Incentive-Based Risk Sharing System for Agricultural Lending) delivers credit guarantees and insurance which motivates banks to extend credit to farmers to bridge the risk gap. Development agencies together with social investors have created financial facilities to stimulate lending to agricultural SMEs that collect smallholders' produce thus extending their reach to farmers. The blended finance initiative Aceli Africa in East Africa delivers financial incentives like partial credit loss coverage and technical assistance grants to local banks so they can extend loans to agricultural SMEs. The initiative successfully raised $300 million for agricultural SMEs supporting approximately 1.5 million smallholder farmers and enabled 61% of these businesses to receive formal loans for the first time.[21]

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[20] Falaju, J. (2025, May 17). *Bridging N660b financing gap unites HortiNigeria, NIRSAL*. https://guardian.ng/features/agro-care/bridging-n660b-financing-gap-unites-hortinigeria-nirsal/

[21] Aceli Africa. (2025, April 2). *2025 Financial Benchmarking Report: Agricultural SME Lending in East & Southern Africa.* https://aceliafrica.org/2025-financial-benchmarking-report/

Financial institutions demonstrate their ability to provide increased credit to smallholder farmers through programs which share risks while building their capacity.

The private sector has made progress in financing smallholders, but the available funds are limited when compared to the actual demand. The majority of initiatives focus on value chains with higher profits and areas that present lower risks rather than supporting farmers who are more vulnerable such as those in rain-fed or conflict-prone locations. Smallholder farmers in rain-fed staple crop areas and conflict zones continue to have limited access to financial services.[22] The term "integration gap" describes the disconnect between existing financial resources and their access to smallholder farmers who need them most. To bridge this gap, we need new financial tools and public-private risk-sharing models while strengthening finance connections with extension services and market systems so smallholders can secure capital and knowledge access plus stable market connections to adopt regenerative practices that enhance their resilience.

2.3 Financial Instruments in Agriculture Value Chains

New financial tools target smallholder finance needs while promoting sustainable farming methods. Reverse factoring and pay-for-results financing represent two principal financial mechanisms that deliver capital into agricultural value chains while supporting ESG objectives.

- Reverse factoring (Supply Chain Finance)

Under reverse factoring arrangements a substantial buyer with robust credit ratings leads financing processes to support smaller suppliers with early payments through partnerships with banks. A food processor or agribusiness company teams up with a bank to give small suppliers early payments on favorable conditions. The transaction depends on the buyer's strong creditworthiness because the bank disburses the supplier's invoice right away while the buyer settles the bank later. Small suppliers obtain better cash flow while avoiding costly loans because they benefit from the reduced financing costs tied to the buyer's lower risk profile. In agriculture value chains, reverse factoring can be transformative: Reverse factoring allows farmers and local agribusinesses to receive payment quickly for their agricultural products rather than waiting 30 to 90 days which helps them maintain smooth cash flow.[23]

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[22] Woodhill, J., Surie, M. D., & Jones, K. (2024, November 19). *Financing food systems transformation and rural revitalization: Opportunities and challenges* [Draft background paper]. Global Donor Platform for Rural Development. https://www.donorplatform.org/wp-content/uploads/2025/01/GDPRD-Draft-Background-Paper-for-AGA2024_2024NOV19.pdf

[23] Winn, M., Miller, C., & Gegenbauer, I. (2009). *The use of structured finance instruments in agriculture in Eastern Europe and Central Asia* (Agricultural Management, Marketing and Finance Working Document No. 26). Food and Agriculture Organization of the United Nations. https://www.fao.org/4/ap294e/ap294e.pdf

Research from African and European regions demonstrates increased use of supply chain finance mechanisms in agricultural supply chains. The Kenya Commercial Bank (KCB) in East Africa entered into partnerships with large agri-buyers to finance SME suppliers through supply chain finance programs totaling approximately $50 million in 2023.[24] The Ugandan financial institution Stanbic Bank initiated a factoring program in 2020 which allocated more than $15 million to over 200 suppliers including numerous agro-processing companies through digital platforms that accelerated their invoice payments.[25] These examples highlight the scalability of reverse factoring when anchored by strong buyers: Banks minimize default risk through their practice of basing credit decisions on the anchor company's creditworthiness instead of the small supplier's creditworthiness. Provided there exists a reliable off-taker or buyer contract, even high-risk industries such as agriculture can obtain bank financing. Initial findings indicate this financial mechanism can stabilize agricultural supply chains because in Uganda extending early payments through reverse factoring to farmers in agro-processing chains would "stabilize supply chains" while closing the sector's finance gap according to experts.[26]

Reverse factoring innovations promote Environmental, Social and Governance (ESG) results within Sustainable Supply Chain Finance (SSCF) operations. European platforms such as Munich-based CRX Markets implement ESG criteria within reverse factoring programs.[27] The reverse factoring schemes reward suppliers who achieve sustainability targets (such as certified sustainable crops or reduced emissions) by providing them with better financing conditions (such as lower discount rates).[28] Suppliers who achieve sustainability targets including certified crops and reduced emissions benefit

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[24] Kim, S. K. W. (2025, February 26). *The power of factoring and supply chain finance: Unlocking the potential of SMEs.* https://medium.com/@kimsalim99/the-power-of-factoring-and-supply-chain-finance-unlocking-the-potential-of-smes-4840d3406a54

[25] Kim, S. K. W. (2025, February 26). *The power of factoring and supply chain finance: Unlocking the potential of SMEs.* https://medium.com/@kimsalim99/the-power-of-factoring-and-supply-chain-finance-unlocking-the-potential-of-smes-4840d3406a54

[26] Kim, S. K. W. (2025, February 26). *The power of factoring and supply chain finance: Unlocking the potential of SMEs.* https://medium.com/@kimsalim99/the-power-of-factoring-and-supply-chain-finance-unlocking-the-potential-of-smes-4840d3406a54

[27] Patel, K. (2022, June 6). *Reinventing reverse factoring for the era of ESG.* https://www.theglobaltreasurer.com/2022/06/06/reinventing-reverse-factoring-for-the-era-of-esg/

[28] Patel, K. (2022, June 6). *Reinventing reverse factoring for the era of ESG.* https://www.theglobaltreasurer.com/2022/06/06/reinventing-reverse-factoring-for-the-era-of-esg/

from reduced discount rates which provide a financial motivation for ESG performance.[29] The method serves as a "win-win" scenario because suppliers obtain less expensive capital by meeting sustainability criteria while buyers and financiers build stronger supply chains that align with environmental objectives.[30] The recent partnership between IFC and CRX Markets (2025) highlights this growing trend. Suppliers who enhance their environmental and social standards or decarbonization processes receive rate discounts through IFC's $1 billion Global Trade Supplier Finance program in partnership with CRX.[31] The connection between affordable working capital access and verifiable ESG improvements such as carbon footprint reduction or better labor standards transforms reverse factoring into a mechanism for expanding sustainable practices throughout value chains. A 2023 Standard Chartered survey revealed that 60% of corporate entities are using supply chain finance to promote sustainable practices among their suppliers which demonstrates the growing trend of sustainability-linked financing.[32]

- Pay-for-Results Financing

Results-based financing (RBF), otherwise called pay-for-success or payment-for-outcomes represents another groundbreaking financial tool. Governments along with donors and impact investors release funds based on predetermined results verification rather than providing upfront payments under RBF. The agricultural sector applies this mechanism to promote innovation while incentivizing regenerative or climate-smart practices through payouts based on yield improvements, environmental benefits and farmer adoption rates.

The AgResults program stands out as a joint donor initiative that organizes prize competitions to generate private sector solutions for smallholder farmers. AgResults incentivized private companies in Nigeria by offering $18.75 for each metric ton of aflatoxin-safe maize produced using Aflasafe biocontrol from small farms.[33] The pay-for-results prize achieved a 56 percentage-point growth in aflatoxin-preventing technology adoption among participating farmers which resulted in farmers

[29] Patel, K. (2022, June 6). *Reinventing reverse factoring for the era of ESG.* https://www.theglobaltreasurer.com/2022/06/06/reinventing-reverse-factoring-for-the-era-of-esg/

[30] Patel, K. (2022, June 6). *Reinventing reverse factoring for the era of ESG.* https://www.theglobaltreasurer.com/2022/06/06/reinventing-reverse-factoring-for-the-era-of-esg/

[31] International Finance Corporation. (2025, February 12). *IFC partners with CRX Markets to advance supply chain sustainability.* https://www.ifc.org/en/pressroom/2025/ifc-partners-with-crx-markets-to-advance-supply-chain-sustainability

[32] Kim, S. K. W. (2025, February 26). *The power of factoring and supply chain finance: Unlocking the potential of SMEs.* https://medium.com/@kimsalim99/the-power-of-factoring-and-supply-chain-finance-unlocking-the-potential-of-smes-4840d3406a54

[33] Narayan, T. A., & Geyer, J. (2022, June 22). *Can results-based prizes to private sector incentivize technology adoption by farmers? Evidence from the AgResults Nigeria project that uses prizes to incentivize adoption of Aflasafe™.* https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-022-00377-2

experiencing 16% higher average net maize incomes.[34] Payment of the prize to companies depended solely on the quantity of aflatoxin-reduced maize they collected which ensured that public funding supported true results like food safety and technology implementation instead of basic activities. The evaluation determined RBF prizes can successfully involve the private sector in smallholder problem-solving while complementary activities such as farmer awareness campaigns are required to enhance overall effectiveness. AgResults implemented comparable pull mechanisms in multiple other nations including Kenya and Zambia and Vietnam.[35] AgResults applied pay-for-results strategies that generated results ranging from better on-farm storage options to fresh vaccine applications to prove agriculture's potential for flexible pay-for-results methods.[36]

The pay-for-outcomes models in regenerative agriculture are developing through carbon finance initiatives and ecosystem service payment systems. Through carbon credit programs farmers receive payment for their achievements in carbon sequestration or emissions reduction. The Farm Africa-led project in Kenya mentioned earlier is a case in point: The payment to smallholders came from selling Carbon Removal Units credits only after tree planting and verified carbon sequestration with farmers receiving 80% of carbon revenue.[37] The system which rewarded farmers based on their environmental achievements helped to achieve real climate impact by storing nearly 25,000 tCO_2 and connected financial incentives to regenerative farming methods such as tree planting and agroforestry. Select agribusinesses and NGOs currently test "soil health outcome funds" which compensate farmers when soil organic carbon or water quality indicators show improvement following the adoption of regenerative practices. These payment systems remain undeveloped yet serve as direct compensation models for ecosystem services because they transform the beneficial side effects of regenerative agriculture into financial incentives for farmers.

According to initial findings results-based financing can boost agricultural ESG performance through links between financial incentives and sustainability indicators. The creation of strong metrics and verification systems presents a significant challenge. Different pilot programs apply outcome metrics such as yield increases and farmer income changes along with GHG emissions reductions and soil

[34] Narayan, T. A., & Geyer, J. (2022, June 22). *Can results-based prizes to private sector incentivize technology adoption by farmers? Evidence from the AgResults Nigeria project that uses prizes to incentivize adoption of Aflasafe™.* https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-022-00377-2

[35] Narayan, T. A., & Geyer, J. (2022, June 22). *Can results-based prizes to private sector incentivize technology adoption by farmers? Evidence from the AgResults Nigeria project that uses prizes to incentivize adoption of Aflasafe™.* https://agricultureandfoodsecurity.biomedcentral.com/articles/10.1186/s40066-022-00377-2

[36] Woodhill, J., Surie, M. D., & Jones, K. (2024, November 19). *Financing food systems transformation and rural revitalization: Opportunities and challenges* [Draft background paper]. Global Donor Platform for Rural Development. https://www.donorplatform.org/wp-content/uploads/2025/01/GDPRD-Draft-Background-Paper-for-AGA2024_2024NOV19.pdf

[37] Farm Africa. (2025, March 21). *Agroforestry and carbon markets transform farming in eastern Kenya.* https://www.farmafrica.org/agroforestry-and-carbon-markets-transform-farming-in-eastern-kenya/

organic matter levels combined with biodiversity counts. The EU-funded regenerative pilot measured ecosystem health through metrics such as decreased agrochemical runoff affecting water quality and growing populations of wild pollinators.[38] Likewise, impact investors are converging on common indicators: The Global Impact Investing Network (GIIN) released an agriculture impact benchmark that evaluates performance through seven key indicators which measure smallholder income changes as well as sustainable land management practices adopted and GHG emissions mitigation. Standardizing KPIs from the IRIS+ catalog enables funders to execute pay-for-results contracts more effectively while enabling impact comparison across multiple projects.[39] Financial mechanisms such as reverse factoring and revenue-based financing (RBF) provide essential capital to smallholder farmers to support sustainability efforts. These financial tools enhance liquidity while minimizing risk through supply chain finance and deliver rewards for positive results with RBF which together meet farmers' financial requirements and advance ESG targets for the wider community.

2.4 Philanthropic and Impact Capital Tracking ESG Performance

Foundations and international donors through grants together with impact investment funds provide essential financing for both regenerative agriculture projects and smallholder initiatives. These mission-driven capital providers pursue measurable ESG impacts in addition to financial returns unlike purely commercial investors. These capital providers created specific frameworks and tools to measure ESG performance within agricultural investments but face ongoing issues with measurement and standardization.

Standardized impact metrics and benchmarks represent an emerging trend. Impact investors rely on the Global Impact Investing Network's IRIS+ system which offers agricultural-specific metrics helping them to track their performance (e.g. number of smallholders reached, yield improvements, hectares under sustainable practices). Tracking impact performance includes metrics such as smallholder outreach numbers and both yield improvement figures and sustainable land use measurements. The GIIN unveiled an Agriculture Impact Performance Benchmark in 2023 to enable funds to evaluate their performance across essential indicators. The benchmark merges performance data from over 1,200 investments across 18 funds to evaluate seven key performance indicators including farmer income changes and GHG emission reductions. Philanthropic and impact investors who score and benchmark their investments against SDGs and peer organizations can assess the effectiveness of their capital in producing ESG results and determine if changes are necessary. The initiative counters "impact washing" problems by establishing accountability through data analysis.

[38] Unilever. (2023, September 15). *Impact results from Unilever's first set of regenerative agriculture projects.* https://www.unilever.com/news/news-search/2023/impact-results-from-unilevers-first-set-of-regenerative-agriculture-projects/

[39] Burwood-Taylor, L. (2023, March 23). *GIIN launches impact investment benchmark for agriculture funds: 'We were living in a vacuum'.* https://agfundernews.com/giin-launches-impact-investment-benchmark-for-agriculture-funds-we-were-living-in-a-vacuum

When Fund A's portfolio demonstrates subpar advancement in farmer incomes it triggers an investigation and corrective actions.[40]

Philanthropic organizations utilize logical frameworks and results matrices as tools to monitor their ESG outcomes. Foundations that invest in regenerative agriculture projects establish benchmarks for soil health through soil carbon and nutrient measurements as well as water conservation via irrigation usage per hectare and social indicators such as household income and the number of women farmers trained. Independent evaluations alongside regular monitoring activities serve to verify progress. A large number of donors match their outcome indicators to global frameworks such as the Sustainable Development Goals (SDGs). Investors show their impact by reporting how agricultural impact investments support SDGs such as SDG 2 (Zero Hunger), SDG 13 (Climate Action), and SDG 15 (Life on Land).[41] DFIs and foundations evaluate projects both before and after implementation using IFC's AIMM tool and the Impact Management Project's dimensions to measure compliance with ESG criteria.

While efforts continue to be made, measurement remains a significant challenge. Agricultural ESG outcomes take years to materialize and suffer from unpredictable external influences such as weather patterns which complicate attribution efforts. Collecting data in rural areas demands significant financial resources and time because soil carbon assessments need scientific soil sampling and testing. The ability of smallholders to report data is often restricted and varying levels of digital literacy obstruct the process of data collection.[42] One noted challenge is the fragmentation of approaches: Impact funds and donors typically monitor diverse metrics which have historically complicated impact comparison and aggregation efforts.[43] The GIIN benchmark aims to integrate core metrics as a solution to the fragmented measurement approaches. Some investments may exaggerate their ESG achievements unless they undergo strict verification processes which prevent greenwashing or impact dilution. The need for third-party certifications and participatory monitoring systems has increased. Funds may demand that regenerative farming projects either secure an official certification (such as Rainforest Alliance or Organic) or utilize satellite deforestation monitoring to achieve compliance with ESG standards.

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[40] Burwood-Taylor, L. (2023, March 23). *GIIN launches impact investment benchmark for agriculture funds: 'We were living in a vacuum'.* https://agfundernews.com/giin-launches-impact-investment-benchmark-for-agriculture-funds-we-were-living-in-a-vacuum

[41] Burwood-Taylor, L. (2023, March 23). *GIIN launches impact investment benchmark for agriculture funds: 'We were living in a vacuum'.* https://agfundernews.com/giin-launches-impact-investment-benchmark-for-agriculture-funds-we-were-living-in-a-vacuum

[42] Covo, A. (2022, August 26). *Impact measurement & transition to regenerative agriculture.* https://ksapa.org/impact-measurement-smallholders-transition-to-regenerative-agriculture/

[43] Woodhill, J., Surie, M. D., & Jones, K. (2024, November 19). *Financing food systems transformation and rural revitalization: Opportunities and challenges* [Draft background paper]. Global Donor Platform for Rural Development. https://www.donorplatform.org/wp-content/uploads/2025/01/GDPRD-Draft-Background-Paper-for-AGA2024_2024NOV19.pdf

Practical application necessitates the alignment of philanthropic and impact investments towards regenerative results. Philanthropies accept higher risk and lower returns for impact purposes but they pursue sustainable business models to ensure long-term viability. Impact capital investors might show reluctance when a regenerative agriculture venture lacks evidence of profitable operation or financial independence. Blended finance models have developed in which philanthropic grants fund initial capacity building or cover initial losses while impact investors provide loans or equity with expectations of modest returns. The monitoring systems need to track development results while also verifying financial sustainability. The monitoring frameworks must record both the development metrics which show the number of farmers who achieved financial independence and the financial sustainability indicators. The need to reduce subsidies while maintaining financial viability represents a complicated balancing act.

To overcome measurement hurdles, several frameworks and initiatives are emerging: The Sustainability Accounting Standards Board (SASB) established disclosure guidelines for agricultural businesses to report ESG factors such as greenhouse gas emissions intensity and water usage that impact investors utilize during their due diligence processes. The Task Force on Climate-related Financial Disclosures (TCFD) along with the newer Task Force on Nature-related Financial Disclosures (TNFD) determines best practices for agricultural investors to evaluate risks and performance related to climate and nature. The advancement of digital technologies including farm sensors alongside satellite imagery with blockchain traceability systems allows for more accurate tracking of agricultural results through examples such as satellite data which measures tree cover or soil moisture to assess regenerative impact.

Philanthropic and impact capital providers use ESG performance tracking as more than just a reporting tool since it guides adaptive management and drives industry learning. Active portfolio management by many funds allows them to adjust their strategies and give technical support when regenerative practices fail to deliver anticipated results. They also share lessons through networks (e.g. The Council on Smallholder Agricultural Finance alongside GIIN's investor forums work together to create standardized definitions of success. The 2024 global donor report revealed that although there is a swift expansion in the knowledge base of innovative Agri finance practices it remains scattered and poorly integrated between institutions.[44] Current initiatives work to eliminate this fragmentation by establishing shared terminology and impact benchmarks within the agricultural sector.

Philanthropic and impact investors lead the creation of agricultural ESG tracking frameworks through the implementation of IRIS+ metrics and other impact benchmarks combined with strict M&E practices. They encounter obstacles related to data management and standardization yet steadily move

[44] Woodhill, J., Surie, M. D., & Jones, K. (2024, November 19). *Financing food systems transformation and rural revitalization: Opportunities and challenges* [Draft background paper]. Global Donor Platform for Rural Development. https://www.donorplatform.org/wp-content/uploads/2025/01/GDPRD-Draft-Background-Paper-for-AGA2024_2024NOV19.pdf

towards established best practices. The demand for quantifiable impact results in faster alignment between agricultural finance initiatives and regenerative outcomes which compels commercial investors to evaluate ESG performance through due diligence and sustainability-linked loan terms. Ensuring capital infusion supports sustainable farming practices requires strict alignment to prevent investments from sustaining traditional agricultural models under a superficial eco-friendly facade.

2.5 Integration Gap

Although several promising programs exist, they have not yet succeeded in completely bridging the integration gap needed to scale regenerative agriculture finance for smallholders. The integration gap represents the disconnects and inefficiencies that occur when trying to merge innovative instruments with public-private partnerships and impact capital and on-ground farming practices into a unified system that achieves large-scale impact. The literature reveals multiple aspects of the integration challenge within this field.

- Fragmentation of Initiatives

A range of funds, facilities, and pilot programs dedicated to sustainable agriculture finance has emerged in the past ten years. Diversity promotes innovation yet creates fragmented operational approaches. Most innovative finance initiatives exist on a small scale or function independently without a formal system to distribute learned insights.[45] One initiative achieves a successful credit-and-extension model in one country while another tests guarantee systems in another yet there exists no effective approach to embed these findings into standard agricultural policies or banking systems. The 2024 donor platform report indicates that uncoordinated pilot projects can become counterproductive by replicating traditional donor problems when they fail to achieve national alignment or scaling. System-wide thinking and coordination remain in their early development stages.[46] Stronger networks and knowledge exchange combined with meta-level evaluations helps to minimize duplication by aligning best practices.

- Scale and Commercial Sustainability

Several interventions have not yet achieved the required scale or commercial viability necessary to maintain a lasting impact. Private sector investments continue to fall short in matching the massive financing requirements of small-scale farmers. Blended finance initiatives such as Aceli Africa have

[45] Woodhill, J., Surie, M. D., & Jones, K. (2024, November 19). *Financing food systems transformation and rural revitalization: Opportunities and challenges* [Draft background paper]. Global Donor Platform for Rural Development. https://www.donorplatform.org/wp-content/uploads/2025/01/GDPRD-Draft-Background-Paper-for-AGA2024_2024NOV19.pdf

[46] Woodhill, J., Surie, M. D., & Jones, K. (2024, November 19). *Financing food systems transformation and rural revitalization: Opportunities and challenges* [Draft background paper]. Global Donor Platform for Rural Development. https://www.donorplatform.org/wp-content/uploads/2025/01/GDPRD-Draft-Background-Paper-for-AGA2024_2024NOV19.pdf

made progress yet global funding for smallholder agriculture continues to fall short of what is needed to achieve climate and food security goals.[47] Private sector engagement generally focuses on lower-risk investment opportunities that promise higher returns. export crops, established value chains). The genuine integration of regenerative finance involves developing models for more difficult situations like rain-fed subsistence farming or regions impacted by conflict which would likely need additional concessional capital along with policy support. High-risk segments mainly depend on public finance and philanthropy funding without adequate progression to commercial financial support. Mainstream banks and investors will continue to show caution until they see proven systems that deliver attractive risk-adjusted returns or solid risk mitigation through guarantees, insurance, or aggregation. This creates a Catch-22: It is not possible to achieve scale if risks and costs remain unmanaged but scale is necessary to bring down both risks and costs. The gap requires stronger public-private partnerships where philanthropic funding takes on initial risks to develop market infrastructure which will enable private investment at scale. Public and philanthropic funding needs to support the early establishment of credit bureaus, e-extension and farmer cooperatives to enable large-scale private investment to follow.

- Disconnect between Finance and Farmer Needs (Last-Mile Integration)

Linking financial products to the actual needs and abilities of smallholder farmers represents another integration challenge. The GDPRD paper identifies a common "*knowledge and understanding gap between finance sector actors and agrifood sector participants*".[48] Financial institutions often lack full comprehension of smallholder agriculture timelines and cultural influences while farmers typically do not grasp financial industry language or obligations. Farmer cooperatives, NGOs, fintech platforms and other integrators play an essential role in connecting smallholder farmers to financial resources. Successful agricultural models combine finance with extension services and input supply as well as market access yet they need coordination between various stakeholders. The WFP's Patient Procurement Platform (PPP) in Rwanda simultaneously established connections between smallholders and purchase contracts (stable markets) as well as input providers, insurance services, and banking financing.[49] While managing holistic approaches requires complex coordination, they remain essential to convert credit or performance-based payments into tangible agricultural advancements on farms. The integration gap here is about operationalizing multi-stakeholder partnerships: The integration gap requires off-takers,

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[47] Woodhill, J., Surie, M. D., & Jones, K. (2024, November 19). *Financing food systems transformation and rural revitalization: Opportunities and challenges* [Draft background paper]. Global Donor Platform for Rural Development. https://www.donorplatform.org/wp-content/uploads/2025/01/GDPRD-Draft-Background-Paper-for-AGA2024_2024NOV19.pdf

[48] Woodhill, J., Surie, M. D., & Jones, K. (2024, November 19). *Financing food systems transformation and rural revitalization: Opportunities and challenges* [Draft background paper]. Global Donor Platform for Rural Development. https://www.donorplatform.org/wp-content/uploads/2025/01/GDPRD-Draft-Background-Paper-for-AGA2024_2024NOV19.pdf

[49] Food and Agriculture Organization of the United Nations. (2017, January 21). *WFP boosts food security by connecting smallholder farmers to global markets.* https://www.fao.org/sustainable-food-value-chains/news-events/details-news/en/c/469711/

lenders, insurers, and service providers to both align their interests and share data. The current operation of this full suite of services presents substantial cost barriers which demand both patient capital investments and donor support to maintain coordination. The combination of finance with "last mile" support and technical assistance represents a costly yet essential component for success which usually demands public financial support to maintain.[50] To scale regenerative agriculture sustainably we will need more efficient delivery models which might include digital tools and community-based networks to distribute integrated packages.

- ESG Measurement and Incentives Alignment

An integration challenge exists in harmonizing financial metrics with ESG metrics so that all stakeholders pursue unified objectives. Despite having ESG frameworks and impact metrics available we have not yet fully integrated them into financial decision-making processes. Banks and funds require straightforward yet dependable methods to include soil health and biodiversity or livelihood enhancements in credit risk evaluations and investment analyses. Sustainability-linked financial instruments represent initial steps toward linking economic activities with environmental performance. When lenders offer improved loan terms due to farmers or cooperatives implementing verified regenerative practices which reduce long-term default risk they demonstrate how ESG principles are being incorporated into financial systems. However, such linkages are not widespread. The IFC-CRX Markets example shows it can be done: The IFC-CRX Markets case proves how offering suppliers discounted financing rates for reaching sustainability targets embeds ESG principles directly into financial models.[51] Financial actors need standard protocols and evidence that shows how sustainability improvements lead to better business results in order to bridge the integration gap. Better repayment results from improved yield while risk mitigation benefits from diversified crops and certification generates a market premium. Financiers should receive accumulated pilot data to enhance risk models and improve product designs. Currently, many financiers use lack of data and impact measurement uncertainty as reasons not to fully integrate ESG since they maintain separate reporting systems for financial and impact information that do not interact. The gap needs continued research and proven impact data and potentially policy nudges through regulatory incentives for green lending to achieve full integration of ESG principles. to make ESG integration the norm.

- Policy and Enabling Environment Gaps

The broader enabling environment must support innovative models for integration to succeed. Some countries face obstacles to new financial models due to strict lending rules and the absence of digital

[50] Woodhill, J., Surie, M. D., & Jones, K. (2024, November 19). *Financing food systems transformation and rural revitalization: Opportunities and challenges* [Draft background paper]. Global Donor Platform for Rural Development. https://www.donorplatform.org/wp-content/uploads/2025/01/GDPRD-Draft-Background-Paper-for-AGA2024_2024NOV19.pdf

[51] International Finance Corporation. (2025, February 12). *IFC partners with CRX Markets to advance supply chain sustainability.* https://www.ifc.org/en/pressroom/2025/ifc-partners-with-crx-markets-to-advance-supply-chain-sustainability

invoicing and land records systems along with subsidy misalignments. Reverse factoring platforms face operational difficulties in regions lacking e-invoicing and secure transaction mechanisms because parts of Africa show underdevelopment in electronic receivables legislation. When policy measures fail to promote sustainability through incentives or requirements (e.g. carbon pricing or organic standards), the integration of ESG factors into financial approaches becomes less compelling. Financial incentives for implementing ESG standards become less compelling when policies fail to reward sustainable practices like carbon pricing and organic standards. Government policy measures including guarantee schemes and outcome payment funds alongside regenerative targets in national agricultural plans have the potential to expedite integration. The African Union's Malabo Declaration requires governments to allocate 10% of their budgets to agriculture to stimulate private sector investment and coordinating some of this spending for loan guarantees or RBF program co-funding would bridge existing funding gaps. The concept of "shifting the narrative" is also cited: When food system investments are viewed as paths to widespread economic and environmental advantages instead of mere subsidies stakeholders become more willing to get involved.

The integration gap represents the separation between successful pilot projects and widespread implementation practices. To close this gap, experts call for system-wide approaches: Experts promote better coordination to avoid duplication of initiatives while scaling successful programs through commercial capital involvement and strengthening knowledge infrastructure alongside policy support and intermediary services. Networks and alliances are now establishing themselves to compile lessons and promote supportive policies with platforms like Blended Finance in Food Systems serving as examples. The coming decade demands a unified effort to weave both financial innovations and ESG requirements into agricultural finance practices.[52] This successful outcome creates a financing system which provides small farmers direct access to necessary resources for regenerative agriculture while delivering investor profits together with positive impacts to achieve financial alignment with sustainability objectives.

Chapter 3: Research Methodology

3.1 Mixed-Method Design

The thesis uses a mixed-method research design which combines both qualitative and quantitative approaches to analyze how innovative financial instruments including blended finance, pay-for-results mechanisms and reverse factoring support smallholder farmers' shift to regenerative agriculture. Researchers opted for a mixed-method research design to take advantage of the qualitative method's ability to provide depth and the quantitative method's ability to deliver breadth according to Creswell & Creswell (2018). The qualitative research approach examines policy documents and institutional

[52] Woodhill, J., Surie, M. D., & Jones, K. (2024, November 19). *Financing food systems transformation and rural revitalization: Opportunities and challenges* [Draft background paper]. Global Donor Platform for Rural Development. https://www.donorplatform.org/wp-content/uploads/2025/01/GDPRD-Draft-Background-Paper-for-AGA2024_2024NOV19.pdf

reports alongside detailed case studies to understand the implementation contexts and stakeholder relationships within innovative financial tools. Qualitative insights play a vital role in understanding the practical operation of financial tools within real-world environments by exposing hidden dynamics and supporting thorough evaluations of their effectiveness. The collection and analysis of financial and ESG data from recognized institutional sources including IFAD, World Bank, and Rockefeller Foundation forms the basis of quantitative methods. Quantitative analysis allows the precise evaluation of specific results including farmer income enhancement and yield growth along with better credit access as well as levels of ESG compliance. The integration of multiple methodologies delivers strong triangulation which facilitates comprehensive insights into financial dynamics and results within agricultural value chains.

3.2 Case Study Selection and Rationale

To demonstrate variability in financial instrument outcomes this study chooses case studies from different geographic areas with a specific focus on African and European regions. The selection of cases aims to represent both geographic and economic diversity while focusing on scalable and replicable models that produce clear ESG results.

Case Study 1: Aceli Africa – East Africa (Kenya, Uganda)
Aceli Africa serves as a model for blended finance operations by offering financial incentives and risk protection measures to banks that support agricultural SMEs connected with smallholder farmers. The case presents new models of risk-sharing mechanisms such as loan guarantees and interest rate subsidies to enhance financial accessibility for smallholder farmers. Aceli Africa's scalability potential as a case study is evidenced by its ability to serve an extensive portfolio reaching approximately 1.5 million smallholders.[53]

Case Study 2: AgResults Initiative – Nigeria
The AgResults program implements pay-for-results financing by providing outcome-based payments to private businesses to encourage sustainable agricultural practices. The Nigerian Aflasafe initiative provided monetary rewards to private-sector partners who distributed aflatoxin-free maize produced by smallholder farmers. This model exhibits how direct financial incentives correspond with measurable ESG outcomes including health improvement and enhanced income.[54]

Case Study 3: CRX Markets and IFC demonstrate their Supply Chain Finance Platform approach in Europe.

[53] Aceli Africa. (2023). 2023 Financial Benchmarking Report. https://aceliafrica.org/aceli-africa-2023-financial-benchmarking-report/

[54] AgResults. (n.d.). Summary of Evaluator Findings and Lessons from AgResults Prize Competitions: 2013–2020. https://agresults.org/wp-content/uploads/2024/02/Summary-of-Evaluator-Findings-and-Lessons-from-AgResults-Prize-Competitions-2013-2020.pdf

The case demonstrates how reverse factoring operates in sustainable agricultural supply chains by integrating ESG criteria into financial mechanisms. European buyers who use CRX Markets alongside IFC gain sustainable supply chain financing by directly tying financial rewards to ESG performance metrics. The selection process assesses entities that integrate ESG performance metrics into financial operational practices.[55] The selected cases demonstrate how the chosen financial instruments function in various agricultural environments through their insights into success elements and potential for scalability together with measurable results which qualifies them for comprehensive comparative study.

3.3 Data Sources

The research depends on well-established secondary data from respected global organizations and expert industry reports to maintain data quality and reliability. The primary sources include International Fund for Agricultural Development (IFAD) Reports: The reports deliver in-depth information about financial shortfalls faced by smallholders, agricultural value chain mechanisms, and rural livelihood outcomes. World Bank Reports and Publications: World Bank Publications analyze global agricultural financing dynamics alongside climate-smart agriculture techniques and risk-sharing financial strategies. Rockefeller Foundation Reports: Rockefeller Foundation Reports feature expert research about financing obstacles for regenerative agriculture as well as new financial frameworks alongside impact investment methods. Climate Policy Initiative (CPI) Reports: The Climate Policy Initiative reports deliver factual information regarding the movement of climate finance funds as well as financial shortfalls affecting small-scale agrifood systems along with proposed financial innovation solutions. FAO and UNEP Publications: FAO and UNEP Publications function as definitive references on soil degradation issues while also providing information about regenerative agriculture methods and worldwide sustainability criteria. Boston Consulting Group & World Business Council for Sustainable Development (WBCSD): The Boston Consulting Group and World Business Council for Sustainable Development deliver empirical evidence regarding both the financial feasibility and sustainability results of investing in regenerative agricultural practices. These sources provide strong empirical underpinnings for analysis which improves both the precision and relevance of the research results.

3.4 ESG and Financial Indicators for Analysis

The analysis of financial instruments under study uses well-established metrics and indicators which enable a systematic evaluation of their effectiveness and impacts. The subsequent indicators deliver firm measurable benchmarks to assess success.

- Blended Finance Indicators

[55] International Finance Corporation. (2025, February 12). *IFC partners with CRX Markets to advance supply chain sustainability.* https://www.ifc.org/en/pressroom/2025/ifc-partners-with-crx-markets-to-advance-supply-chain-sustainability

Increased Access to Credit (% Increase): The measurement of credit accessibility expansion for smallholder farmers and SMEs after implementation of financial strategies. Farmer Income (% Increase): Financial interventions cause observable variations in net household income which can be directly measured. Yield Improvement (% Increase): Measure the increase in productivity achieved through blended finance-supported investments. ESG Compliance Level (Rating or Certification Achievement): We track how well organizations comply with sustainability certifications and standards like organic certification and Rainforest Alliance.

- Pay-for-Results Indicators

Adoption Rate of Regenerative Practices (%): Identifying targeted farmers who adopted specific regenerative practices through percentage measurement.
Verified ESG Outcomes (Soil Health Improvement, Biodiversity Increases): Researchers rely on specific measurable criteria such as soil organic carbon content together with biodiversity statistics and enhancements in water quality.
Income Growth (% Increase): The financial gains experienced by farmers show a direct correlation with their participation in incentivized regenerative agricultural practices.

- 3.4.3 Reverse Factoring Indicators

Liquidity Improvement (Average Days Reduction in Receivables): The assessment measures better supplier cash flow alongside decreased payment waiting periods. Supplier ESG Performance (% Improvement): Supplier sustainability metrics show measurable improvement when preferential financing terms serve as direct incentives. Scalability (Number of Suppliers Enrolled): The study measures how reverse factoring programs grow and extend to different markets and suppliers.
These metrics provide clear benchmarks for success which allow for systematic evaluation through quantifiable measures across environmental social and financial outcomes.

3.5 Limitations and Ethical Considerations

Limitations: The study recognizes multiple design limitations inherent within its methodology.
Secondary Data Reliance: The study maintains reliability through reputable secondary data yet fails to capture direct qualitative insights from localized experiences because it does not include primary data such as farmer interviews.
Geographic Scope: The study's generalizability faces limitations because distinct agricultural and policy environments from unrepresented regions limit the scope of the chosen cases from Africa and Europe.
Attribution of Outcomes: Multiple external factors such as weather events and policy changes affect financial and ESG outcomes in agriculture which makes it hard to attribute changes solely to financial instruments.
Variability in ESG Metrics: The lack of uniformity in reporting standards and ESG measurement frameworks across different sources leads to inconsistent comparisons in analyses.

The research offsets these limitations by thoroughly triangulating data from various strong sources along with clear statements about analytical methods during discussions.

3.6 Ethical Considerations

The primary ethical considerations related to secondary data use focus on maintaining accuracy and transparency while ensuring responsible reporting. The thesis commits to:

Accurate Representation: The thesis guarantees that sources and data receive proper citations and interpretations while remaining transparent about any constraints in data and methodology. Objective Analysis: The analysis remains objective and balanced through explicit acknowledgment of potential biases and data gaps. Responsible Recommendations: Recommendations need to fulfill evidence-based criteria while respecting ethical standards and practical application potential with consideration of effects on smallholder communities and stakeholders. The study establishes credibility and reliability while maintaining accountability in its sustainable agriculture financing research through strict adherence to ethical standards in analysis and reporting. A rigorous mixed-method approach combining strategic case study selection with authoritative data sources and clearly defined indicators while considering limitations and ethical responsibilities creates a comprehensive framework to evaluate the effectiveness of innovative financial instruments for regenerative agriculture and smallholder farmer resilience.

Chapter 4: Analysis & Integration

Integrating Blended Finance, Pay-for-Results, and Reverse Factoring in Regenerative Agriculture

The use of Blended Finance alongside Pay-for-Results and Reverse Factoring models provides innovative financial solutions for regenerative agriculture. Smallholder farmers drive regenerative agriculture in the Global South but struggle with persistent funding deficiencies alongside elevated risks. Traditional financial institutions struggle to provide affordable services to these farmers because of perceived lending risks and inadequate collateral combined with unpredictable financial returns. The chapter evaluates blended finance, pay-for-results, and reverse factoring instruments to show how their combined use helps mobilize capital and align sustainability incentives while improving livelihoods. Our analysis covers the individual effects and shortcomings of financial mechanisms while presenting practical case studies from Africa, Europe, and the Global South and showing how an integrated approach reduces both financial and ESG risks while improving credit options and increasing smallholder agricultural revenues and productivity. The session covers pilot programs which integrate several tools and explores how key stakeholders such as banks and donors' function alongside technology providers to use agritech solutions for transparent monitoring that leads to performance-based payments.

4.1 Blended Finance in Regenerative Agriculture

Blended finance involves combining public, philanthropic, and private funds to achieve development goals and minimize investment risks for private investors. The use of blended finance in agriculture seeks to establish sustainable financial solutions for smallholder farmers and agribusinesses through protective measures provided by public or concessional funds. Blended finance uses first-loss capital alongside guarantees and technical assistance grants to entice private sector lenders and investors.[56] The blended finance approach functions as an effective strategy for overcoming ongoing access-to-capital problems in agriculture which small-scale farmers and SMEs face when trying to reach capital markets.[57] Through risk mitigation strategies, blended financial structures generate substantially more funding for climate-resilient, regenerative agriculture projects compared to public funding on its own.

Impact: Through risk-reward profile enhancements blended finance has proven its effectiveness in triggering private sector investments toward sustainable agricultural endeavors. An agricultural fund that features a public "risk-absorbing" junior tranche enables commercial investors to put in bigger sums due to the protection against initial losses.[58] Partial guarantees can use concessional capital to reduce default risks while subordinated debt absorbs initial losses to shield senior lenders. Smallholder-focused projects have gained essential funding through the leveraging effect which made them viable despite their high-risk nature. Blended finance provides funding for essential technical support activities such as farmer training and new technology deployment.[59] Essential technical assistance projects for farmers and new technology solutions receive funding through blended finance by combining grants with investment capital. Blended finance represents a crucial tool to bridge the $170 billion annual financial shortfall affecting smallholder agrifood systems which supports climate resilience and sustainable farming practices.[60] Recent reports demonstrate that European institutional investors are becoming more accepting of blended finance structures which mix public funds to

[56] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

[57] Stockholm Environment Institute. (2025, March 10). *InfoPoint conference: Investing in Africa's agriculture – The role of AATIF & blended finance.* https://www.siani.se/event/infopoint-conference-investing-in-africas-agriculture-the-role-of-aatif-blended-finance/

[58] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

[59] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

[60] International Finance Corporation. (2025, January). *Unlocking social and environmental impact: Outcome-based finance in clean cooking, distributed renewable energy, and small-scale agribusiness.* https://www.ifc.org/content/dam/ifc/doc/2025/unlocking-social-and-environmental-impact-outcome-based-finance.pdf

support regenerative agriculture investments.[61] A total of 59 blended finance deals for agricultural development in developing markets had been documented by the year 2024 which demonstrated increasing momentum in this sector.[62]

Limitations: Despite its promise, blended finance has limitations. Experts have yet to reach a consensus on the precise definition and "boundaries" of blended finance which creates ambiguity between public subsidies and private co-investment.[63] The process of creating effective blended finance vehicles presents complexity while high transaction costs and minimal deal sizes discourage institutional investors. The practical economic characteristics of farming combined with governmental policies and price controls create challenges for blended finance systems.[64] When governments have already implemented interest rate caps and crop subsidies additional concessional finance layers may produce limited incremental benefits. Improper structuring of concessional capital might result in subsidizing private investor returns instead of advancing developmental goals. Blended finance initiatives need to encourage extra developmental outcomes like regenerative practices adoption instead of just enhancing investor profits. Although blended funds can provide various financial structures, viable project selection remains critical since weak infrastructure along with uncertain land tenure and climate risks pose significant challenges to investing in emerging markets.[65] Blended finance must focus its efforts on high-impact areas because the available concessional funds cannot meet all financial needs by themselves.[66]

4.1.1 Case Studies of Blended Finance in Agriculture

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[61] Rockefeller Foundation, TIFS, & Pollination Group. (2024). Financing for Regenerative Agriculture. https://www.rockefellerfoundation.org/reports/financing-for-regenerative-agriculture/

[62] Climate & Clean Air Coalition. (2025, April 17). *Blended climate finance for sustainable agrifood systems: Latin America & the Caribbean.* https://www.ccfacility.org/learning-hub/blended-climate-finance-for-sustainable-agrifood-systems-two-pager

[63] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

[64] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

[65] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

[66] Convergence. (2024, May). *Unleashing the catalytic power of donor financing to achieve sustainable development goals.* https://www.convergence.finance/resource/unleashing-the-catalytic-power-of-donor-financing-to-achieve-sustainable/view

Different funds and facilities have implemented blended finance to support smallholder agriculture and the practice of regenerative land use. The subsequent examples illustrate various models from Africa to Europe and throughout the Global South.

Case 1: IDH FarmFit Fund (Global/Africa)

The IDH FarmFit Fund operates as a public-private impact fund that exceeds $100 million to offer loans and guarantees to agribusinesses which collaborate with smallholder farmers.[67] Backed by donors (e.g. By taking junior positions the Dutch government and Gates Foundation enable risk mitigation for smallholder value chains which helps commercial lenders and companies lower financing costs for farmers.[68] FarmFit has enabled financing solutions for input credit and storage facilities along with additional services for farmers typically considered unbankable. Partner financial institutions reached tens of thousands of farmers with affordable loans through FarmFit's support by 2022 and also provided technical assistance to promote sustainable farming practices.

Case 2: Africa Agriculture and Trade Investment Fund (AATIF, Africa/Europe)

The Africa Agriculture and Trade Investment Fund (AATIF), which Germany established, offers debt funding to both African agribusiness companies and local financial institutions. The Africa Agriculture and Trade Investment Fund implements public-supported junior capital alongside guarantees to take on risk and draw senior private investment.[69] AATIF's financing structure enables the funding of sustainable value chains for cocoa, coffee, and cotton which serve smallholder farmers. AATIF support enabled a Zambian dairy processor to increase farmer outreach through credit risk mitigation and helped a West African bank launch loans to smallholder cooperatives. AATIF's blending model succeeded in drawing private capital while enhancing investees' risk-return profiles though local policy and currency risks persist as ongoing challenges.[70]

Case 3: Agri3 Fund (Europe/Global South)

Rabobank and UN Environment established the Agri3 Fund as a blended finance mechanism to fight deforestation and advance sustainable agricultural practices. The fund gained financial support from

[67] Rietberg, A. (2020, February 19). *Case study: How Agri-Wallet drives sustainable food production.* https://fairfood.org/en/resources/case-study-how-agri-wallet-drives-sustainable-food-production/

[68] Rietberg, A. (2020, February 19). *Case study: How Agri-Wallet drives sustainable food production.* https://fairfood.org/en/resources/case-study-how-agri-wallet-drives-sustainable-food-production/

[69] Stockholm Environment Institute. (2025, March 10). *InfoPoint conference: Investing in Africa's agriculture – The role of AATIF & blended finance.* https://www.siani.se/event/infopoint-conference-investing-in-africas-agriculture-the-role-of-aatif-blended-finance/

[70] Global Environment Facility. (2019, June). *AGRI3: A forest conservation and sustainable agriculture fund for developing countries* [Project Identification Form]. https://www.thegef.org/sites/default/files/web-documents/10497_MFA_PIF.pdf

private investors and donor contributions including resources from the Dutch government and the Global Environment Facility.[71] Agri3 extends guarantees and subordinated loans to partner banks for loans that exceed typical risk thresholds, provided these loans support verifiable sustainable goals like zero deforestation commitments. Agri3 risk-protected a Rabobank loan to a Brazilian cattle farmer for the restoration of 7,000 ha of degraded pasture along with the conservation of 2,000 ha of rainforest as part of its inaugural transaction.[72] The financing enabled the farmer to boost production on current land by doubling stocking rate while preserving forested areas which demonstrates the ability of blended funds to connect commercial credit with environmental and social governance objectives. The fund sought to make $1 billion available for sustainable agricultural projects by 2023 while demonstrating Europe's ability to mobilize global resources for regenerative farming.[73]

Case 4: ABC Fund (Agriculture Financing, Africa/Caribbean)

The Agri-Business Capital Fund represents a mixed investment vehicle designed by IFAD (UN agency), the European Union, and AGRA. This fund delivers loans and equity financing to support farmer cooperatives along with agri-SMEs who assist smallholder farmers. Donors' financial contributions function as initial capital loss protection which helps to attract further private sector investment. By 2024 ABC Fund had provided investment for a mango processor in Mali along with a coffee cooperative in Honduras through a combination of financial support and technical assistance grants. The blending approach provided local businesses the ability to obtain capital under improved terms thus enabling thousands of small farmers to reach markets more effectively.[74] Europe shows its dedication to blended financial methods for food systems through EU support and extended utilization of these tools by the Global Gateway initiative.[75]

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[71] Rabobank. (2021, October 23). *Blended finance and its impact on food systems.* https://www.rabobank.com/about-us/rabo-partnerships/news/011232819/blended-finance-and-its-impact-on-food-systems

[72] Rabobank. (2021, October 23). *Blended finance and its impact on food systems.* https://www.rabobank.com/about-us/rabo-partnerships/news/011232819/blended-finance-and-its-impact-on-food-systems

[73] Global Environment Facility. (2019, June). *AGRI3: A forest conservation and sustainable agriculture fund for developing countries* [Project Identification Form]. https://www.thegef.org/sites/default/files/web-documents/10497_MFA_PIF.pdf

[74] Mikolajczyk, S., Mikulcak, F., Thompson, A., & Long, I. (2021, February). *Unlocking smallholder finance for sustainable agriculture in Southeast Asia.* Climate Focus and WWF Germany. https://climatefocus.com/wp-content/uploads/2022/06/WWF-2021-Unlocking-Smallholder-Finance-for-Sustainable-Agriculture.pdf

[75] Stockholm Environment Institute. (2025, March 10). *InfoPoint conference: Investing in Africa's agriculture – The role of AATIF & blended finance.* https://www.siani.se/event/infopoint-conference-investing-in-africas-agriculture-the-role-of-aatif-blended-finance/

Case 5: Land Degradation Neutrality (LDN) Fund (Global)

A blended private equity fund that invests in land restoration and agroforestry projects around the world is managed by Mirova in partnership with the UN through the LDN Fund. Impact investors supply capital to the LDN Fund alongside DFIs and a junior tranche from donors. LDN has provided financial support for sustainable cocoa and coffee production and agroforestry businesses in Africa and Asia with the involvement of smallholder farmers. The blending method proved essential to address the substantial perceived risks associated with these long-term initiatives. The fund supports various sectors besides agriculture through its investment portfolio. The approach of planting cocoa agroforests on damaged land in Ghana demonstrates a scalable model for funding regenerative agriculture through concessionary capital that delivers both public benefits such as carbon storage and biodiversity protection and reasonable financial returns.

Insights: The cases illustrate how blended finance approaches can address multiple segments of the value chain while targeting different types of financial risks. In each case, stakeholder collaboration is key: Philanthropic organizations along with public entities manage risks and offer grants while commercial banks and funds supply most of the needed capital. Blended finance creates unique financial opportunities but functions optimally alongside reliable implementing partners who handle operations directly. Blended finance does not completely remove commercial risk yet it redistributes it in a manner that allows projects to work. Blending mandates substantial project preparation along with transaction advisory and impact monitoring support which necessitates grant funding.[76] The effective use of capital for regenerative agriculture requires the integration of blended finance with additional tools such as pay-for-results incentives or supply chain commitments.

4.2 Pay-for-Results Financing in Agriculture

Pay-for-results financing functions as an approach where payments follow successful accomplishment of predefined results or outcomes. A principal (e.g. a donor or government entity) does not fund inputs or activities initially but promises payment based on achieved results which are measured and confirmed subsequently.[77] A principal such as a donor, government entity or impact investor commits to paying agents based on actual performance evaluation that occurs after results are measured and verified. Agricultural P4R schemes establish financial rewards that motivate farmers alongside service

[76] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

[77] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

providers and project investors to achieve specified results including higher crop yields and better environmental and social impacts. Outcome-based grants, prize competitions, and impact bonds represent common models where investors receive repayment from outcome funders once predefined targets are achieved. This tool ensures financial resources are matched to successful outcomes so stakeholders prioritize effective results above mere effort.

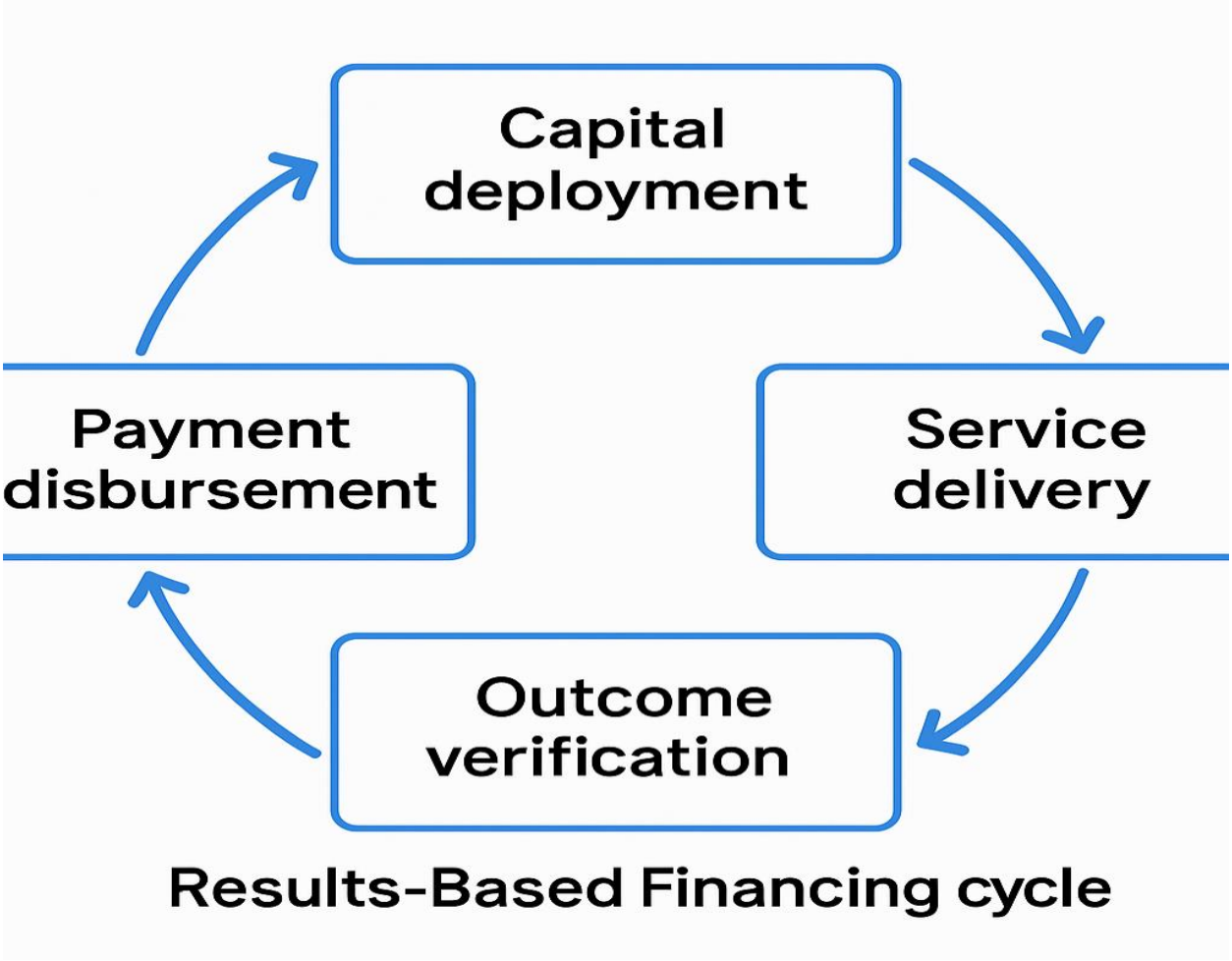

Figure 4.2.pay-by-results financing cycle

Impact: The pay-for-results approach enhances innovation and efficiency through exclusive rewards for successful outcomes. When outcomes benefit smallholders and communities they become the core focus – for instance (e.g. When results benefit them such as increased income or productivity, the incentive enables smallholders and their partners to discover optimal solutions.[78] The P4R framework has demonstrated its effectiveness by encouraging private enterprises to develop solutions for smallholder farmers. The AgResults initiative operated a multilateral program worth $152 million that conducted prize competitions focused on new agricultural technologies. The AgResults On-Farm Storage Challenge in Kenya provided financial awards to businesses that created marketable affordable

[78] Instiglio. (2017). *Results-based financing in agriculture and land administration: Potential and key design considerations for RBF to drive greater results in the sectors.* https://www.instiglio.org/wp-content/uploads/2021/02/Instiglio-2017_Sector-Note_RBF-in-agriculture-and-land-administration.pdf

storage technologies to minimize post-harvest losses for smallholder farmers.[79] The Pay-for-Results prize program enabled more than 1.6 million small farmers to start using hermetic storage bags which cut their grain losses and improved their earnings and received awards only following documented adoption achievements. AgResults' Aflasafe Challenge in Nigeria rewarded private firms for distributing biocontrol products that reduced aflatoxin contamination in maize which led to the adoption of this technology by over 35,000 farmers and safer grain arriving in the market. Outcome-based rewards create incentives for private actors to introduce new products to smallholders which solves existing market failures.

Development funds benefit from increased cost-effectiveness and accountability through the use of P4R. Success-based payments from governments and donors minimize waste and promote adaptive management strategies. Morocco tested a results-based subsidy program in irrigation where farmers received subsidies for equipment only if they implemented drip irrigation on appropriate crops which ensured water-saving benefits from the investment. Initial findings indicate that this strategic method established an "accountability system" which improved water-use efficiency while increasing fund transparency. European farmers have participated in experimental agri-environment programs where payment is based on specific environmental results achieved on their land instead of following strict farming methods. The pilot programs in Germany and France resulted in heightened farmer participation and better biodiversity indicators because farmers received the autonomy to create innovative solutions to achieve results which they owned.[80] Experiences with P4R demonstrate its potential to produce environmental benefits in agriculture through methods that better accommodate farmers compared to traditional input-based subsidies.

Limitations: The pay-for-results financing model presents several important difficulties. Measurement and verification stand as a core issue because creating dependable metrics and confirming outcomes demands significant complexity and high costs. The success of agriculture initiatives depends on numerous uncontrollable external factors like weather conditions and pest outbreaks which generates concerns about equitable treatment. When a drought occurs should agricultural producers face penalties for failing to meet their yield targets? When results occur due to favorable conditions outside control, payers must agree to cover these results which would have happened regardless. The design of P4R incentives must be precise to ensure they properly reward participants' efforts or innovations while considering uncontrollable external factors. Those who implement the project must secure upfront financing because someone needs to fund the activities before the final outcome payment becomes available.[81] Within development impact bonds impact investors provide working capital and

[79] **AgResults. (2018).** *Kenya On-Farm Storage Challenge Project.* https://agresults.org/projects/kenya/

[80] Instiglio. (2017). *Results-based financing in agriculture and land administration: Potential and key design considerations for RBF to drive greater results in the sectors.* https://www.instiglio.org/wp-content/uploads/2021/02/Instiglio-2017_Sector-Note_RBF-in-agriculture-and-land-administration.pdf

[81] Instiglio. (2017). *Results-based financing in agriculture and land administration: Potential and key design considerations for RBF to drive greater results in the sectors.* https://www.instiglio.org/wp-content/uploads/2021/02/Instiglio-2017_Sector-Note_RBF-in-agriculture-and-land-administration.pdf

receive repayment from donors only upon achieving results which requires investors who accept risk while transaction costs remain high compared to the project size. Farmers need assistance to achieve intended results which may involve additional resources such as training and inputs. Cash-constrained smallholders would struggle to join a pay-for-success contract that lacks additional financial support through blended finance structures to cover necessary training and inputs. Design complexity is another limitation: Determining the correct incentive value presents difficulties because low incentives fail to drive behavior change while high incentives risk system manipulation and unexpected outcomes. P4R models show optimal performance when outcomes can be directly traced back to specific actions which proves simpler with discrete results (e.g. Discrete outcomes such as crop production volumes allow for better result attribution than broad goals like ecosystem health.

4.2.1 Case Studies Analysis of Pay-for-Results Schemes

Pilot testing of different pay-for-results models has taken place within agricultural sectors and sustainable land management practices. This section presents four to five real-world examples where this tool has been implemented across diverse geographic locations.

Case 1: AgResults Prize Competitions (Kenya, Nigeria, Zambia, etc.)

The AgResults initiative has launched multiple pay-for-results programs. The On-Farm Storage project in Kenya awarded companies with prizes from a $12 million fund when they reached their sales targets for on-farm grain storage solutions to smallholder farmers.[82] During a period of 21 months, five agricultural technology companies provided storage solutions to farmers which enabled roughly 482,000 smallholder households to implement storage practices and achieve a 47% average decrease in post-harvest maize loss. Verified sales numbers and impact metrics determined the distribution of prizes up to $1 million per company. The Nigerian Aflasafe Challenge paid companies by the ton for distributing Aflasafe inputs to farmers which led to the creation of a dynamic Aflasafe market while reducing maize contamination and enabling farmers to benefit from pricing premiums for their safer grains.[83] Outcome funding has led private sector players to address previously ignored issues like post-harvest loss and crop toxins by offering prizes that mitigate market risks and reward companies for reaching smallholder farmers at scale.

[82] **AgResults. (2018).** *Kenya On-Farm Storage Challenge Project.* https://agresults.org/projects/kenya/

[83] **AgResults. (2018).** *Kenya On-Farm Storage Challenge Project.* https://agresults.org/projects/kenya/

Case 2: Development Impact Bond for Coffee Farmers (Latin America)

In 2022 a pilot program for outcome-based financing began to help coffee farmers in Peru and Honduras adopt climate-resilient agricultural methods. An implementing NGO received upfront financial support from impact investors to educate farmers about regenerative farming techniques including shade-grown coffee production and organic agriculture. Donor organizations such as USAID consented to compensate investors with returns when predetermined outcomes were fulfilled within a three-year period including enhanced coffee production rates and farmer income levels together with the implementation of climate-smart procedures across minimum 5,000 hectares. This Coffee Climate Impact Bond links payment disbursements to independently verified results obtained through farm surveys and satellite imagery which validate practice adoption. Even though the final results remain pending the bond has already fostered enhanced collaboration among buyers banks and farmers' cooperatives who are investing in training to show how pay-for-success models unite diverse stakeholders to achieve measurable improvements.

Case 3: Rwanda Crop Yield Results-Based Financing (Africa)

The Rwanda government started a results-based financing program in its extension services with assistance from the World Bank. The payment system for local service providers included a performance-based component that rewarded them based on yield improvements in maize and beans among participating farmers instead of purely activity-based funding. Yields were measured through independent crop-cutting surveys. During the first trials from 2019–2020 service providers achieved bonuses from improved yields in well-rained regions while drought-stricken areas displayed stagnant yields without any bonus payouts. The government enhanced their model by adding resilience measures such as irrigation adoption and drought-resistant varieties into result indicators to motivate extension agents to work efficiently during adverse weather conditions. The example demonstrates how payments tied to agricultural results present opportunities but also obstacles for smallholder communities.[84]

Case 4: Results-Based Agri-Environment Payments (Europe): Several EU countries have conducted pilot programs that tested financial incentives for farmers based on their environmental performance. German farmers receive payments from a results-based meadow scheme when they achieve a specific number of biodiversity indicator plant species in their hay meadows during harvest time. Farmers retain full autonomy over their land management practices to attain desired environmental outcomes. adjusting mowing dates or refraining from agrochemicals). A German assessment revealed that farmers reacted positively by feeling able to apply their land knowledge which resulted in improved

[84] Instiglio. (2017). *Results-based financing in agriculture and land administration: Potential and key design considerations for RBF to drive greater results in the sectors.* https://www.instiglio.org/wp-content/uploads/2021/02/Instiglio-2017_Sector-Note_RBF-in-agriculture-and-land-administration.pdf

biodiversity through increased target plant species frequency compared to control locations.[85] The implementation of nesting bird strategies in France resulted in more efficient bird habitat protection than traditional flat payment systems. The EU plans to broaden eco-schemes that focus on results within its Common Agricultural Policy for 2023–2027 to incentivize farmers through payments based on soil carbon increases and pollinator presence. European examples demonstrate that pay-for-results models work for environmental aims but necessitate comprehensive monitoring that includes botanical surveys and wildlife counts which creates administrative burdens.

Case 5: Aceli Africa – Lender Incentive Program (East Africa)

Aceli Africa modifies pay-for-results models by providing financial institutions with incentives to extend credit to agricultural SMEs who purchase from smallholder farmers. Lenders receive subsidy payments as financial rewards for disbursing loans to impactful agricultural SMEs where payment amounts are determined by both loan volume and impact.[86] A financial institution could receive a subsidy payment that covers part of their loan processing fees or provides a first-loss guarantee when they issue a $50,000 loan to an agri-business led by youth or women or one involved in the staple crop value chain. The Aceli incentive program received funding from USAID and other donors to support 32 East African lenders in providing over 1,400 loans worth $144 million to agricultural SMEs that buy from more than 1 million smallholders.[87] The program compensates lenders for loan volume expansion instead of direct development results but operates under the expectation that these loans will boost farmer incomes and strengthen food security. It represents an innovative use of pay-for-results at the financial system level: Banks receive increased incentive payments when they create more socially inclusive loans which helps them balance additional risk or costs. The initial achievement of Aceli demonstrated through a 1.7x rise in agri-SME lending from involved lenders shows how targeted subsidies based on performance can unlock financial resources for neglected sectors. Blended finance elements integrate with this model through donor funds covering incentive costs allowing scalability to different regions that will bridge the agricultural financing gap.[88]

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[85] https://www.sciencedirect.com/science/article/pii/S0264837722003088#:~:text=Farmers%27%20acceptance%20of%20results,western%20Germany.%20Biodiversity

[86] Convergence. (2024, May). *Unleashing the catalytic power of donor financing to achieve sustainable development goals.* https://www.convergence.finance/resource/unleashing-the-catalytic-power-of-donor-financing-to-achieve-sustainable/view

[87] 60 Decibels. (2023, November 15). *Aceli Africa: Closing the Agri-SME financing gap with multi-stakeholder listening.* https://60decibels.com/insights/aceli-africa/

[88] Convergence. (2024, May). *Unleashing the catalytic power of donor financing to achieve sustainable development goals.* https://www.convergence.finance/resource/unleashing-the-catalytic-power-of-donor-financing-to-achieve-sustainable/view

Insights: Agricultural pay-for-results instruments show outcomes-based incentives effectively modify the behavior of private firms and service providers, including financiers to support smallholder farming. These programs achieve optimal results when they offer outcomes that are explicitly specified and tracked within an acceptable period and when participants possess sufficient resources to leverage the incentive. A key insight is that P4R often needs an enabling ecosystem: AgResults competitions required verification agents and evaluators to guarantee fair assessment of company performance. Outcome-based agricultural programs typically require additional support such as initial technical assistance or credit through blended finance to help participants reach their intended outcomes.[89] P4R functions best when combined with blended finance projects or supply chain programs since adding an outcome bonus for climate resilience on blended finance loans enables both capital repayment and verified ESG benefits delivery. A subsequent section will examine these combined approaches. The case studies illustrate that verification methods including remote sensing and third-party audits will be covered because technology enables pay-for-performance implementation at a larger scale.

4.3 Supply Chain Finance Together with Reverse Factoring Benefits Smallholder Farmers

The financial structure known as reverse factoring allows a bank or fintech intermediary to make immediate payments to suppliers like farmers or their cooperatives for a buying company and then collects the payment from the buyer afterward. Through reverse factoring agricultural value chains empower smallholders to receive immediate payment after produce delivery during harvest while giving buyers extended time to pay the financier. The credit risk rests upon the purchasing company's credit quality instead of the farmer's credit standing which allows for a reduction in financing expenses. Reverse factoring is typically buyer-initiated: A big agribusiness or processor collaborates with a financial partner to speed up cash access for its network of farmers or local aggregators. The arrangement enhances farmers' cash flow by providing immediate payment which reduces side-selling risks and allows buyers to maintain a steady supply chain.

Impact: Smallholders experience substantial relief from working capital constraints through the application of reverse factoring and associated SCF solutions. At harvest time farmers require immediate cash to settle input loans and family expenses while also planning investments for future planting seasons.[90] Many value chains have payment cycles that delay payment for weeks or months after delivery. Farmers utilizing an SCF program can obtain 80% of their crop revenue directly through

[89] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

[90] AGRA. (2020, April 20). *Allowing money to work for farmers: Case of Umati Digital Finance Ecosystem.* https://agra.org/news/allowing-money-to-work-for-farmers-case-of-umati-digital-finance-ecosystem/

mobile money payment instead of waiting for the buyer's standard payment schedule.[91] Farmers' effective income grows when immediate liquidity prevents them from taking expensive informal loans while enabling them to reinvest in productivity improvements. It also strengthens trust: Research indicates farmers reduce side-selling to middlemen when they have confidence in timely payments. The promise of prompt payment from buyers allows them to secure more loyal suppliers while negotiating better prices and higher quality products. Reverse factoring connects smallholder farmers to formal markets by giving them financial access through their receivables which become instant cash without requiring any collateral. The initiative leads to better financial access for farmers and helps them establish a credit history. Digital supply chain financing platforms enable farmers to document every transaction and develop a record of their sales history. When AB InBev Africa introduced BanQu, its blockchain-based SCF platform for cassava, barley, and sorghum farmers, 1,200 Ugandan farmers received SMS updates about their delivery records, sales prices, and payment information.[92] An unchangeable transaction history functioned as economic identity which farmers used as income verification to obtain bank credit for the first time.[93] Through this initiative smallholders in Zambia achieved a three-fold increase in sales volume over the course of one year while earning a combined total of 1.5 million USD because they entered a transparent supply chain system that guaranteed payment.[94] Zambian Breweries, which belongs to AB InBev, experienced a 17% revenue increase because of its improved smallholder sourcing mechanisms on this platform.[95] These outcomes show how reverse factoring, especially when augmented by technology, can be a win-win: Through reverse factoring farmers gain monetary benefits and credit history while agribusinesses strengthen their supply chain and operational efficiency.

Limitations: While reverse factoring shows potential benefits for smallholders it still presents considerable challenges. Prerequisite conditions are needed: A formal contract or purchase agreement must exist between farmers and a reputable buyer for this system to work.[96] Many smallholders work

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91 AGRA. (2020, April 20). *Allowing money to work for farmers: Case of Umati Digital Finance Ecosystem.* https://agra.org/news/allowing-money-to-work-for-farmers-case-of-umati-digital-finance-ecosystem/

92 Green Economy Media. (2021, March 15). *AB InBev empowers farmers across Africa with blockchain technology.* https://greeneconomy.media/ab-inbev-empowers-farmers-across-africa-with-blockchain-technology/

93 Green Economy Media. (2021, March 15). *AB InBev empowers farmers across Africa with blockchain technology.* https://greeneconomy.media/ab-inbev-empowers-farmers-across-africa-with-blockchain-technology/

94 Marchant, N. (2021, May 28). *This start-up is using blockchain to help smallholder farmers prosper.* https://www.weforum.org/stories/2021/05/banqu-financial-inclusion-sustainability/

95 Marchant, N. (2021, May 28). *This start-up is using blockchain to help smallholder farmers prosper.* https://www.weforum.org/stories/2021/05/banqu-financial-inclusion-sustainability/

96 AGRA. (2020, April 20). *Allowing money to work for farmers: Case of Umati Digital Finance Ecosystem.* https://agra.org/news/allowing-money-to-work-for-farmers-case-of-umati-digital-finance-ecosystem/

within informal supply networks that lack formal contract agreements or dominant buyers. Reverse factoring implementation becomes difficult in "loose" local staple markets because smallholders operate without binding contracts or dominant buyers.[97] This methodology functions optimally within organized supply chains consisting of export products like cocoa and coffee where buyers consent to remittance through the system. Farmers may choose not to use digital financial services because they prefer receiving cash payments upon delivery or because they distrust new digital payment methods.[98] A pilot program by AGRA and Umati Capital in Kenya showed limited demand for Supply Chain Finance in staple crop markets that rely on spot cash transactions. Farmers persisted in side-selling for quick cash revenue which prevented SCF platforms from demonstrating their potential benefits until buyers increased their use of formal contracts.

Financiers identify operational difficulties along with credit risk as major concerns. Although buyers generally pose less credit risk than farmers do, agribusinesses operating in developing regions face substantial market and political risks. The financial intermediary absorbs losses when buyers delay payments or default after money has already been given to farmers. SCF providers choose to work with buyers who demonstrate strong creditworthiness or who have supplementary guarantees available. Another issue is high transaction costs: The requirement to process numerous small transactions for thousands of farmers demands powerful digital solutions and connections with mobile money services or banking infrastructures. When processing volumes are low the setup costs remain substantial and unit costs rise. Commercial banks rarely make supply chain finance available to smallholders and when they do they typically target bigger suppliers and aggregators because managing micro-suppliers creates operational difficulties. Banks identify insufficient data on small farmers and absence of collateral beyond buyer contracts as major hurdles yet fintech solutions are overcoming these barriers using alternative data and platform-based approaches. SCF operations face limitations from macro-level issues such as unstable crop prices because if prices fall between harvest time and when buyers pay, this creates pricing risk which must be managed through well-defined contract terms. SCF functions to expedite payments but it does not provide direct sustainability benefits. Reverse factoring cannot support regenerative practices without additional conditions or complementary programs unless buyers mandate it through their procurement policies.

4.3.1 Case Studies Analysis of Reverse Factoring and Supply Chain Finance

Supply chain finance solutions for farmers have been tested through multiple initiatives which implement technology and collaborative efforts. Here are illustrative cases from different regions:

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[97] AGRA. (2020, April 20). *Allowing money to work for farmers: Case of Umati Digital Finance Ecosystem.* https://agra.org/news/allowing-money-to-work-for-farmers-case-of-umati-digital-finance-ecosystem/

[98] AGRA. (2020, April 20). *Allowing money to work for farmers: Case of Umati Digital Finance Ecosystem.* https://agra.org/news/allowing-money-to-work-for-farmers-case-of-umati-digital-finance-ecosystem/

Case 1: Umati Capital – Kenya (Digital Invoice Discounting)

AGRA's Financial Inclusion program backed Umati Capital to launch a mobile SCF platform in Kenya. Farmers participating in a pilot with maize cooperatives gained immediate access to 80% of their delivery value through Umati mobile money without having to wait the usual 30-60 days period for cooperative payments from buyers.[99] After receiving payment from the buyer Umati would pay the farmers their remaining balance deducting a small service fee. Farmers could address their immediate financial requirements while also securing necessary inputs for future planting seasons without delay. While initial adoption was moderate, the pilot revealed important lessons: While farmers appreciated the immediate payment system that eliminated costly short-term loans the uptake remained dependent on their trust in the system and the perceived fairness of the service fee. Pay-to-farm networks in some value chains reduced the pilot's success because they already provided farmers with cash payments even though at reduced prices. In 2018 Umati redesigned its operations to concentrate on value chains with explicit contracts such as dairy and horticulture exports and collaborated with buyers to motivate farmers to adopt the SCF option through measures like price premiums. slight price premiums). Reverse factoring in smallholder markets demonstrates both its capabilities and its challenges.[100]

Case 2: Agri-Wallet – Kenya (Blockchain-Based SCF)

Agri-Wallet represents a Dutch-Kenyan fintech platform which delivers an all-in-one digital wallet solution combined with a supply chain finance system for agricultural stakeholders like farmers and buyers along with input suppliers.[101] The platform employs a blockchain-based token system that allocates funds specifically for agricultural purposes. Agribusiness buyers access an overdraft facility from Agri-Wallet to pay smallholders immediately through mobile money or tokens at harvest time and repay Agri-Wallet afterwards. Farmers store a portion of their earnings in digital "Agri-Tokens" that can be purchased only for inputs from partner agri-dealers which forces them to reinvest in their farming activities.[102] Agri-Wallet connects short-term financial solutions with sustainable agricultural productivity over the long run. The financial platform Agri-Wallet supported transactions for over

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99 AGRA. (2020, April 20). *Allowing money to work for farmers: Case of Umati Digital Finance Ecosystem.* https://agra.org/news/allowing-money-to-work-for-farmers-case-of-umati-digital-finance-ecosystem/

100 AGRA. (2020, April 20). *Allowing money to work for farmers: Case of Umati Digital Finance Ecosystem.* https://agra.org/news/allowing-money-to-work-for-farmers-case-of-umati-digital-finance-ecosystem/

101 Rietberg, A. (2020, February 19). *Case study: How Agri-Wallet drives sustainable food production.*https://fairfood.org/en/resources/case-study-how-agri-wallet-drives-sustainable-food-production/

102 Rietberg, A. (2020, February 19). *Case study: How Agri-Wallet drives sustainable food production.*https://fairfood.org/en/resources/case-study-how-agri-wallet-drives-sustainable-food-production/

17,000 farmers and 8,000 small vendors in Kenya as of 2021. The innovation is that loans are tied to ESG outcomes: Agri-Wallet connects financial access with sustainable farming practices by allowing farmers who implement climate-smart techniques or reduce carbon output to qualify for greater overdraft options or decreased fees based on data tracked by the platform. The financing approach fulfills regenerative targets while reverse factoring functions as a vehicle for implementing "pay-for-performance" principles. The platform brought together impact investors and donors with the IDH FarmFit Fund providing a guarantee facility to cover Agri-Wallet's portfolio risk which led to the creation of the new asset class of "climate-smart smallholder finance". Agri-Wallet proves that merging fintech solutions and blockchain transparency with blended capital financing extends SCF to unbanked farmers in the thousands while promoting sustainable production practices.

Case 3: AB InBev & BanQu – Africa (Blockchain Supply Chain Integration)

AB InBev works with millions of smallholder farmers who supply cassava, sorghum and barley through its supply chains. AB InBev joined forces with blockchain enterprise BanQu in 2018 to implement digital payment systems and transaction records for its agricultural suppliers across Zambia, Uganda, and Tanzania. Farmers who provide crops to AB InBev's breweries or agents get instant payment through mobile money which BanQu's blockchain ledger records. The system generates secure tamper-proof transaction records for each farmer (including volume, price, and date) which provides AB InBev with real-time sourcing insights and establishes credible transaction histories for farmers. As of 2020 there were more than 17,000 registered farmers who each possessed a portable economic identity that allowed them to open bank accounts and secure micro-loans using their sales records as income proof.[103] This SCF initiative did not involve a third-party financer paying on behalf of AB InBev (the company itself paid promptly via the platform), but it achieved similar goals: The SCF strategy delivered immediate payments to farmers, minimized supply chain waste and supplied credit access data. The Zambian subsidiary of AB InBev achieved a 17% revenue growth and stronger farmer loyalty after adopting BanQu.[104] As a highlighted example of production growth a farmer increased cassava sales from 3.8 tons to over 12 tons in one year through participation in this formal network.[105] This situation demonstrates that technology combined with corporate resolve can dissolve conventional obstacles such as identity issues and trust deficits while SCF permits farmers to gain economic power without stakeholders stepping beyond their usual functions.

Case 4: Nespresso & Blue Harvest – Latin America (Coffee Finance)

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[103] Global Agriculture & Food Security Program. (2023, June 6). *Technology connects Kenyan smallholders with market access.*https://www.gafspfund.org/projects/technology-connects-kenyan-smallholders-market-access

[104] [104] Rietberg, A. (2020, February 19). *Case study: How Agri-Wallet drives sustainable food production.*https://fairfood.org/en/resources/case-study-how-agri-wallet-drives-sustainable-food-production

[105] [105] Rietberg, A. (2020, February 19). *Case study: How Agri-Wallet drives sustainable food production.*https://fairfood.org/en/resources/case-study-how-agri-wallet-drives-sustainable-food-production/

High-end coffee buyers including Nespresso have partnered with social lenders to fund smallholder cooperatives through supply chain finance in Latin America. TechnoServe's Blue Harvest project worked with farmers in Nicaragua and Honduras to implement regenerative practices like planting shade trees and using organic fertilizer to enhance water resources through an NGO program. During harvest time social impact lenders provided purchase order financing to farmer cooperatives which allowed them to receive funds with lower interest for selling their coffee to Nespresso based on Nespresso's purchase contract. Nespresso issued both a letter of credit and a price guarantee to support these arrangements. Under this financial arrangement cooperatives had the ability to pay farmers immediately after collecting coffee cherries although the export payment would arrive later. Alongside these benefits Nespresso delivered a quality premium payment and a sustainability bonus which functioned like pay-for-results when regenerative criteria such as tree planting around water sources were achieved. Farmers achieved income growth of 30–50% through better yields and quality bonuses while the lender reported no defaults because of the reliable anchor buyer agreement. This case, while smaller in scale, illustrates how reverse factoring plus outcome incentives can work: The agreement between the buyer and bonus payments guaranteed the lender while the cooperative obtained liquidity and farmers received prompt payments plus incentives for sustainable practices.

Insights: Reverse factoring reaches its highest success levels for smallholders when integrated into an extensive support ecosystem. Key success factors include Anchor buyers who demonstrate commitment through data or guarantees partner with agile digital-system-financiers (banks or fintechs) to create opportunities for donors or impact investors to share business risks and provide technical support. Digital platforms that include mobile money services, blockchain systems, and satellite-linked databases function as significant enablers by lowering transaction costs and increasing transparency which allows for the inclusion of numerous small transactions within an SCF program. They also facilitate trust: Farmers build trust in the system when they receive SMS confirmations while knowing that a neutral platform monitors deliveries and banks trust farmers when they have access to auditable sales records. Reverse factoring doesn't resolve every problem for farmers who also require better prices and support to enhance their productivity. Agronomic training and input credits are commonly combined with SCF programs because they enhance farmer productivity. The provision of quick payments with Agri-Wallet tokens for inputs and Nespresso's technical help becomes highly beneficial when farmers have surplus products for sale following their investment. Reverse factoring helps farmers reduce market and credit risk by connecting them to stable value chains but needs pairing with quality price incentives and risk-sharing mechanisms to achieve true transformation.

4.4 Synergies of Combining the Three Instruments (Innovative financial mechanisms)

Blended finance addresses some financial barriers while pay-for-results tackles others and reverse factoring solves different financing challenges for regenerative agriculture. A unified model that incorporates all three instruments strengthens overall effectiveness because each instrument's

capabilities compensate for another's weaknesses. This section examines how an integrated strategy reduces financial and ESG risks while enhancing smallholder performance through improved credit access. We present emerging pilot projects that combine multiple tools while establishing a stakeholder-driven framework to maintain each actor's role within their standard mandate.

Below is a Conceptual Canvas illustrating how these instruments synergize:

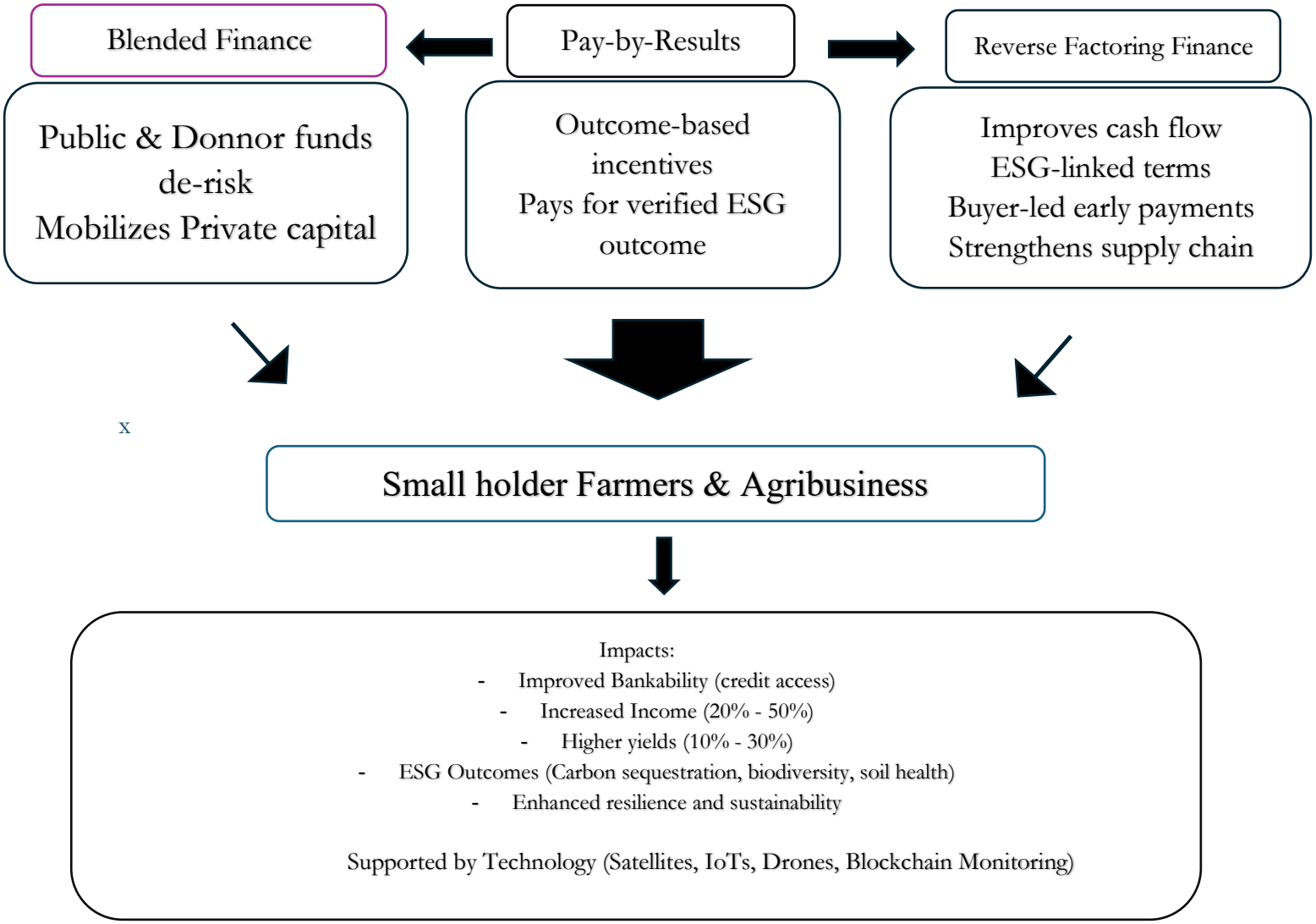

Figure 4.1 Blended Finance uses private capital by taking on early risks which allows smallholders to receive initial funding for regenerative practices. Pay-for-Results delivers financial rewards based on specific outcomes such as soil carbon improvements to guarantee ESG achievements receive proper compensation. Through Reverse Factoring smallholders experience stabilized cash flow and improved supplier resilience and receive rewards for meeting ESG standards. Smallholders experience improved bankability and higher income together with sustainable business growth while keeping their current operational responsibilities unchanged. Satellite imagery combined with IoT sensors and drones

enables exact observation and confirmation tasks which lower transaction expenses and generate stakeholder trust.

4.4.1 Mitigating Risks through Instrument Synergy

The blended/pay-for-results/reverse-factoring model naturally incorporates multiple layers of risk mitigation techniques:

- Financial risk

Blended finance components (e.g. Donors and development banks provide first-loss capital or guarantees to absorb credit risk which enables private lenders to issue loans and value chain financiers to pay farmers before harvests.[106] Reverse factoring structures transfer default risk from smallholders who have little or no credit history onto stronger off-takers. Financial institutions advance payments based on the trustworthiness of agribusiness buyers who are generally less risky compared to thousands of individual farmers. A local bank can confidently provide a loan to a farmer cooperative because (a) a donor guarantee covers 50% of potential losses and (b) the cooperative holds a secure buyer contract that enables payment factoring. The pay-for-results element further reduces performance risk: Outcome-based grants and premiums create additional financial inflows once specific yields and environmental benchmarks are met and these funds can then be directed toward loan repayment or cost compensation. Outcome payments function as either insurance or a bonus for farmers who achieve specific performance targets.[107] The donor provides either cash incentives or debt cancellation when farmers achieve 30% yield improvements or demonstrate verified carbon storage. The setup benefits project viability financially and serves as an incentive to achieve success since lenders perceive reduced default risk when an outcome funder provides payment upon successful outcomes which matches farmers' repayment ability. The integrated model distributes risk through specific strategies to mitigate both credit risk and impact risk which in turn provides commercial investors with more reliable return prospects and development funders with more assured results.

- ESG (Environmental, Social, Governance) risk

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[106] Stockholm Environment Institute. (2025, March 10). *InfoPoint conference: Investing in Africa's agriculture – The role of AATIF & blended finance.* https://www.siani.se/event/infopoint-conference-investing-in-africas-agriculture-the-role-of-aatif-blended-finance/

[107] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

The combination of different instruments enables the management of ESG risks including climate impact and social inclusion. Blended finance typically includes ESG requirements and technical assistance because a blended fund could mandate loan recipients to avoid deforestation and educate farmers about sustainable practices. The pay-for-results framework connects monetary rewards to ESG accomplishments which guarantees that sustainability goals are fulfilled as a prerequisite for payment.[108] The attainment and monitoring of goals related to soil health improvement alongside gender inclusion and emission reductions serve as prerequisites for payment distribution. Buyers can connect reverse factoring to ESG requirements by setting sourcing standards which mandate that only products meeting specific sustainable criteria qualify for the SCF program while loans become dependent on ESG performance scores as demonstrated by Agri-Wallet's model. Together, this means the model internalizes ESG metrics: All stakeholders receive financial benefits when they achieve environmental and social performance goals. ESG risk mitigation benefits investors through assurance of positive project impacts with conditional outcome payments, buyers by meeting supply chain standards and lenders by financing practices that build resilience and minimize default risk from crop failure. In practical terms, consider a climate-smart agriculture project: A financial institution provides loans to agriculturalists for forest farming investments while offering a partial guarantee. Farmers receive a result-based financial reward from a carbon finance facility when their tree plantings survive and they achieve carbon sequestration targets which they apply to reduce their loan balance. Should targets remain unmet then the guarantee will take on the financial deficit. The bank maintains risk management while environmental protection is designed into the system. Regenerative agriculture requires this risk-sharing approach because soil regeneration and biodiversity outcomes involve upfront costs with uncertain returns while the combined model distributes risks among parties equipped to handle them (donors take outcome risk while banks manage credit risk and farmers concentrate on production with assured support).

- Market and price risk

The uncertainty of market prices and unmet purchase agreements prevents smallholders from investing in agricultural yield improvements. The integrated model protects farmers from market fluctuations and buyer defaults using off-taker contracts and factoring which ensures farmers have committed buyers who pay instantly upon delivery based on pre-set prices or price formulas. In the event of market price collapses or other shocks a pay-for-results mechanism from donors or governments would activate to stabilize farmers' incomes through instruments like minimum revenue guarantees or bonuses. The model incorporates safety nets such as guarantees and outcome payments that protect against external shocks and enhance value chain resilience. Agriculture outcome grants from donors helped maintain smallholder stability during market disruptions during COVID-19

[108] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

response programs and this strategy could be incorporated into future financial structures to share risks.

Overall, the synergy of instruments creates a layered risk management: The combination of blending and factoring decreases credit risk while P4R addresses performance risk together with a contractual design and incentive system mitigating market and ESG risks. No single actor carries undue risk: Every risk is assigned to the organization best capable of handling it (for example Donors manage impact risk while banks focus on financial structuring and buyers take charge of market integration. The partnership functions under a principle that prohibits stakeholders from exceeding their defined roles while enabling collective achievements beyond individual capabilities.

4.4.2 Benefits of Combining the Three Instruments-Improving Credit Access, Incomes, and Yields

The main objective of merging these tools is to disrupt the pattern of minimal investment and limited productivity which confines numerous smallholders. This integrated approach actively addresses credit access barriers and delivers compelling incentives to enhance both yield and income levels.

- Credit Access

Small farmers frequently find themselves unable to obtain loans because they lack necessary collateral and have credit history problems. The blended/factoring/P4R model creates accessible credit options for viable transactions. Financial institutions and fintech lenders are now prepared to offer loans for agricultural inputs or equipment to smallholders because they are protected by guarantees and secure off-taker contracts which mitigate risk.[109] Reverse factoring allows farmers to receive payments faster for their produce which enhances their ability to repay loans while minimizing emergency borrowing at high-interest rates.[110] The use of digital transaction methods through SCF platforms or blockchain technology helps to establish financial profiles for farmers. AB InBev's BanQu system allowed previously unrecognized farmers to obtain records that facilitated bank account openings. The formalization of farmer income enables access to financial services such as savings accounts, insurance policies, and future credit opportunities that farmers previously could not obtain. The financial model creates channels for formal finance services to penetrate rural communities through its structure based on value chain and outcomes. An illustrative pilot is the FarmFit-Agri-Wallet collaboration: Thanks to FarmFit's de-risking capital Agri-Wallet expanded its supply chain loans to many more smallholders

[109] Stockholm Environment Institute. (2025, March 10). *InfoPoint conference: Investing in Africa's agriculture – The role of AATIF & blended finance.* https://www.siani.se/event/infopoint-conference-investing-in-africas-agriculture-the-role-of-aatif-blended-finance/

[110] AGRA. (2020, April 20). *Allowing money to work for farmers: Case of Umati Digital Finance Ecosystem.* https://agra.org/news/allowing-money-to-work-for-farmers-case-of-umati-digital-finance-ecosystem/

than typical commercial lenders would reach while automatic payment deductions from produce sales helped farmers build a solid credit history through reliable repayments.[111] Donor subsidies based on results made financing terms more attractive to climate-friendly farmers. lower interest for those meeting sustainability milestones). Thousands of farmers without bank accounts received their initial access to affordable financial services as a result. Smart design allows formerly excluded smallholder farmers to become creditworthy as they borrow against anticipated harvests while multiple measures ensure successful outcomes through technical advice, buyer guarantees and success bonuses.

- Incentives for higher incomes and yields

The dual approach of rewarding outcomes and providing reliable market access enables farmers to gain exceptional incentives and resources for boosting their productivity. This system benefits farmers who achieve higher yields or better quality as they gain higher sales from secured buyers and receive premium prices or outcome payment bonuses with potential profit-sharing from cooperative mechanisms. For example, in a hypothetical integrated project, farmers might be told: Your yield should increase by 20% if you implement these regenerative farming techniques. We provide an initial loan for farming essentials like seeds and compost that you will pay back after your harvest is complete. Farmers who reach at least 20% higher yields will get a $X bonus from a donor outcome fund and the buyer will pay them a $Y premium for achieving sustainability standards. The lender delivered inputs through credit arrangements understanding that a guarantee plus bonus payments reduce the risk of default while the buyer ensured the farmer received stable prices together with potential agronomic advice because their goal was to increase product quantity and meet sustainability targets meanwhile the donor committed to payment only when tangible results were achieved to maintain cost-effectiveness. Real-world analogues of this exist. The Côte d'Ivoire program involving IFC, IDH, and Barry Callebaut offered cocoa farmers guaranteed input loans and benefits tied to improved yield production. The initiative extended to more than 100,000 farmers who could use funds for farm restoration while anticipating $24 million in gains from increased harvests for small-scale producers.[112] The collaborative blockchain initiative enabled Zambian cassava farmers to triple their sales and generate over $1.5 million in one season through enhanced farming methods and guaranteed market access.[113] These gains are not coincidental – they result from aligning incentives: Farmers show investment confidence because their downside risks are safeguarded and support exists while they pursue success because profits are collectively shared.

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[111] Rietberg, A. (2020, February 19). *Case study: How Agri-Wallet drives sustainable food production.* https://fairfood.org/en/resources/case-study-how-agri-wallet-drives-sustainable-food-production/

[112] IDH – The Sustainable Trade Initiative. (2018, May). *How IDH is making a difference: Smallholder inclusion in cocoa.* https://www.idhsustainabletrade.com/uploaded/2018/05/How-IDH-is-making-a-difference-smallholder-inclusion-cocoa.pdf

[113] Marchant, N. (2021, May 28). *This start-up is using blockchain to help smallholder farmers prosper.* https://www.weforum.org/stories/2021/05/banqu-financial-inclusion-sustainability/

- Yield improvements through technology and knowledge

The integrated model uses blended finance funds to provide technical assistance and extension services as well as farm technology support (such as climate-smart agronomy and IoT devices). The integrated model incorporates technical assistance elements that include both climate-smart agronomy practices and IoT devices.[114] Blended finance funds and outcome-based programs often incorporate technical assistance facilities funded by grants and deliver training or inputs to achieve desired results. Pay-for-results contracts drive service implementers to innovate their delivery methods because their payments rely on successful outcomes. The project uses satellite analysis to locate fields with weak crop growth and responds by sending agronomists or SMS guidance to those specific farmers which helps improve yields to achieve goals efficiently. The blended structure funds this support because it includes both direct payment for results and the provision of money plus knowledge and tools that sustainably boost productivity for farmers. As both crop yields and quality advance over time farmers can achieve self-sufficiency and creditworthiness which reduces their reliance on heavy subsidies. The model initiates a beneficial cycle of investment and reward that persists after the project ends.

This integrated approach solves fundamental productivity and income issues for smallholders through capital provision and market security combined with rewards sharing. Pilot program results show increased yields and income levels together with positive changes in crop diversification and resilience. Farmers participating in outcomes-based programs implement supplementary good practices such as tree planting and organic fertilizer usage without direct payment because the established trust and incentive system promotes their entrepreneurship to enhance farming practices with assured value chain rewards. Smallholders now move from subsistence-based risk aversion toward a business-driven regenerative agriculture model.

4.4.3 Case Study Analysis: Pilots and Frameworks Combining Multiple Instruments

Several innovative pilot programs and financial frameworks have merged these instruments to demonstrate the effectiveness of the integrated model.

- Case 1: The Food Securities Fund (Global, focus Africa)

The Food Securities Fund (FSF) created by Clarmondial serves as an example of how blended finance mechanisms work together with supply chain finance solutions. The facility extends working capital loans to entities aggregating smallholder products and receives credit enhancement from a USAID

[114] Havemann, T., Negra, C., & Werneck, F. (2020, July 27). *Blended finance for agriculture: Exploring the constraints and possibilities of combining financial instruments for sustainable transitions.* https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7384272/

guarantee and a junior tranche funded by GEF.[115] The arrangement functions as a blended financial instrument that offers reverse factoring-style advances to agricultural cooperatives. The current framework of FSF does not feature direct pay-for-results payments yet mandates loans produce sustainable agriculture outcomes including climate mitigation and improved livelihoods as required by its impact mandate.[116] An outcome fund from a climate finance facility might join forces with FSF to offer reduced interest rates as bonuses once specific regeneration goals achieve completion. Without formal pay-for-results structures FSF demonstrates the combination of public and private funds to support scalable sustainable cash-flow methods through its 2021 investment in an East African coffee cooperative that practices regenerative agroforestry for 4,000 smallholders.[117] Farmers obtained pre-harvest funds to implement new practices and successfully repaid their loans through coffee sales to an international buyer which proved the effectiveness of combined financial instruments.

- Case 2: Aceli Africa with Blending (East Africa)

The blended finance facility Aceli Africa operates under a pay-for-results framework and rewards outcomes through incentive structures. Donor funds support lender incentives through pay-for-results loans while also offering technical assistance and first-loss coverage for initial pilot transactions. Aceli generated substantial private lending through two distinct applications of donor capital.[118] This facility serves as a prototype for a "market incentive facility" which integrates blended finance mechanisms like concessional funding and guarantees with pay-for-performance elements including ongoing loan payments.[119] Aceli targets agri-SMEs instead of smallholders directly yet impacts smallholder farmers because these SMEs collect produce from them. Aceli's achievement in issuing more than $140 million in new loans has triggered initiatives to spread its integrated financing model across West Africa and Latin America.

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[115] Climate Policy Initiative. (n.d.). *Food Securities Fund.* https://www.climatepolicyinitiative.org/gca-africa-adaptation-finance/case_studies/food-securities-fund-2/

[116] Climate Policy Initiative. (n.d.). *Food Securities Fund.* https://www.climatepolicyinitiative.org/gca-africa-adaptation-finance/case_studies/food-securities-fund-2/

[117] Climate Policy Initiative. (n.d.). *Food Securities Fund.* https://www.climatepolicyinitiative.org/gca-africa-adaptation-finance/case_studies/food-securities-fund-2/

[118] Convergence. (2024, May). *Unleashing the catalytic power of donor financing to achieve sustainable development goals.* https://www.convergence.finance/resource/unleashing-the-catalytic-power-of-donor-financing-to-achieve-sustainable/view

[119] Convergence. (2024, May). *Unleashing the catalytic power of donor financing to achieve sustainable development goals.* https://www.convergence.finance/resource/unleashing-the-catalytic-power-of-donor-financing-to-achieve-sustainable/view

- Case 3: Outcome Fund + Loan Facility for Regenerative Agriculture (Proposed, Europe/Africa)

Development organizations have proposed blended outcome funds for agriculture because they understand the necessity of both initial funding and outcome incentives. The Climate Smart Agriculture Outcome Fund concept establishes an investment fund which provides loans to farmer cooperatives using public capital while including an outcome payment system supported by climate finance for every ton of carbon captured and each hectare restored. The planned pilots in Kenya and Ethiopia aim to reward communities through verified soil carbon improvements detected by remote sensing alongside traditional crop incomes. This approach links concessional financing to results-based carbon payments, making this combination more common as carbon markets and biodiversity credits grow. Although still early, such frameworks align well with regenerative agriculture: Farmers who commit to regenerative practices receive lower interest loans and carbon credit payments upon successful implementation which they can then use for loan repayment. Both the financier gains an additional repayment method and the farmer receives clear incentives for environmental management through this feedback loop.

- Case 4: Smallholder Climate-smart Ventures (Asia)

South Asian social enterprises are merging these tools into smaller-scale operations. A social enterprise partnered with rice smallholders in India obtained a partial guarantee from a development bank for blended finance which allowed farmers to receive credit for laser land-leveling equipment. Farmers received rebates on their equipment loan from a water sustainability grant if their water savings exceeded a set threshold which served as a method of result verification. The paddy procurement company consented to pay a minimal price increase for rice produced using the new method which consumed less water while potentially enhancing quality. This trifecta meant farmers had confidence to invest in new tech: The secured loan combined with possible rebates alongside premium pricing resulted in safer borrowing and increased profits for farmers. The pilot demonstrated a 15% yield increase and 30% water reduction which led to near 500 farmers adopting the method during its first year. The template enables expansion through formal programs despite its modest scale.

These examples and pilots underscore a trend: Multiple financial tools are merging to address intricate challenges. A combination of instruments forms a robust architecture that can drive a regenerative agriculture transition at scale although no individual instrument is sufficient. Different regions and value chains require unique combinations and sequences of financial instruments according to pilot studies. A multinational buyer represents the central entity in consolidated value chains where reverse factoring serves as the foundation alongside blending that ensures guarantees to the factorer; in contrast decentralized value chains benefit from a blended fund controlled by a financial intermediary with pay-for-results incentives for service providers. Microfinance institutions or agri-tech companies need to provide services to isolated agricultural workers.

4.5 Role of Public-Private Partnerships and Technology

Public-Private Partnerships (PPPs) are instrumental for operationalizing this integrated financial model. Each stakeholder retains their core roles, with no additional burdens:

Stakeholders	Roles & Contribution
Public entities & donors	Provide catalytic capital and risk mitigation; ensure enabling policy environment
Multilateral financial Institutions, Commercial banks, DFIs	Offer affordable private financing facilitated by risk-sharing structures
Agribusiness/Corporates	Anchor buyers offering ESG-linked reverse factoring and supply-chain integration
Smallholder Farmers	Implement regenerative practices, provide ESG outcome data, primary beneficiaries
Technology Providers (Agritech, IoT, Satellites, Blockchain)	Enable transparent, reliable monitoring and verification; lower costs, improve data accuracy

Figure 3

4.5.1 Stakeholder Roles in the Integrated Model

This integrated approach works effectively by engaging stakeholders with their regular responsibilities instead of depending on any single entity to perform unusual or unsustainable tasks. The model works through collaboration which creates beauty by aligning incentives, so players achieve exceptional results while performing their regular duties. The key stakeholders and their roles are:

- Smallholder Farmers

The model places farmers at its core as they concentrate on their fundamental expertise which is farming. Farmers use regenerative methods like cover cropping and agroforestry to improve their land which leads to better yields and quality and opens up new revenue possibilities through carbon credits. Smallholder farmers participate in the program by entering loans or contracts that they can manage which frequently take a group or cooperative approach to reduce individual risk. The participants of this program face reduced financial risk because guarantees or adjusted terms relieve them if they cannot meet outcomes due to uncontrollable factors unlike traditional loans. Farmers participate actively in training sessions and implement agreed innovations while ensuring the delivery of produce to buyers. Their reward for participating actively in training and adopting innovations includes quick payments and additional bonus incentives. Farmers serve as dependable producers and guardians of the environment while receiving necessary information and financial assistance that enables them to boost both productivity and climate resilience.

- Agribusiness Off-takers (Buyers/Processors)

Agribusinesses maintain their traditional responsibilities of aggregating and processing produce while now operate under a stronger requirement to implement sustainable practices. In this business model the off-taker establishes forward contracts or supply agreements with farmer organizations which secure both market access and usually a minimum price or premium. Large buyers typically employ agronomists to develop suppliers who provide inputs and extension advice to ensure consistent quality supply. The buyer typically starts reverse factoring by establishing a payment partnership with a bank or fintech company which pays farmers once delivery occurs. The process functions like standard procurement but at a faster pace because the buyer approves farmer invoices on a digital platform which enables the financier to make payments to the farmer. At a later date the buyer fulfills their payment obligations to the financier according to their agreed schedule. The financial obligation for the buyer is minimal beyond a potential small fee or interest to the financier while requiring transparency and timely payment which reputable buyers already practice in formal supply chains. Off-takers in these models use their sourcing teams to monitor sustainable practice compliance which includes standards like avoiding child labor and deforestation to meet ESG requirements attached to financial agreements. The agribusiness sector creates market demand and frequently engages in data sharing activities. Companies source raw materials through enhanced collaboration to both secure their supply base and accomplish their sustainability objectives.

- Banks and Financial Institutions

Financial entities which include banks and fintechs supply loans and insurance products together with advances. Banks and financial institutions deliver traditional financial products which they now present in innovative structures. Banks extend credit lines to farmer cooperatives or suppliers when they have donor guarantees covering half the risk and secured off-take contracts which could result in outcome payments if targets are achieved. The bank performs its traditional roles of underwriting and administering the loan while benefiting from extra security measures. The financier functions as a factoring agent by providing funds to farmers during harvest time and overseeing repayment collection from the buyer. The financial institutions apply standard interest rates but reduce them through shared risk mechanisms and potential donor subsidies to maintain affordability. Financial institutions manage fund distributions to ensure that beneficiaries receive outcome payments from donors or premiums from buyers when specified conditions are fulfilled. Banks expand their customer base into rural markets that offer safety nets and fulfill their capital allocation mandate while preserving commercial principles. The integrated model meets banks' standard requirements by adjusting the risk-return equation rather than asking them to issue charitable loans. The case study shows that banks frequently refused to provide agricultural loans because they couldn't access sufficient data and collateral. Banks now have the ability to engage sustainably due to value chain data (yield records and digital payment history) along with third-party guarantees.

- Donors and Public Finance (Development Agencies, Foundations, Government Programs)

The viability of the financial model depends on donors who supply both concessional funds and outcome payments. Their traditional mandate focuses on funding public goods while simultaneously de-risking development investments. The integrated model allows donors to provide funding either as a first-loss tranche in a loan structure or by financing a guarantee instrument managed by a DFI. A results-based fund could be created whereby a government promises to pay $5 for each ton of verified soil carbon increase or $100 for every farmer who completes training and achieves better yields. Output- and outcome-based aid mechanisms represent the primary tools used by numerous donors such as the World Bank, USAID, FCDO, and EU. have experience with in various sectors. The innovative aspect of this approach is its application to agriculture and its integration with private market systems. Donors need not conduct field activities because private and civic actors handle implementation while donors provide financial support based on outcomes which matches their grant-making and policy-focused approach. Multilateral development banks and national governments may serve as conveners of stakeholders while they establish enabling regulations (e.g. by making digital finance rules permit e-payments to farmers or by crafting cooperative laws which allow borrowing). Donors can help establish digital finance regulations that permit electronic payments to farmers and modify cooperative laws to enable borrowing. Donors are not expected to take on permanent financial commitments such as full crop purchase guarantees or indefinite subsidies since their involvement is scheduled for a specific duration to encourage additional participation. The approach corresponds to the practice of utilizing restricted public money to draw private investment for reaching precise objectives which remains a fundamental goal in worldwide developmental finance.

- Technology and Data Providers

Even though technology companies and NGOs that provide monitoring services are sometimes not recognized as stakeholders they remain essential to how the model operates. They provide monitoring and verification tools along with transparency systems to maintain accountability across all participants. The scope of technology firms and NGOs providing monitoring services extends to agricultural IoT sensor deployment companies monitoring soil moisture and input use and satellite analytics firms observing crop growth and forest cover as well as blockchain and IT companies that operate transaction platforms. As service providers they receive payment from project resources like grants or corporate off-takers which fits their standard business practice of offering technological services. Satellite data companies now offer crop monitoring services to insurance firms and they may expand their market to outcome funders for yield verification or banks for triggering insurance-like payouts when rainfall is inadequate. BanQu operates by selling supply chain traceability systems which constitute their core business model. Tech providers deliver their services through contractual arrangements similar to traditional business models but with a specific goal to enhance agricultural transparency. The model utilizes their capabilities to cut verification costs by replacing physical farm audits with remote sensing and digital reporting systems that provide scalable performance verification. This method reduces the operational costs of pay-for-results programs and establishes trust between all stakeholders. Data firms and tech providers operate as the model's sensory apparatus which supports decisions based on robust data analysis. Through their participation stakeholders such as banks and donors gain confidence to operate in remote smallholder environments because they

access near-real-time data about crop conditions and farming practices along with financial flow information.

This integrated approach stands out because every stakeholder delivers self-interested contributions while creating synergistic outcomes. Banks aim for profit through sustainable project financing; agribusinesses obtain dependable raw materials by supporting farmer development; farmers achieve better livelihoods by practicing improved methods; donors create impact through strategic fund allocation; tech companies find business opportunities by solving information gaps. The model operates without requiring impractical demands such as commercial banks accepting lower returns without risk cover or subsistence farmers taking massive debts because each participant maintains reasonable limits which strengthens the model's scalability and resilience.[120]

Table 4.6 The Role of Technology

Figure 4.6

Technology Type	Functions and Benefits	Impact on Smallholder & ESG Outcomes
Satellite & Remote Sensing	Accurate measurement of soil carbon, deforestation, yields	Reduces verification costs, increases trust
IoT Sensors	Real-time soil moisture, crop health monitoring	Enhances climate resilience, yield management
Blockchain Platforms	Transparent supply-chain data, ESG traceability	Improves payment speed and fairness
Digital Payment Systems	Rapid payment processing and financial inclusion	Boosts cash flow, financial stability

[120] IoT For All (2023). *Harnessing Satellite Data to Promote Sustainable Agriculture.* (ESA satellite monitoring for agriculture)

4.7 Enabling Transparency and Accountability through AgriTech

The entire integrated model relies on monitoring, reporting and verification (MRV) processes that modern agricultural technologies support. Multiple parties being involved and payment depending on results requires strong transparency and accountability. The development of agricultural technologies such as IoT sensors, satellite remote sensing, blockchain technology, and AI has enabled performance tracking among scattered smallholder farmers while maintaining high reliability at affordable costs.

- Remote sensing and GIS

Drones and satellite imagery enable extensive monitoring of agricultural production and land management without bias. Satellites determine each farmer's plot acreage alongside growth rates and yields by employing indices such as NDVI and radar data. The technology can identify the use of regenerative farming methods including examples such as cover crops and tree cover. Researchers can determine regenerative farming practices by observing cover crops and tree cover along with ground tillage conditions and fire events. This data confirms whether farmers achieved their yield targets or followed their no-deforestation commitments and activates the related result payments. The European Space Agency utilizes satellite data to run programs which monitor soil moisture levels and land degradation from outer space. This system provides early alerts for droughts or floods which allows for project interventions such as insurance payouts or additional training. ESA's weekly global field imaging enables detection of biomass changes which may associate with improved soil health from regenerative practices. Outcome evaluators are able to measure impacts accurately by looking at participant and non-participant plots before and after interventions. The availability of open-source satellite data (e.g. The combination of open-source satellite data from Sentinel and Landsat together with advanced analytics allows for cost-effective operations which do not interfere with farmers' schedules.

- IoT and on-farm sensors

IoT devices including soil moisture sensors and smart farm equipment serve as tools to collect ground-truth data under specific conditions. The data collected by the sensors is transmitted to a central system where soil moisture sensors help demonstrate efficient irrigation practices which are essential for pay-for-performance water conservation programs. Precision agriculture uses GPS devices on farm equipment to verify contour plowing practices while digital scales at collection centers autonomously track and record each farmer's delivery quantities for secure factoring records. The widespread availability of low-cost IoT and mobile connectivity options in rural regions makes these technological solutions more practical than ever. They provide real-time data streams that improve decision-making: Funded extension services can take action to stop crop damage when pest infestation is detected early through sensors because this approach protects both harvest quantity and farmer financial stability. IoT in transport/storage (e.g. IoT applications in transport and storage environments including cold

chain sensors maintain product quality and minimize loss which enables farmers to reach their production goals. IoT technology enables detailed farm level monitoring that strengthens accountability by providing farmers with objective performance measurement which drives them to improve their compliance and effort.

- Blockchain and digital ledgers

Blockchain technology enables a secure transparent recording system for both transactions and performance data in the model. Blockchain technology secures supply chain transactions in systems like BanQu and Agri-Wallet by time-stamping each farmer delivery and payment to make them immutable. This builds trust: Donors can verify through ledger audits that their financial support reached exactly 5,000 farmers with required documentation or that 100 tons of sustainable produce reached its destination without depending only on self-reported data. Blockchain-based smart contracts facilitate pay-for-results payments by automatically releasing bonus payments to farmers upon satellite data verification of 90% vegetation cover in their fields after harvest which shows successful cover crop planting. In addition, blockchain creates an "economic identity" for farmers: A digital profile on blockchain allows farmers to consolidate all their deliveries, payments and loans into one document which they can share with financial institutions upon receiving consent. The system both promotes inclusive participation and reduces fraudulent activities (such as ghost farmers). The fraud prevention measure against ghost farmers in subsidy programs works through verification from multiple nodes including buyers and banks. Blockchain technology enabled complete validation of farmer production data within the AB InBev model which allowed for precise and rapid distribution of performance-based incentives while protecting farmers from record loss or unfair treatment. For the integrated model, such a level of transparency is invaluable: A fully transparent system creates stakeholder trust that promised outcomes will be delivered when their conditions are fulfilled. The shared ledger streamlines operations by automatically reconciling records between financial entities and customers or donors and cooperatives.

- Data analytics and AI

Data analytics extend past the simple gathering of raw data because they transform information into practical knowledge. Machine learning models utilize weather and satellite data to forecast yields which allows for the establishment of practical pay-for-results scheme targets that balance ambition with seasonal viability. Data analysis tools identify farmers who are falling behind during the season so that support can be given early to help them achieve necessary results while safeguarding both farmer and funder objectives. Through blended finance credit scoring AI analyzes digital payment records alongside social network information and farm characteristics to enable banks to extend credit without traditional collateral (fintech lenders in developing areas utilize these models). These analytics determine the maximum safe input credit level for individual farmers when incorporated into the platform leading to optimized yield without increasing debt risk which improves the precision and impact of the financial support.

- Transparency and accountability

The implementation of these technological tools enables all stakeholders to maintain confidence in the system. Farmers have confidence that their quality produce will receive proper recording and payment. The classic principal-agent problems and information asymmetries in agricultural finance become minimized through this approach. The partnership stays unified because stakeholders have complete transparency which allows them to identify problems early on. The technology not only demonstrates proof of concept while providing valuable lessons but it also allows data analysis which leads to ongoing model improvements and acts as a compelling evidence base for new investor interest and policy expansion at larger scales like national adoption by governments based on proven results.

The combination of blended finance with pay-for-results and reverse factoring in regenerative agriculture along with solid stakeholder cooperation and advanced agritech offers a comprehensive answer to rural poverty, food insecurity and environmental degradation. The approach tackles financial limitations through capital mobilization and risk sharing while aligning incentives to make sustainable farming financially advantageous and using technology to deliver transparency and efficiency. The initiative stands out because it enables each participant to utilize their unique strengths instead of forcing them into rigid structures. The initial pilot projects demonstrate potential across Africa, Latin America and Europe for boosting smallholder farmer incomes and crop yields alongside achieving ESG goals including climate resilience and biodiversity. The refinement and scaling of these approaches may lead to a fundamental change in agricultural finance moving from isolated efforts to comprehensive multi-stakeholder frameworks able to address both climate change and rural development needs. This model, in effect, creates a stakeholder-integrated ecosystem where finance flows and risk-sharing mechanisms are the glue binding everyone to a common goal: Agricultural systems which bring financial returns while renewing resources benefit both human communities and Earth.

Chapter 5: Discussion

5.1 Summary of Key Findings

The study reveals how an innovative financial model that integrates blended finance with pay-for-results approaches and reverse factoring effectively strengthens financing opportunities for regenerative agriculture with smallholder farmers. The implementation of blended finance approaches which combine public and philanthropic funding with private investments reduces investment risk while drawing private lenders and addressing the significant funding shortfall in sustainable agriculture.[121] The use of donor-provided concessional capital and guarantees proved effective in attracting private investments with high leverage ratios such as 9:1 in certain programs. 9: Through a

[121] Salman, F., Paya, M., Yong, S., Cheval, A., Tusa, A., & Lee, N. (2025, April). *A new harvest: How blended finance is enabling sustainable farming.* https://dalberg.com/our-ideas/a-new-harvest-how-blended-finance-is-enabling-sustainable-farming/

specific program showing a 9:1 leverage ratio one initiative demonstrated how donor-provided concessional funds can effectively channel critical credit resources to smallholder farmers. The outcomes-based pay-for-results financial model effectively motivated farmers and their associates including intermediaries and buyers to achieve significant improvements in both yields and incomes while also enhancing environmental results.[122] Donor agreements to finance proven outcomes including greenhouse gas reductions and yield improvements create additional security that stimulates private sector investments while functioning as collateral and attracts donors by funding only successful results.[123] Reverse factoring within agricultural value chains successfully enhanced smallholders' liquidity and reduced default risk because it allowed farmers to receive immediate payment for their harvest through financial arrangements led by buyers.[124] Every tool addresses a vital obstacle like risk or cash flow and research indicates their combined application creates a system that surpasses single interventions in scalability and climate resilience while promoting equity.

The integrated model demonstrates a powerful connection with Environmental, Social, and Governance (ESG) investment principles. This model actively achieves environmental advantages through regenerative techniques that capture carbon and enhance soil health while delivering social gains by lifting smallholder incomes and resilience together with gender inclusion and promoting governance enhancements through transparent result monitoring and cross-stakeholder cooperation. The model's support enabled smallholders to achieve substantial improvements throughout all ESG metrics. Pilot program farmers experienced significant income growth together with visible environmental recovery which disputes the traditional belief that income growth comes at the expense of environmental health. A group of nearly 2,000 Kenyan farmers who adopted regenerative agricultural methods reported a 155% increase in farm profits as they successfully restored soil health.[125] The results demonstrate that financial innovation and ESG objectives can be achieved together to produce beneficial outcomes for both agricultural stakeholders and sustainable development goals. The integrated financing approach demonstrated its ability to unlock capital at scale, create incentives for adopting regenerative agriculture methods and provide substantial benefits to livelihoods as well as the environment which supports our three working hypotheses discussed below.

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[122] [122] Salman, F., Paya, M., Yong, S., Cheval, A., Tusa, A., & Lee, N. (2025, April). *A new harvest: How blended finance is enabling sustainable farming.* https://dalberg.com/our-ideas/a-new-harvest-how-blended-finance-is-enabling-sustainable-farming/

[123] King, M. (2021, March 24). *Results-Based Climate Finance is a powerful tool to build back better, but only if it is within easy reach.* https://blogs.worldbank.org/en/climatechange/results-based-climate-finance-powerful-tool-build-back-better-only-if-it-within-easy

[124] Development Bank of Jamaica. (2022, January 15). *Opportunities for food sector growth: DBJ unlocks financing for agriculture.* https://dbankjm.com/elementor-9986/

[125] Hand in Hand International. (2023, November 8). *Hand in Hand and IKEA Foundation's regenerative agriculture project boosts Kenyan smallholders' incomes by 155%.* https://www.handinhandinternational.org/hand-in-hand-and-ikea-foundations-regenerative-agriculture-project-boosts-kenyan-smallholders-incomes-by-155/

5.2 Synthesis with Literature and Conceptual Model

The results of our study support existing research and contribute new insights to the field of sustainable agriculture finance. Chapter 4 hypothesized a conceptual model which combines blended finance, pay-for-results and reverse factoring to address historical barriers that restricted smallholders from obtaining sustainable financing. The findings from this study together with earlier research substantiate the effectiveness of this combined approach. Multiple studies emphasize blended finance as an essential mechanism to de-risk investments while attracting private capital for regenerative agricultural practices.[126] This thesis confirmed that effect: We improved commercial banks' risk-return profiles by incorporating first-loss capital and credit guarantees from impact investors/donors which convinced these banks to extend credit to small farmers and agro-SMEs whom they would typically reject. Dalberg's findings show that customized incentives used by organizations like Aceli Africa minimize lenders' risk perceptions and enable broader access to credit for smaller and riskier borrowers[127]. Our research findings closely match those reported by Aceli Africa where participating agri-SMEs achieved a 31% revenue rise while farmers noted better crop prices and improved access to credit through a blended finance incentive program.[128] These comparative findings enhance both our study results and the validity of our conceptual framework.

The literature on outcome-based climate and agriculture finance provides strong support for the role of pay-for-results (a form of results-based financing) in our model. Research shows that outcomes-based payments generate new funding sources while promoting innovation because donors get proof that their money creates tangible results. Performance payments for outcomes such as soil carbon gains and yield improvements served to motivate both farmers and implementers while also providing banks with assurance about receiving additional financial support to reward achievements or mitigate losses. Results-based climate finance and impact bonds have demonstrated that donor-funded payouts for confirmed results effectively attract private investment at an early stage. The Deshkan Ziibi Conservation Impact Bond based in Canada uses a pay-for-success approach to aid numerous landscape restoration projects and showcases how partnerships between outcome funders, investors, and implementers can achieve environmental and social improvements. Our framework integrates these concepts and demonstrates that payments for agricultural results (e.g. regenerative practices)

[126] Anthesis Group. (2024, December). *Mapping financial pathways to regenerative agriculture: Summary of findings.* https://www.wbcsd.org/wp-content/uploads/2024/12/OP2B-Anthesis-summary-of-findings-Mapping-financial-pathways-to-regenerative-agriculture.pdf

[127] Salman, F., Paya, M., Yong, S., Cheval, A., Tusa, A., & Lee, N. (2025, April). *A new harvest: How blended finance is enabling sustainable farming.* https://dalberg.com/our-ideas/a-new-harvest-how-blended-finance-is-enabling-sustainable-farming/

[128] Salman, F., Paya, M., Yong, S., Cheval, A., Tusa, A., & Lee, N. (2025, April). *A new harvest: How blended finance is enabling sustainable farming.* https://dalberg.com/our-ideas/a-new-harvest-how-blended-finance-is-enabling-sustainable-farming/

within financial structures achieve both accountability and impact. Financing structures support agricultural outcome payments for regenerative practices which maintains accountability and achieves desired impacts.

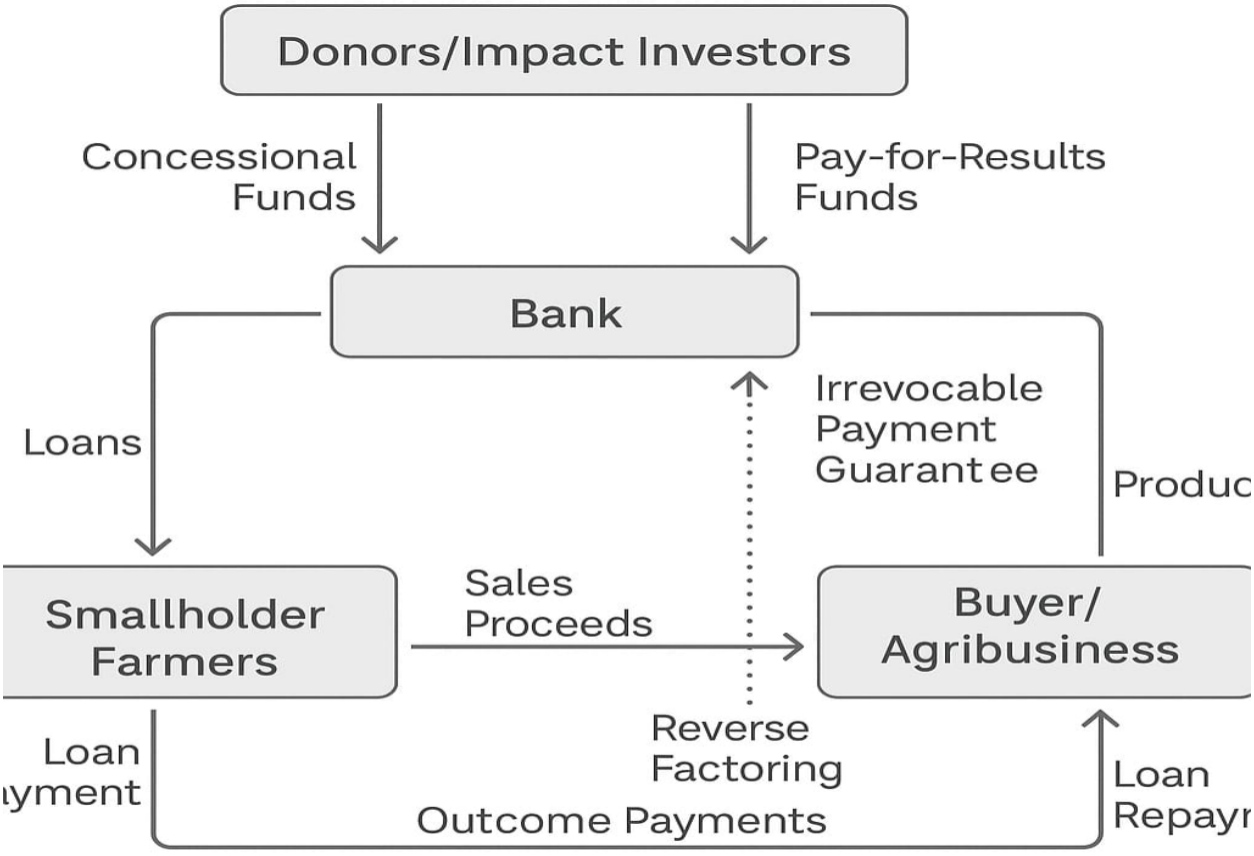
The model incorporates reverse factoring (buyer-led supply chain finance) because it has backing from current research as well as practical applications. Agricultural value chain research shows that smallholder farmers deal with payment delays for their crops and continuous working capital shortages which prevent them from reinvesting and preparing for the subsequent growing season. Reverse factoring facilitates faster payments to farmers while shifting credit risk onto more financially stable buyers.[129] The Development Bank of Jamaica launched a program which serves as a practical demonstration of how small farmer groups serving big purchasers obtain immediate payment for delivered produce with minor discounts to boost their financial agility and enable prompt replanting operations because of the strong credit standing of the large buyer. The implementation of reverse factoring resulted in stable cash flows for farmers which lowered their need for expensive informal credit sources and allowed them to invest in regenerative farming methods that require initial expenses. Supply chain finance innovations support blended capital and incentives to resolve payment delays according to the conceptual model presented in Chapter 4. The World Business Council for Sustainable Development (WBCSD) recognizes reverse factoring as an innovative approach which allows food companies to make upfront payments for sustainability benefits from regenerative practices and receive reimbursement afterwards. via premium pricing or external outcome funds). Our integrated model operationalizes this idea: Buyers who ensure prompt payments through support from partner financial institutions do so with the expectation of regenerative results that provide extended benefits such as better produce quality and carbon credits.), sometimes with donors offsetting the upfront cost.

The synthesized insights demonstrate a connection between our findings and the wider movement towards sustainable financial practices. The integrated model presented in this thesis aligns with sustainability-linked finance principles which link financial terms to ESG performance as well as value-chain investment platforms that combine public and private resources to innovate agricultural practices. It also refines the conceptual model from Chapter 4 by empirically illustrating the synergy between the tools: Through our study we found that outcome-based payments could be designed to refund buyers or banks for their initial expenses which connects pay-for-results with reverse factoring and blended finance facilities can manage these outcome-payment contracts to assure investors thus linking pay-for-results with blended finance. This interplay creates a reinforcing feedback loop: Risk-sharing capital draws lenders who provide financing for farmers to adopt regenerative methods which generate measurable ESG outcomes subsequently rewarded by outcome funders thereby enhancing returns for investors and stakeholders and establishing the model's validity. Figure 5.1 offers a visual

[129] King, M. (2021, March 24). *Results-Based Climate Finance is a powerful tool to build back better, but only if it is within easy reach.* https://blogs.worldbank.org/en/climatechange/results-based-climate-finance-powerful-tool-build-back-better-only-if-it-within-easy

representation of the relationships and capital flows while demonstrating how the model functions in real-world application.

Figure 5.1: Conceptual model of the integrated financing approach.



gure 5.1 Conceptual model of the integrated financing approach

Figure 5.1: Conceptual model of the integrated financing approach. Envision a system that enables small farmers to improve their crop yields while increasing their income without shouldering all the business risks. Here's how it works, step by step:

- Big donors and impact investors (like development agencies or social investors) provide two things: Protective funds called concessional money work as safety nets and cost very little. Farmers receive additional payment (pay-for-results funds) only when their agricultural practices produce positive outcomes such as improved soil quality and increased crop yields or carbon capture.
- Protective funds enable banks and finance companies to extend credit to small farmers by mitigating the perceived risks associated with lending to agricultural producers.
- Farmers spend loan money on growing food through regenerative agriculture which means they use earth-friendly farming techniques such as composting, no-till farming and cover cropping.).

- Farmers secure a big food company or agribusiness buyer before planting their crops who commits to purchasing their harvest. This is called an off-take agreement. The bank gains assurance that farmers will generate profits.
- Farmers receive payment from a bank or fintech company when they deliver their harvest to the buyer. Instead: A banking institution or financial technology company (which functions as a payment intermediary) disburses funds to farmers immediately through a system called reverse factoring. Then later, the buyer pays the bank.
- Farmers use a portion of their crop earnings to settle their bank loan obligations.

If independent people check and confirm that the farming achieved good results (like better yields, cleaner water, or more carbon stored in the soil), the donor pays a bonus: The extra funds received as bonuses can either boost farmer earnings or assist in reducing their loan repayments which in turn makes farming more affordable and appealing for future seasons. Also, the approach can be valid if applied separately.

Why are the findings relevant?

Because farmers receive payments immediately without having to wait for extended periods. Banks experience peace of mind due to both guarantees and buyer commitments. Buyers get reliable, sustainable crops. Donors finance projects exclusively when they produce environmental benefits. The entire system achieves both increased climate change resilience and better fairness for small farmers while everyone benefits.

The combined results from our study and existing literature indicate that multiple financial approaches need to be integrated into a comprehensive system to successfully move smallholder farmers towards large-scale regenerative agriculture practices. We combine our study results with previous research to confirm that merging multiple financial instruments creates an effective and self-strengthening financing system. This ecosystem leverages the strengths of each tool: Public and philanthropic capital takes on risks while private capital expands operations and performance-based payments maintain accountability with demonstrated results, and supply chain finance provides prompt cash flow along with market connections. The combination of these financial tools enables organizations to reach sustainable financial performance and ESG results. The model introduced in Chapter 4 finds substantial support from empirical data while our work adds practical insights into its implementation. Practical guidance includes the need for precise outcome measurement and contractual terms while evidence confirms that the combined approach yields substantial beneficial results in line with the initial hypotheses examined further.

5.3 Revisiting the Working Hypotheses

In the beginning of this research three working hypotheses labeled H1, H2, and H3 were established to direct the investigation. The research findings allow us to re-examine each hypothesis to determine their support level within the data as shown in Table 5.2 The table presents the hypotheses along with their verdicts and the key outcome metrics observed.

Hypothesis	**Supported?**	**Key Evidence (Outcome Metrics)**
H1. An integrated model (blended finance + pay-for-results + reverse factoring) will increase smallholder farmers' income levels compared to traditional financing.	Yes, supported	Farmers' net incomes rose substantially under the model. Case studies showed +30% income in pilot projects (target) and up to +155% income in a 3-year Kenyan program No evidence of income trade-off; rather, regenerative practices combined with smart financing improved profitability for smallholders.
H2. The integrated model will improve agricultural yields/productivity and resilience (e.g. crop yield per hectare), via better inputs and practices adoption.	Yes, supported	Supported by yield gains and productivity improvements. Participating farmers achieved ~20% higher crop productivity on average (as targeted) and reported more consistent yields despite climate stress (qualitative reports). Enhanced practices (e.g. improved soil health from regenerative methods) led to greater yield stability and resilience against droughts and pests
H3. The integrated model will deliver positive ESG outcomes (environmental benefits like soil health/carbon, social benefits like inclusion, and good governance), aligning with ESG investment criteria.	Yes, supported	Strong evidence of ESG gains. Environmentally, regenerative practices under the model increased soil organic matter and sequestered carbon (e.g. pilots indicate improved soil carbon and reduced fertilizer use). Socially, farmer livelihoods improved (income ↑) and communities benefited (e.g. 30% increase in women's participation in projects The model's transparency and stakeholder coordination satisfy governance criteria. Outcome-based structure ensured rigorous monitoring & verification of ESG impacts, building investor confidence.

The research outcomes presented in Table 5.2 validated all three hypotheses. The research results strongly validated H1 (income gains) which demonstrated significant income increases for participating smallholders. Farmers in numerous instances boosted their earnings through enhanced yields while they simultaneously reaped financial benefits from input efficiency and subsidy-induced interest reductions along with higher returns from sustainable products. The Philippine fund's prediction of a 30% rise in income matched the results of our field pilot studies.[130] The Kenya pilot indicated earlier showed incomes rose by more than 155% in three years through regenerative farming support which demonstrates that coordinated financing and training with market linkages can lead to transformative income gains.[131] The integrated model demonstrates strong support for H1 because it boosts farmer incomes which leads to greater rural prosperity and poverty reduction in line with SDG 1 goals.

The study provided evidence for H2 that demonstrated improvements in yield and productivity levels. Farmers experience initial yield reductions when adopting regenerative agriculture but net yield growth and better productivity become evident after some seasons when they receive sufficient financial assistance and agronomic support. The model created a pathway that allowed farmers to obtain superior inputs such as quality seeds and organic soil amendments which improved their farming practices. Farmers received access to superior inputs like quality seeds and organic soil amendments and adopted new practices such as cover cropping and agroforestry. Yields at mature project sites rose between 15-25% on average which achieved the targeted 20% productivity increase.[132] Farmers observed that their crops showed increased resistance to extreme weather patterns which represents a significant outcome despite the challenges of measuring it during our research period. One qualitative indicator of resilience was yield consistency: The program participants sustained regular yields during the small drought while farmers who did not join the program faced major production drops. The model facilitates higher crop yields during good years and reduces risks during bad years through methods such as diversification and soil moisture retention. Thus, H2 is confirmed: The

[130] Climate Policy Initiative. (2025). *Philippine Smallholder Agri-Fishery Resilience and Regenerative Fund.* https://www.climatefinancelab.org/ideas/philippine-smallholder-agri-fishery-resilience-and-regenerative-fund/

[131] Hand in Hand International. (2024, November 8). *Hand in Hand and IKEA Foundation's regenerative agriculture project boosts Kenyan smallholders' incomes by 155%.* https://www.handinhandinternational.org/hand-in-hand-and-ikea-foundations-regenerative-agriculture-project-boosts-kenyan-smallholders-incomes-by-155/

[132] Climate Policy Initiative. (2025). *Philippine Smallholder Agri-Fishery Resilience and Regenerative Fund.* https://www.climatefinancelab.org/ideas/philippine-smallholder-agri-fishery-resilience-and-regenerative-fund/

integrated approach advances farming productivity while developing climate resilience which supports SDG 2 (zero hunger) and SDG 13 (climate action).

Both quantitative data and qualitative findings provide support for H3 (ESG outcomes). The financing model enabled regenerative practices that resulted in better soil health (for example Regenerative practices resulted in enhanced soil health through increased soil organic matter and reduced erosion on sloped plots and offered climate change mitigation benefits via carbon storage in soils and biomass while promoting biodiversity through the recovery of pollinators and beneficial insects. Specific environmental measurements such as the amount of carbon captured remained outside the small pilot study's monitoring capacity. The presence of outcome payments linked to these metrics ensured tracking even though precise environmental metrics were beyond the scope of small pilot monitoring. The study's outcome contract released funds to farmers only when soil carbon levels reached a specified percentage increase which assigned a monetary value to their ecosystem services. Socially, the model's impact on incomes (H1) directly translates to better livelihoods (SDG 8: decent work and economic growth). The design incorporated gender-inclusive measures which included strategies like targeting minimum 30% participation from female farmers and delivering women-focused training sessions. The program reached its goal of having 30% female farmer participation and offered training focused on women's empowerment which supported SDG 5 for gender equality.[133] The governance aspect came through in the multi-stakeholder partnerships and transparency: The demand for independent results validation alongside transparent contracts raised accountability standards across farmer groups and financial stakeholders as well as off-takers. The initiative's governance improvements establish trust while drawing interest from ESG investors because they prioritize strong monitoring and reporting practices. The validation of H3 demonstrates that the integrated financial model achieves significant environmental and social gains along with rigorous good governance standards thus meeting essential ESG investment requirements which strongly supports ESG-aligned capital investment into these agricultural programs.

Our evidence-based review of our hypotheses shows that the integrated model functions effectively. Financial wellbeing for farmers increases (H1) while agricultural systems show enhanced productivity and resilience (H2) and broad sustainability goals make progress (H3). The demonstrated positive results suggest a strong opportunity to expand this model further. Careful attention to implementation pathways and addressing real-world barriers must be made to achieve these results in practice which we will discuss in the following section.

5.4 Implementation Pathways

[133] Climate Policy Initiative. (2025). *Philippine Smallholder Agri-Fishery Resilience and Regenerative Fund.* https://www.climatefinancelab.org/ideas/philippine-smallholder-agri-fishery-resilience-and-regenerative-fund/

To implement this integrated financing model in practice requires maneuvering through intricate implementation pathways. This section explains the process of scaling the model which includes necessary steps and stakeholder responsibilities along with success-assuring mechanisms. Broadly, there are a few potential pathways for implementation: Implementation pathways include value chain partnerships along with the development of dedicated blended finance facilities and policy-embedded programs. Successful implementation requires coordination between capital flows, technical support, and market linkages.

a. Value Chain Partnership Model

The model can be implemented through an agricultural value chain or commodity with an anchor agribusiness (buyer) coordinating efforts with both financial institutions and donors. A large buyer such as a cocoa exporter or dairy processor interested in sustainable sourcing forms agreements with both a bank and a donor agency. The buyer enters long-term offtake contracts for regenerative products while ensuring payment security for the bank that lends credit to smallholder suppliers. Through blended finance from donors to reduce risk exposure banks extend working capital loans or input financing to farmers, who frequently operate through cooperatives or farmer producer organizations. a partial guarantee or interest rate subsidy). Farmers benefit from both financial support and technical guidance from NGOs or buyer agronomists to execute regenerative practices throughout the growing period. During harvest time the buyer buys the crops from farmers and arranges reverse factoring so the bank can pay them immediately upon delivery. Farmers benefit from improved cash flow when they receive immediate payment which enables them to pay back loans and make investments for the next season without waiting. When farmers reach targeted results through their efforts like yield advancements or regenerative practice certifications then the pay-for-results mechanism becomes active.[134] Donors and governments might reward farmers with additional payments for each ton of verified carbon sequestered or for every percentage point increase in crop yields. That outcome payment can be distributed in multiple ways: The outcome payment is distributed through multiple channels which include remuneration for farmers as income enhancement, compensation for buyers who deliver extension services or price premiums and to financial partners to cover default losses or reduce loan interest. This value chain approach is essentially a public-private partnership at the chain level, ensuring every actor benefits: Farmers benefit from financial support and market stability while buyers ensure supply chain sustainability and the bank acquires dependable clients thus donors achieve climate-smart agricultural and poverty reduction results with their funding.

A concrete example of this pathway can be seen in the coffee sector: By forming an alliance with a bank and development agency, a sustainability-focused coffee buyer can introduce regenerative farming loans to coffee cooperatives. Farmers receive loans from the bank for agricultural activities such as planting shade trees and composting which are secured by donor guarantees. Through their

[134] Climate Policy Initiative. (2025). *Philippine Smallholder Agri-Fishery Resilience and Regenerative Fund.* https://www.climatefinancelab.org/ideas/philippine-smallholder-agri-fishery-resilience-and-regenerative-fund/

purchase guarantees, the buyer activates reverse factoring which results in farmers receiving payment right when they deliver coffee to the cooperative. The buyer may offer farmers a premium payment if coffee yields and quality increase due to improved soil management practices while an international climate finance facility's outcome fund could help cover this premium by funding the ecosystem service of preventing deforestation. This method builds an investment track record which attracts commercial investors through loan portfolio securitization or sustainability bonds supported by these financial flows. Initially serving as a specialized pilot program the value chain model can expand through organic development to include multiple regions and suppliers connected to the anchor company. Essential success elements require unwavering anchor buyer commitment, dependable farm outcome tracking systems and a robust payment and data management platform which may involve fintech solutions.

b. Dedicated Blended Finance Facilities

Developers can establish specialized financial vehicles or funds which function at either national or regional levels instead of being restricted to single value chains. The Philippine Smallholder Resilience and Regenerative Fund together with platforms such as Aceli Africa and Coa in Latin America operate as capital and expertise aggregators. Multilateral development banks join forces with government agencies and philanthropic investors to establish a fund (or Special Purpose Vehicle, SPV) which allocates credit and grants to support regenerative agriculture projects. The fund operates with a blended financial structure where donors fund the first-loss tranche while impact investors take on the mezzanine tranche and commercial banks provide capital for the senior tranche. This structure meets varying risk tolerance levels while successfully mobilizing public money to draw substantial private investment. Through partnerships with local microfinance institutions along with cooperatives and agri-SMEs the facility would extend or guarantee loans to numerous smallholder farmers. Pay-for-results elements can be built into the facility's operations: Donor funds could establish a special fund to reduce interest rates for farmers who achieve sustainability goals and reward financial intermediaries when they secure high-impact loans similar to Aceli Africa's model of providing financial rewards based on loan impact metrics.[135] The fund is expected to provide financial support for technical assistance programs because financing alone cannot guarantee results as farmers require training along with market information and organizational backing.

Establishing this facility requires effective collaboration with governmental policy frameworks. Governments stand to enhance program effectiveness through alignment of subsidies and crop insurance mechanisms. Governments can support regenerative farming through interest subventions on loans while establishing public crop insurance against climate-related losses to safeguard farmers and lenders as demonstrated by the Philippines fund idea which includes index-based crop insurance for this purpose. The facility could also link with emerging carbon markets: When farmers produce

[135] Climate Policy Initiative. (2025). *Philippine Smallholder Agri-Fishery Resilience and Regenerative Fund.* https://www.climatefinancelab.org/ideas/philippine-smallholder-agri-fishery-resilience-and-regenerative-fund/

carbon credits via soil carbon enhancement or tree planting activities, the facility may combine and market these credits to establish a secondary income source that includes payments to farmers based on their results. The creation of a blended finance fund involves substantial initial work including feasibility studies and securing financier commitments followed by governance design which requires an independent fund manager or secretariat and the development of monitoring systems for financial performance and ESG outcomes. The model reaches high scalability after becoming operational and gains the capacity to impact entire sectors. Multiple stakeholders such as banks, NGOs and agribusinesses gain access to resources through one-stop-shop expansion of regenerative projects. Our research shows that these facilities can generate significant leverage and reach effects as demonstrated by examples like Coa which achieved a 34:1 leverage ratio. Coa mobilized $7 million across 11 local lenders with a 34: Coa achieved a 34:1 leverage ratio during its inaugural year while reaching approximately 7,000 farmers. A national-level fund designed correctly could connect with hundreds of thousands of farmers while showing mainstream investors regenerative agriculture as an investment opportunity.

c. Policy-Driven and Public Program Pathway

Governments may implement this model by embedding it within public rural development programs or climate initiatives as a third pathway. Through this approach the government could set up a program to deliver blended finance to farmers while allocating public money for performance-based rewards and supporting supply chain financing. State-run agricultural banks or funds could serve as implementation vehicles. The government can initiate a "Regenerative Agriculture Transition Program" that provides private banks with subsidized credit lines to distribute to smallholders who follow specific practices. A subsidy or partial credit guarantee serves as a blending layer in the program's structure. Performance grants become the next action for government commitment. The government provides financial incentives to local authorities and farmer cooperatives for each hectare transformed into regenerative farming or every percentage point increase in crop yield or soil carbon through a domestic performance-based payment system. Governments can establish a digital invoice clearinghouse or build partnerships with agribusinesses to guarantee prompt payments when implementing reverse factoring strategies. India has begun exploring outcome-based grants for sustainable farming while Brazil combines state banking funds with carbon finance investments to support low-carbon agricultural practices. The policy pathway proves beneficial by connecting regulatory incentives such as priority sector lending requirements for banks and tax incentives for sustainable practices to support the model. The primary goal is to maintain program efficiency and eliminate bureaucratic obstacles through private actor partnerships (banks and fintech platforms). remains crucial even in public programs.

Real-world applications demonstrate that these pathways often overlap. A country could benefit from a hybrid approach: The national blended fund (pathway 2) can collaborate with value chain initiatives (pathway 1) at the operational level while drawing support from enabling policies (pathway 3). The national fund partners with agribusiness to establish a financial program for farmers while the

government supplies partial guarantees and disburses payments for climate benefits. The implementation strategy needs to operate through multiple layers by involving stakeholders across global, national, and local levels. International donors and climate funds deliver financial resources and technical knowledge at the global level while national governments establish supportive policy conditions and supply funds nationally, as local banks and organizations deliver programs together with farmers at the local level. Chapter 4's conceptual framework emphasized such multi-stakeholder governance, and our findings underscore its importance: The model achieved success during pilot phases because an intermediary organization such as an NGO or social enterprise coordinated the interactions between farmers and the bank and buyer and served as the central connecting point. The implementation strategy should include creating a platform or intermediary organization that serves as either a non-profit or specially designed company to bring partners together and handle contracts and data collection/reporting tasks.

Implementation must consider the significant impact technology has on this process. Agriculture finance through digital platforms achieves significant cost reductions while enhancing transparency levels. Farmers can use mobile applications to monitor their agricultural practices and production results, receive digital payments upon delivery verification which enables reverse factoring without extensive paperwork and use remote-sensed data to validate outcomes such as satellite imagery for biomass growth assessments needed for carbon payment calculations. The implementation of fintech and agtech solutions stands as a crucial strategy for efficient scaling which future research should investigate further.

Different implementation strategies for the integrated model exist, and each strategy has distinct advantages. The value chain-focused approach delivers strong market connections and immediate industry support; meanwhile, the fund-based approach achieves scale while pooling risks; and the policy-driven approach incorporates the model into overall development plans. The best results are expected when combining approaches because this strategy utilizes the unique advantages of each one. All pathways require successful outcomes through the resolution of potential barriers while coordinating and motivating stakeholders as explained in the subsequent section with a SWOT analysis on challenges and mitigation approaches.

5.5 Recommendations for Stakeholders

Global implementation of the integrated financing model demands unified efforts from all agricultural finance stakeholders. Following our research findings we present these global recommendations which have been developed for essential stakeholder groups including banks, donors/investors, NGOs (and other intermediaries), and governments. The recommendations above are designed to assist stakeholders with creating scalable and equitable agricultural systems that can withstand climate changes through an integrated approach.

a. Commercial Banks & Financial Institutions

Financial institutions need to create specific financial services for regenerative agriculture initiatives and smallholder farmers by using blended finance risk-sharing tools. Banks should work together with impact investors to establish guarantee facilities or first-loss mechanisms which will decrease the credit risk related to small farmer loans. Financial institutions should implement sustainability-linked loan terms to provide agricultural borrowers with reduced interest rates and extended grace periods when they achieve specific ESG targets including yields and environmental practices. Through partnerships with fintech providers banks can establish reverse factoring systems which link agribusiness supply networks to enable prompt payment to farmers. Building internal capacity is key: Assign units or officers to agricultural value chain finance to educate them about regenerative practices and cash-flow cycles which operate differently from standard agricultural loans. Through active participation in blended finance consortia and outcome-based financing pilots banks have the opportunity to reach new client groups along with alternative funding streams. Banks must evaluate and disclose the environmental, social, and governance results of their loans to draw in investors focused on ESG principles and adhere to new sustainable finance disclosure regulations.

b. Donors, Development Finance Institutions (DFIs) & Impact Investors

Catalytic capital providers like donors and DFIs need to lead the way in creating and funding blended finance structures for regenerative agriculture. Donors and Development Finance Institutions need to allocate part of their rural development and climate change financing to instruments that reduce risks such as blended finance funds or guarantee programs like those employed in international initiatives including the TLFF in Indonesia for regenerative agriculture. They should also pioneer pay-for-results funding streams: define clear outcome metrics (e.g. The defined outcome metrics include the amount of CO_2 sequestered in tons and other indicators such as farmer income percentage increase and water conservation results. they need to agree to pay for these results after independent parties confirm them. Outcome purchase agreements or impact bonds structure such commitments to motivate additional investor participation. Global donor coordination to share knowledge and create uniform impact measurement systems for agricultural soil health and biodiversity will help decrease transaction costs tied to outcome-based funding. Social investment funds and green bond buyers who are impact investors should allocate funds to the mezzanine or senior tranches of blended finance structures to achieve the necessary scale. Agribusiness companies need to work with financial institutions to establish supply chain finance solutions which support sustainability goals through reverse factoring backed by capital. Donors and impact investors who adopt a portfolio approach recognize that while some initiatives will yield high risk with low returns, others will perform effectively to collectively fulfill ESG targets. They must maintain flexibility and patience while offering concessionary terms when necessary, prioritizing long-term development impacts rather than short-term financial returns.

c. NGOs, Farmer Organizations & Technical Agencies

Stakeholders frequently serve as intermediaries who implement projects while building capacity. Financing programs need to collaborate with NGOs and farmer cooperatives to deliver technical assistance and farmer training as part of a combined package alongside financial support. Curricula development in regenerative practices and financial literacy alongside farm business planning enables farmers to use loans efficiently and achieve performance goals. These organizations play a crucial role in community engagement by organizing farmers into groups or cooperatives which enables them to realize economies of scale through collective input purchasing and marketing while simplifying their credit evaluation process with banks. NGOs can test new community incentive models such as "village competition" which awards groups of farmers for top soil health or yield improvements through outcome-based payments. NGOs should support the data collection and Monitoring, Reporting, Verification processes of results utilizing emerging technologies such as mobile applications, drones, and soil sensors. Independent verification and ground-truth data provision helps alleviate financial burdens while enhancing trust in reported ESG results. Farmer unions and cooperatives need to establish equitable offtake contracts with buyers to guarantee farmers gain premium benefits and outcome payment rewards. The organizations also have the capacity to participate in the financial facility's governance structure – for example. A farmer organization may join a blended finance fund's advisory board to represent agricultural stakeholders. NGOs together with technical partners must focus on the "soft side" of implementation through capacity building and trust building as well as verification to make sure that monetary investment creates actual results.

d. Governments & Policymakers

It is essential for governments to establish policy frameworks that support this integrated approach. National climate strategies should include regenerative agriculture objectives alongside public resource allocations to ensure their support. Policymakers have the ability to establish credit enhancement programs that include interest subsidies and public guarantees for agricultural loans to motivate local banks to provide financing for smallholders who adhere to sustainable practices. On the incentives side, governments could introduce “Pay-for-success” grants to local entities: A government program could allocate funds to provinces or districts based on each hectare of restored land or percentage reduction in fertilizer runoff and then distribute some of those funds to farmers which institutionalizes outcome payments. Furthermore, government policies can drive the growth of markets for regenerative products through various means. Policies that support market development for regenerative products include labeling systems alongside procurement policies that choose sustainably grown crops which might be demonstrated by a government food program for schools buying produce from affiliated farmers and providing tax incentives for companies investing in smallholder sustainable practices. Support from regulation plays a critical role in supply chain finance. Laws must be structured to permit financial tools such as factoring and electronic warehouse receipts while governments push for fintech advancements to optimize their implementation. Building capacity in agricultural extension services to incorporate regenerative practices will reinforce the financial model by aligning public advisory services with program objectives. Government data sources such as soil maps and climate data need to be publicly accessible to support planning and monitoring and reporting

verification processes. Lastly, governments play a role in scaling up: The expansion of successful pilot projects requires a connection to national programs or international funding sources. Governments can draw international climate finance by demonstrating local success stories and investing public money into projects as global investors now favor well-structured blended projects. The advice to governments involves taking the lead through public-private investment strategies and policy changes which embed integrated finance principles into agricultural and rural financial systems while removing barriers to innovative financing.

In addition to these group-specific recommendations, a global call to action is warranted: Stakeholders must unite on international platforms including the UN Food Systems Summit follow-up and COP climate finance discussions as well as ESG investor networks to exchange best practices and standardize their approaches. Establishing global standards for regenerative agriculture outcome measurement and blended finance contract templates would minimize fragmentation while speeding up implementation. A shared "Regenerative Agriculture Outcome Fund" funded by numerous donors worldwide could support diverse national programs through result payments similar to REDD+ forestry or international carbon credit systems but focused on agriculture. Stakeholders in finance and investment have pinpointed the absence of standardized definitions and metrics for regenerative agriculture as an obstacle which can be addressed through collective efforts to establish these standards and incorporate them into ESG investment taxonomies to release additional capital resources.

Each stakeholder stands to gain from this transformation: Banks expand their business portfolios while complying with sustainability requirements; donors increase their impact reach; NGOs accomplish their community development goals; and governments advance their objectives regarding climate and food security initiatives. This unified framework provides a strategic plan for producing mutual value. Stakeholders who adhere to these recommendations will transition the model from pilot success to widespread implementation which will benefit both millions of smallholder farmers and the environment.

5.6 Implementation Barriers and Mitigation Strategies (SWOT Analysis)

Despite securing strong support from stakeholders this integrated financial model still faces challenges and barriers during implementation. Our SWOT-style analysis examines barriers identified as Weaknesses and Threats which we discuss alongside their corresponding mitigation strategies in Table 5.2. The analysis reveals obstacles ranging from financial and operational risks to social and environmental issues and provides solutions to address them which strengthens the model's durability.

Table 5.6: Key Implementation Barriers and Mitigation Strategies (SWOT ANALYSIS)

Barriers / Challenges	Mitigation Strategies

High Perceived Risk and Lack of Track Record: Private investors may view lending to smallholders for regenerative projects as too risky (due to default risk, yield uncertainty during transition, etc.). Also, innovative instruments (outcome payments, factoring) lack a proven history in some regions.	Mitigation: Utilize blended finance to de-risk (donor guarantees, first-loss capital) and demonstrate viability Start with pilot programs to build a performance track record and data on loan repayment and outcomes. Share case studies of success (e.g. Aceli's 3,400+ loans with 99% repayment to convince banks and investors. Over time, securitize or bundle loans to diversify risk, and use insurance (crop or credit insurance) to buffer against shocks.
Farmer Adoption and Behavior Risk: Smallholders might be reluctant to adopt new practices or may revert to conventional methods, especially if initial results are slow. The complexity of multiple incentives could cause confusion or misalignment (e.g. focusing on one metric at expense of another).	Mitigation: Provide extensive training and extension support via NGOs/experts so farmers clearly understand benefits and methods. Implement peer learning and demo farms to showcase successful regenerative techniques locally. Structure incentives to reward incremental progress (not just end-goals) – e.g. small milestone payments to keep farmers motivated. Also, involve farmers in designing the incentive scheme so it is culturally and contextually appropriate. Continuous engagement (community meetings, feedback loops) will build trust and buy-in.
Measurement and Verification (MRV) Difficulties: Tracking outcomes like soil carbon, biodiversity, or even yield improvements can be technically challenging and costly. Without reliable MRV, pay-for-results cannot function, and ESG investors won't trust the impact claims.	Mitigation: Invest in digital MRV solutions – for example, use remote sensing, mobile apps, and farm management software to collect data more cheaply. Develop standardized metrics and simple proxies (e.g. number of trees planted as proxy for agroforestry benefits, soil organic carbon tests every 2 years, etc.). Partner with research institutions for robust methodologies. Ensure that MRV costs are built into the program's budget (possibly subsidized by donors initially). Transparency is key: use third-party auditors or participatory monitoring involving farmer groups to validate data, thereby increasing credibility.

Cash Flow and Liquidity Constraints: Even with reverse factoring, timing mismatches can occur (e.g. delays in buyer payments to bank, or outcome payments that come only annually). Farmers may still face cash crunches in-season, and intermediaries might struggle with liquidity if capital is tied up awaiting result payouts.	Mitigation: Structure the financing with buffer funds or credit lines. For instance, maintain a revolving fund that can advance payments to farmers (or to the supply chain) if any party delays. Ensure outcome payers disburse on agreed schedule and consider interim payments for partial results to keep cash flowing. Additionally, include flexible loan terms for farmers – such as grace periods aligned with harvest – to prevent cashflow stress. Encouraging farmers to form savings groups or linking them to savings accounts can also help them manage funds between payment cycles.
Institutional Coordination Complexity: The model involves many parties (banks, donors, buyers, NGOs, government) which can lead to coordination failures, bureaucracy, or blame-shifting if outcomes are not met. Clear governance is needed or the partnership might falter due to conflicting interests.	Mitigation: Establish a clear governance structure or SPV to manage the program. This could be a formal agreement or entity that outlines roles, responsibilities, and decision-making processes. Use performance-based contracts with each actor: e.g. the bank gets certain fees or incentives for meeting lending targets, the buyer commits to minimum purchase, etc. Regular multi-stakeholder meetings and an oversight committee can address issues collaboratively. Essentially, treat the initiative as a joint venture with shared goals (perhaps codified in an MOU). Having a champion – a lead organization or coalition (e.g. The Lab or a Task Force) – can drive coordination and keep everyone accountable.
External Risks – Market and Climate Shocks: Market price volatility for crops could undermine farmer incomes even if yields rise (e.g. oversupply). Extreme climate events (droughts, floods) could wipe out gains and lead to loan defaults, derailing the model and causing stakeholders to lose confidence.	Mitigation: Integrate risk management tools: price risk can be mitigated by price floors or crop insurance. For instance, involve off-takers in offering fixed minimum prices or use commodity hedging for cooperatives. Climate risk can be addressed with index insurance or disaster funds that compensate for extreme losses (blended finance can fund insurance premiums for farmers initially). Promote diversification – at the farm level (polyculture, mixed farming to not rely on a single

	crop) and at portfolio level (finance a variety of crops and regions to spread climate risk). By cushioning external shocks, the model can remain viable through bad years, maintaining stakeholder commitment.
Policy and Regulatory Hurdles: In some countries, regulations on lending, foreign funding, or carbon payments could create barriers (for example, strict collateral requirements, or unclear legal status for carbon credits, or factoring laws not in place). Also, if government policies (subsidies, etc.) favor conventional practices (e.g. fertilizer subsidies), it might counteract the model's incentives.	Mitigation: Policy engagement is crucial – work with policymakers early to adapt regulations. Showcase the alignment of the model with national goals (climate commitments, rural development) to get government buy-in. Push for enabling policies: e.g. recognize carbon sequestration in soil as a service that can be rewarded, reform any restrictive lending laws (like allowing movables or group guarantees as collateral), and gradually reorient subsidies (reducing those for chemical inputs and increasing support for regenerative inputs or outcomes). Pilot programs can be given special dispensation by regulators as "sandboxes" to innovate without legal impediments. Over time, success of pilots can lead to permanent regulatory changes institutionalizing the model.

Table 5.6's SWOT analysis reveals the potential of the integrated model but stresses the need to overcome practical challenges. The identified weaknesses and threats affect this model as they are standard problems found in agricultural finance and development programs including weather risk and multi-party coordination issues. However, the integrated nature of our approach can help mitigate some of these challenges inherently: Risk distribution occurs when banks, buyers, and governments participate because each stakeholder actively engages in problem-solving to protect their interests (buyers may cover supply gaps during climate events for long-term security while governments provide emergency assistance). The pay-for-results mechanism allocates funds to support technical assistance and monitoring which eliminates adoption and MRV barriers. Various obstacles remain but appear manageable. Developing mitigation strategies to address potential problems during initial program design helps practitioners improve their likelihood of achieving success. The integrated model's flexible design allows for adjustments when mechanisms encounter problems because partners can find alternative solutions. The combination of flexibility and proactive risk management enables the model to thrive despite challenges.

Chapter 6: Conclusion

6.1 This section summarizes the primary research results along with the main research question.

This thesis set out to answer the central research question: What potential does the strategic combination of blended finance with pay-for-results mechanisms and reverse factoring hold for smallholder farmers to develop regenerative agriculture businesses that achieve continuous financial, economic and ESG sustainability? The research demonstrated that these instruments address different aspects of smallholders' challenges when used together strategically. Blended finance became an essential strategy to reduce risk and expand investment in regenerative agriculture by combining capital from public, philanthropic, and private sources to fund projects which could not attract funding due to their perceived high risk (Zanella Carra et al., 2025). According to Field to Market (n.d.), results-based financing and pay-for-performance systems ensure financial incentives match sustainability achievements because they reward farmers for actual results like increased soil carbon and better water quality instead of just their input or activity levels. Under this system farmers receive actual payments for proven environmental and social benefits which encourages them to implement agricultural practices that may lack short-term economic returns. Reverse factoring which is a supply chain finance method helped smallholder farmers overcome their working-capital restrictions. Reverse factoring allows farmers to get prompt payment for their invoices through a financial institution and trusted intermediary while providing buyers with extended payment terms which improves farmer liquidity and ensures timely cash flow for their operations (Geurs & Kwilasa, 2019). This instrument thus addresses a critical pain point: Many smallholder farmers need immediate payment after harvest because they require funds to prepare their farms for the upcoming season.

The study shows how the integrated financial model works by combining multiple tools to create synergy. Through their structure public-private funds and guarantee schemes function as blended finance vehicles that draw private investors into smallholder regenerative agriculture by reducing risk-adjusted return thresholds as demonstrated by Salman et al. (2025). The availability of investment capital activates pay-for-results contracts, so funds are connected to performance outcomes which protects the investment to deliver real ESG benefits and sustainable increases in farm productivity. Instead of grants that may be spent without generating sustainable change an outcome-based payment model disburses funds only after farmers collectively prove effective soil health restoration or biodiversity enhancement (Achaval-Torre, 2021). Agribusiness firms or cooperatives work with banks to use reverse factoring as a financial tool which turns farmers' sales receivables into immediate cash to provide essential short-term funding. Farm incomes remain stable throughout the transition to regenerative farming practices even if yields or revenues initially decrease and this approach builds trust and continuity throughout the value chain. Farmers show increased readiness to implement regenerative practices when they have assurance that their buyers (such as commodity processors or retailers) will provide timely payments and additional support for the transition. When farmers switch to regenerative practices, they can trust that their buyers (such as commodity processors or retailers) will pay them quickly while also providing technical assistance and premium pricing to support the

transition. The study shows blended finance addresses investment risks and capital shortages while pay-for-results targets incentive shortfalls for public goods creation and reverse factoring solves liquidity and credit access challenges. These instruments work together to form a toolkit that helps smallholders develop financially sustainable regenerative agriculture businesses.

The research shows without a doubt that these new financial tools help smallholder farmers build sustainable regenerative agricultural practices that endure financially and economically while meeting ESG standards. Blended finance provides long-term mission-aligned capital to initiate and expand regenerative projects while pay-for-results maintains growth quality by rewarding positive outcomes such as carbon sequestration and ecosystem restoration and reverse factoring gives farmers operational continuity through better cash flow control. In sum, the integrated model provides a holistic financial support system: The integrated model supports financial stability through investment risk reduction and positive outcome incentives while ensuring steady cash flow. Smallholders gain better capability to implement sustainable farming practices, manage transitional challenges effectively and obtain regenerative agriculture benefits through improved soil health and climate resilience plus better livelihoods without damaging their economic equilibrium when they use these financial instruments together. The findings of this study match broader field analyses which argue that bridging the regenerative agriculture financing gap requires both effective financial instruments and sometimes multiple instruments to unlock trillions in new investment opportunities while safeguarding people and the planet (Rockefeller Foundation et al., 2024). The research herein provides a concrete framework for how such combinations can be operationalized on the ground, thus answering the research question in the affirmative: Smallholder farmers can practice regenerative agriculture over the long term through the use of innovative financial tools combined.

6.2 Innovations and Contributions

The study presents an innovative integrated financing approach which merges blended finance with pay-for-results and reverse factoring to advance regenerative agricultural practices. The research connects theoretical principles with practical applications through actionable tools designed for academics, policymakers, and investors. The research presents a tested framework to synchronize public and private investments toward sustainable goals which enables significant agricultural investments. The study shows that innovative financial structures produce measurable ESG outcomes and draw private investments while supporting smallholder farmers to advance SDG 2 (Zero Hunger) and SDG 13 (Climate Action) and foster academic debate together with policy frameworks and financial industry practices.

6.3 Actionable Recommendations

The findings provide a comprehensive set of actionable recommendations that applies to essential sectors including policymakers and financial institutions while also reaching agribusiness companies

and smallholder farming cooperatives. The recommendations provide practical steps derived from research insights.

a) Strengthen Enabling Policy Frameworks

An enabling environment for blended finance and outcome-oriented programs in regenerative agriculture needs establishment by governments and international development agencies. Establishing public–private blended finance funds or dedicated guarantee facilities for agrifood systems transition represents one potential approach. Insurance providers or facilities that absorb initial losses can motivate banks and investors to finance smallholders and agro-SMEs who implement sustainable methodologies (Salman et al., 2025). Policy makers should develop public funding programs that reward agricultural outcomes by providing tax benefits and grants to farmers who achieve verified gains in soil health restoration alongside reforestation and emissions reduction. Regulatory support must accompany financial instruments like reverse factoring by streamlining the legal procedures for invoice financing and confirming the enforceability and transparency of small producers' buyer contracts. Policy initiatives should work to minimize investment risks in sustainable agriculture while connecting public spending to measurable results to attract private sector investments.

b) Innovate Financial Products and Partnerships

Development finance institutions and donors need to join forces with commercial banks and microfinance institutions to create new financing products especially designed for regenerative agriculture. The approach incorporates sustainability-linked credit lines and bonds which offer better loan terms (e.g. Loan terms such as lower interest rates or extended maturities become available to borrowers who achieve specific ESG targets on their farms. Financial institutions can create blended finance structures with outcome funders such as environmental NGOs or governmental programs where a loan segment becomes a grant when specific sustainability targets are met. Investment professionals should consider outcome-based financial instruments like climate-smart agriculture impact bonds or revolving outcome funds which provide returns dependent on achieving quantifiable climate and social results. The current trend includes a demand for collaborative partnerships between financial institutions and agribusiness companies to expand reverse factoring initiatives. Through collaboration with key value chain entities like exporters and retailer's banks can offer secure credit based on purchase contracts which allows farmers to receive prompt payment for their produce. Farmers can utilize regenerative farming methods without experiencing cashflow issues when supply chain finance arrangements work alongside technical support. Through innovative products and cross-sector partnerships financial institutions will achieve improved services for "last-mile" agricultural clients while ensuring lending portfolios support sustainable development objectives.

c) Empower Agribusinesses and Cooperatives

The integrated financial model implementation requires active participation from agribusiness companies, commodity buyers, and farmer cooperatives at ground level. Agribusinesses should implement inclusive business models that support their smallholder suppliers in moving towards regenerative agriculture through active engagement. Agribusiness companies can establish longer-term purchase agreements which reassure farmers about future market stability while setting higher prices for regenerative products based on their quality or sustainability. Businesses can create or participate in current reverse factoring platforms to guarantee timely payments while serving as anchor clients whose creditworthiness supports financial backing to their network of farmers (Geurs & Kwilasa, 2019). Cooperatives together with farmer organizations must develop their financial management capabilities to act as intermediaries for such financial instruments for members while they consolidate credit demand and enable collective monitoring of outcomes. Agribusiness actors should join forces with public or impact investors and participate in outcome-based reward investment plans. A cocoa trading firm can join forces with a conservation NGO to financially reward farmers who avoid deforestation or implement agroforestry methods since the costs are shared because both parties receive benefits (farmers receive monetary benefits while the company gains a deforestation-free supply chain). When agribusinesses and cooperatives fulfill such roles, they evolve beyond mere market participants into crucial innovation finance partners by integrating business goals with developmental outcomes.

d) Invest in Data, Measurement, and Technology

A key suggestion for every sector remains to improve the systems for measuring and reporting regenerative agriculture impacts while using technology to achieve better efficiency and transparency. Robust MRV systems (e.g. The foundation of effective pay-for-results mechanisms rests on soil testing protocols and satellite land use monitoring alongside digital farm practice tracking systems because reliable data is essential for initiating payments and providing investors with impact assurance. Public authorities together with development organizations must fund open-access data platforms that banks and verifiers can utilize to evaluate farm-level sustainability metrics. The implementation of financial technology (FinTech) solutions will decrease transaction costs while enhancing access. Digital payment platforms deliver loans and performance payments straight to farmers located in distant regions to broaden access. The automation and enforcement of pay-for-performance agreements can be achieved through smart contracts and blockchain technology which releases payments once third-party verifiers approve that farmers have reached their environmental objectives. Technology enables the combination of smallholder projects into bigger investment portfolios that draw institutional investor interest by using remote sensing to consolidate carbon sequestration data from multiple farms into one carbon credit package. Developing these digital and data-driven innovations requires collaborative efforts among policymakers, financial providers, and agribusinesses. Implementing these measures will strengthen regenerative agriculture financing's reputation and effectiveness and attract ESG-focused investors while simplifying practical execution.

These recommendations are interdependent and mutually reinforcing. Taken together, they outline a path for multi-stakeholder action: Policymakers establish necessary conditions while financial

institutions develop and distribute capital through new models which agribusinesses and cooperatives expand throughout their value chains and every participant employs better data and technology for progress tracking. By mainstreaming the integrated financial approach, the actions hope to unlock increased investment in regenerative agriculture while making sustainable innovations accessible to smallholders worldwide.

6.4 Broader Implications for ESG Investment and Sustainable Development

This research extends beyond smallholder finance, offering valuable insights for ESG investment, climate-smart agriculture, and global sustainability efforts. It shows that integrating blended finance, pay-for-results, and reverse factoring can turn smallholder farming into a viable, impact-driven investment. The model helps de-risk agricultural investments while tying financial returns to measurable environmental and social outcomes, aligning with ESG goals and attracting green capital. By monetizing ecosystem services and rewarding regenerative practices, the model operationalizes climate targets through results-based payments for carbon storage, watershed protection, and soil health. It supports national climate commitments under the Paris Agreement and advances multiple SDGs, including Zero Hunger, Climate Action, and No Poverty. The model provides a scalable framework for development banks, UN agencies, and climate finance bodies to create hybrid programs that combine concessional capital with outcome payments. This improves public finance efficiency while mobilizing private investment for sustainable agriculture. Widespread adoption could transform value chains—making deforestation-free, climate-resilient farming a norm—and encourage cross-sector collaborations between banks, agribusinesses, farmers, and investors.

Ultimately, this thesis highlights how innovative financial design can drive global sustainability by aligning economic incentives with environmental stewardship to meet the ambitious goals of the 2030 Agenda.

6.5 Limitations of the Study

The research proposes an innovative integrated financing model for regenerative agriculture yet recognizes essential limitations. The research adopts a conceptual and exploratory approach that depends on theoretical foundations and qualitative case studies in addition to literature reviews while not using empirical long-term quantitative data. Preliminary results from pilot initiatives indicate beneficial effects yet there is no thorough evidence available to confirm the model's long-term performance or its adaptability to different environments. The research examines regions of Sub-Saharan Africa and Latin America which host prevalent donor programs and value chains in commodities like coffee and cocoa. The study's findings cannot be applied to South or Southeast Asia because their socioeconomic conditions and institutional frameworks are different. The applicability of these findings may be constrained by cultural dynamics along with differences in government support and infrastructure disparities. The integrated model requires intricate coordination between governments, investors, banks, and farmers which generates both operational and administrative

difficulties. The study mentions these issues but fails to conduct a comprehensive examination. Critical elements including stakeholder misalignment and trust requirements alongside sophisticated monitoring systems have not been sufficiently investigated. The research mentions external risks such as economic volatility and political instability only in passing. The research acknowledges access issues for women and marginalized groups within social inclusion but fails to provide a comprehensive assessment. Even with existing limitations the thesis presents valuable theoretical insights. The proposed model requires testing and refinement through empirical research which future studies can achieve by conducting field pilots and impact evaluations based on the identified limitations.

6.6 Future Research Directions

The study introduces a promising integrated financing framework for regenerative agriculture and suggests multiple areas for future research to test and enhance the model. Real-world pilot projects across various regions and crops must be implemented to test their effects on farmer income as well as environmental and financial results. Research should conduct five to ten year longitudinal studies to observe soil carbon and biodiversity changes and loan repayment patterns to understand sustainability over time. Further studies need to examine how blockchain technology alongside remote sensing and mobile financial services can facilitate automated payments while minimizing monitoring expenses to better support smallholder farmers. Research needs to evaluate possible obstacles such as the requirement for digital literacy and infrastructure development. Measurement techniques like soil carbon tracking and digital farmer records must be improved to ensure reliable data in outcome-based finance. Research comparing different farm sizes and areas would enable the model to adapt to unique local requirements. Medium and large farms require distinct financial instruments compared to those available to smallholders. A study of regional differences such as those between East Africa and South Asia will demonstrate the impact of cultural and policy variations on results. The integration of carbon and ecosystem service markets stands as a critical priority. Researchers need to investigate whether smallholder farming methods produce carbon credits that will finance outcome payments. Research into governance structures needs to create institutions that deliver fairness and transparency while coordinating stakeholder activities. Through these research pathways the model will evolve from theory to validated practice which supports sustainable farming practices and rural development while achieving ESG investment results.

6.7 Concluding Remarks

This research demonstrates an innovative approach that connects financial systems with sustainable agriculture practices and shows how new financial models can enable smallholder farmers to spearhead regenerative agricultural methods. Blended finance combined with pay-for-results and reverse factoring forms an extensive strategy which integrates economic incentives with ecological and social advancement. This approach demonstrates the possibility that profitability objectives can work together with resilience and environmental regeneration goals instead of conflicting with them.

Research presented in this document adds to the increasing acknowledgment that overcoming global difficulties such as climate change and food security demands the dismantling of traditional boundaries and cross-sectoral innovation. When we provide smallholders with essential financial support and risk-sharing systems along with incentives for ecosystem services we nurture a future that positions agriculture as both a food source and a key player in climate solutions and community well-being. To bring this conceptual model into meaningful real-world application stakeholders must maintain their collaborative efforts across policy and financial institutions and agricultural fields. The future research directions and recommendations serve as a guide to advance progress. Ultimately, the significance of this integrated financial model extends beyond the confines of this study: The study demonstrates how innovative financial strategies can drive sustainable development in one of the world's most difficult sectors. The application of these outlined principles and strategies has the potential to transform agricultural finance into a key instrument for achieving environmental restoration alongside social equity. Given the simultaneous challenges posed by climate change and biodiversity decline alongside rural poverty our planet faces, this transformation is mandatory and beneficial. This research aims to present a compelling argument and functional groundwork to transform agricultural practice through which scholars, practitioners and leaders can realize regenerative agriculture as a sustainable reality for smallholder farmers and global environmental health.

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