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A Way Forward for Policy, Practice and Research

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Review

Revisiting the Factors Shaping Outcomes for Forest and Landscape Restoration in Sub-Saharan Africa: A Way Forward for Policy, Practice and Research

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Abstract: A lack of systematic understanding of the elements that determine the success of forest and landscape restoration (FLR) investments leads to the inability to clearly articulate strategic and practical approaches to support natural resource restoration endeavors across Sub-Saharan Africa (SSA). This review examines the different challenges and opportunities for effective restoration interventions. Using a structured literature review, we draw evidence from a broad range of scholarly works on natural resource conservation and governance to investigate the early dynamics of FLR in SSA. We first engage in a contextual clarification of FLR concepts and then provide a synthesis of the factors that influence the results of FLR interventions at the social and institutional level to inform relevant restoration stakeholders—policy makers, investors, and practitioners. The review finds that several interacting factors shape the outcomes of FLR interventions. We classified them into three categories based on their features, intensity, and scale of occurrence: (1) micro-scale factors that enable or limit individual engagement in FLR and sustainable management practices; (2) project/program-level factors, including the design and implementation stages; and (3) institutional, policy, and governance factors, and issues of inequity that operate at the local or national government scale. The review goes beyond underscoring funding constraints as a major challenge to the up- and out-scaling of restoration interventions and FLR success. The findings also set out a premise for future research to guide the design and implementation of successful FLR models in SSA.

Keywords: restoration; sustainable land management; natural resource policy and governance; design and implementation; micro-scale; challenges and enabling factors; Sub-Saharan Africa

1. Introduction

1.1. Context

The complex dynamics that characterize land and forest resource degradation, restoration, and holistic management in Sub-Saharan Africa (SSA) have received renewed scrutiny in recent years, mostly from studies on human–environment relationships [1]. Over the past two decades, scholarly works from various natural science disciplines have sought to understand discourses and practices regarding regional natural resource management [2–4]. These works have shed light on contested African landscapes and their dynamics, including political ecology perspectives [4–6].

Other works fit within the population–poverty–environment nexus approach [7], linking poverty and land degradation [8–10], including work by the Poverty Environment Network (https://www.cifor.org/pen/) [11]. Together, these studies have unveiled the complex socioecological character of resource management in SSA. While recognizing that there is a diversity of factors that affect the management of land-related resources, most previous work still reinforces orthodox narratives of the degradation and environmental crisis of African landscapes, particularly land and forest resources.

Degradation and loss of forest and land resources mostly result from their unsustainable use, causing problems such as soil degradation, erosion, and soil fertility loss, which aggravate existing challenges of poverty and hunger in SSA [12]. Consequently, land degradation has received increasing attention from practitioners and scientists. This includes an appeal for more research into socioeconomic and bio-ecological aspects, as well as the development of new approaches to reverse such trends. Since the Bruntland report of 1987 brought attention to issues of land degradation and sustainable development [13], a two-pronged endeavor has evolved in the development and scientific communities. One focuses on understanding the drivers of land degradation, the other on ways to reverse the degradation trends. Previous works provide comprehensive knowledge of direct and indirect drivers of land degradation in different settings [14–18]. The persistent evidence that the expansion of agriculture is the main driver of land degradation and deforestation [19] has led to calls for more integrated management and governance of natural resources [20], particularly between environment and agriculture sectors, with improved coordination of their policies and interventions.

1.2. Reverting Land and Forest Degradation: What is Problematic?

To reverse the trend of land degradation requires mechanisms to reconcile conflicting land-use objectives, such as environmental conservation and sustainable development with a people-centered approach. Merging biodiversity-conservation efforts with sustainable and resilient livelihoods development in a changing climate [21–23] is now becoming the gold standard to address structural issues of land degradation in rural landscapes across Africa. Such a perspective is embodied in the concepts and practice of forest and landscape restoration (FLR) coupled with sustainable land management (SLM), which adopt integrated landscape approaches to promote highly productive landscapes [24].

FLR has gained momentum recently, with a wave of ambitious restoration goals backed by substantial political commitments both globally and in SSA. However, moving from restoration commitments to implementing and achieving FLR promises is challenging [25]. Many barriers undermine the implementation of FLR (and SLM) schemes. Although some are common, their relative roles are not well understood or well articulated [25]. There persist critical limiting factors that prevent FLR interventions from delivering on their promises. The lack of concrete and adequate financial support (beyond mere promises or short project cycles) for FLR initiatives [26], exacerbated by the apparent reluctance of the private sector to invest in restoration [27], is at the center of such obstacles. Dewees et al. [28] have outlined avenues to unlock investment potential for FLR, as a guide to efforts being channeled to address these bottlenecks.

However, the promises of FLR call for avoiding the traditional heuristic learning approach to implementing environmental interventions, such as the climate-mitigation scheme known as REDD+. Beyond the relatively established knowledge on drivers of deforestation and the well-known challenges of financial resources, there is scant understanding of the constraints and enabling factors for scaling up FLR. There is need not only to close knowledge gaps on factors that undermine FLR initiatives, but also to reveal the affirmative determination of different policy, governance, human, and biophysical factors and other conditions that enhance the effectiveness and expansion of current restoration and sustainable land-resource management efforts in SSA. Although such efforts have largely been disjointed, they have spread across diverse sectors (e.g., forestry, agriculture, agroforestry, wildlife management, water resources management, and climate change—adaptation and

mitigation, such as REDD+) and different international conventions (e.g., on biodiversity conservation, desertification, climate change).

What value does FLR add to previous initiatives to warrant the recent excitement and confidence in the approach, beyond repackaging of the elements under a different label? What are the concepts, theoretical and organizing principles, goals, approaches, and processes that undergird the FLR approach? Is there a common understanding of these concepts within the literature and in practice as the FLR concept/approach takes off? What lessons do previous integrative efforts addressing similar goals as the FLR approach offer? What separates the rhetoric, reality, and prospects of FLR? By seeking answers to such important questions, or at least by uncovering insights to make sense of the conceptualization and dynamics of FLR, our review study contributes to debates on FLR and its potential contributions to sustainable natural resource management (mainly forests and land), associated livelihoods, and socioeconomic development in SSA. This is important during these formative (though not entirely first) years of FLR as a contemporary restoration movement, when countries in the developing world pledge millions of hectares of degraded forests and lands for restoration under FLR.

1.3. Objective and Structure of the Paper

This research addresses the broad question of how contemporary FLR (and SLM) initiatives can achieve their set goals. By reviewing the scientific evidence, the study sets out to improve the understanding of factors that influence the outcomes and impacts of FLR interventions. Specifically, we investigate barriers and drivers of successful FLR projects, schemes, and programs by building on the core concepts associated with FLR and the related theoretical knowledge base. These enabling/impeding factors include socioeconomic, policy, institutional, and organizational dynamics, and their interplay. We explore the types, nature, scale of operation, and significance of these factors through a fine-grained review and synthesis of studies on natural resource management interventions that loosely fit the FLR label. We ultimately offer a consolidated state of the knowledge for restoration stakeholders—researchers, practitioners such as policy makers, investors, and project or program managers, and rural communities.

Our literature review, informed by our conceptual framework, revealed scale as a useful organizing frame for factors and processes that influence the outcomes of FLR. Three scale-based categories helped in effectively untangling the nature, extent/significance, and operational level of the factors, as well as the main stakeholders and their relative levels of power and influence. They include: (1) factors related to individual managers making land-use decisions at the household or individual farm level; (2) factors operating at the institutional meso-scale of FLR projects and programs; and (3) governance factors, along with policy and institutional arrangements manifest as local, national, and broader influences. The reviewed publications further shed light on the challenges to scaling up and out those oases of success observed in small-scale landscape restoration scenarios. Insights gained from the ensuing systematic, multi-scalar examination of the dynamics that substantiate and govern FLR processes and outcomes can help to shape a future research agenda designed around a multi-level and multi-scale parametric model of FLR success in SSA.

This paper further unfolds with Section 2, which clarifies and contextualizes the main concepts underlying landscape restoration debates and identifies core concepts used in assessing the factors shaping the outcomes of FLR schemes. In Section 3, we elaborate on the review methodology used in this study. Section 4 articulates, in three subsections, the findings of our analysis of the literature on landscape restoration interventions in the SSA region. We first present a synthesis of micro-scale factors that hinder or drive engagement in FLR/SLM practices at the household or farmer level. We then elaborate meso-scale factors that shape outcomes of FLR/SLM interventions at the project and program level, from design through implementation to evaluation stages. The third category of emerging factors are governance aspects, including FLR governance and the broader governance context operating either at the local government (community or village) or state/national government scale. These factors cover

especially the governance, institutional, and policy and legal aspects, including issues of (in)equity. We distill the relevance of the findings in a discussion section and underscore the potential of the knowledge gleaned to valuably inform FLR policy, guide effective implementation of FLR interventions, and highlight knowledge gaps needing further research commitments.

2. Core Concepts of the Forest and Landscape Restoration Approach

The novelty in the discourse around the latest surge in land restoration built around trees within and outside forests in SSA is often blurry, especially vis-a-vis long-standing environmental resource management paradigms. Thus, the FLR concept, and indeed movement, engenders controversy regarding the understanding and added benefits of FLR in the land-use community. In this study, we contextualize current key concepts in the land restoration debate within SSA, and offer clarifications gleaned from the literature.

2.1. Forest and Landscape Restoration

The most contested part of the global land restoration movement is its principal scheme, forest and landscape restoration (FLR). Some contend that the concept of FLR evolved out of the forestry discipline around the 1990s, when the concept of "*forest restoration*" was broadened with the word "*landscape*" [29]. This broadening was meant to capture the practical scope of forest restoration and integrate the evidence that such restoration involved a return to multi-purpose forest management and the provision of diverse forest and tree-related goods and services [30]. Others trace the specific term "*FLR*" back to 2000 at a forestry meeting in Segovia, Spain [31,32], where it was defined as: "*a planned process that aims to regain ecological integrity and enhance human well-being in deforested or degraded forest landscapes*" [31]. The primary emphasis is on recovering functional levels of ecosystem services and related benefits to meet human and societal needs, thereby enhancing their well-being [33,34].

FLR proponents argue that the concept and approach go beyond traditional restoration interventions that put more emphasis on eco-centric dimensions of restoration, while balancing trade-offs between ecological demands and costs on the one hand and human needs on the other [35,36]. Eco-centric approaches target recovery to pre-disturbance states. The new restoration movement being championed through FLR is explicitly anthropocentric, rather than a call to return to "original" states and patterns of land use, at least for African countries. Lessons from North America highlighting the drawbacks of eco-centric and preservationist restoration informed the early reframing of ecological restoration and fed the momentum of the FLR concept. Shortcomings included the neglect of social justice issues, such as disregarding disadvantaged riverine people [37]. The conceptualization of restoration in FLR is underscored by the challenges of poverty and food security, which in many instances coexist in degraded and deforested landscapes in developing countries. These ecological landscapes and the human communities inhabiting them often face realities of adverse impacts of climate change. Therefore, broadening restoration into FLR opens options to effectively deal with socioecological uncertainties, such as climate change, economic challenges, and social change [29].

The International Union for the Conservation of Nature (IUCN), in particular, nurtured and spearheaded the FLR concept globally, and in 2001 initiated a supporting broad-based partnership, the Global Partnership on FLR (GPFLR). Variants of the term "*FLR*" appear in the literature, including *Forest and Landscape Restoration*, or *Forest and Land Restoration*. In this paper, we use *Forest and Landscape Restoration* to reflect the FLR philosophy of being inclusive of both forest restoration and other dimensions of landscape restoration, such as agricultural and wooded landscapes. Indeed, FLR accommodates a mosaic of land uses in a given landscape, including forests and woodlands, trees on farms, agricultural lands, pastures, wetlands and more, thereby combining natural resource management and livelihood considerations across jurisdictional boundaries [29,38]. Thus, as a landscape approach, FLR is implemented across sectors straddling agriculture, forestry, and their interface—trees on farms or outside forests [39].

2.2. The Concept and Definition of the Landscape Approach

While there is no universally approved definition of "*landscape approach*", the concept is central to FLR. Landscape approaches draw on a diversity of holistic approaches to environmental and agricultural landscape management. According to Sayers et al. [30] (p. 8352), it is a "*widely advocated means to address growing pressures on land, water, and other natural resources and to accommodate the needs of present and future generations*". The multiple definitions of the word "*landscape*" employ broad conceptual terms that go beyond simple reductionism to a physical space. Thus, Sayer et al. [30] (p. 8350) settle for a broad ecosystem-leaning definition of landscape: "*an area delineated by an actor for a specific set of objectives [...]. It constitutes an arena in which entities, including humans, interact according to rules (physical, biological, and social) that determine their relationships, [...]*" which often change. On goals, Reed et al. [24] (p. 2544) state that the "*landscape approach seeks to address global challenges of poverty alleviation, food security, climate change, and biodiversity loss*".

The contemporary appeal of the landscape approach is largely driven by the urgency to reconcile environmental conservation goals with sustainable development objectives [40], which have often been seen as incompatible and treated in a sectoral way [41]. It is also fueled by the need and consciousness to address society's priorities that span the socioeconomic development–environmental conservation divide [42]. Current framings of the landscape approach [30] appear as re-conceptualizations that are rooted in environmental conservation theories of protected areas, and notions of land sharing or land sparing [43,44]. By including people as an integral part of biophysical dynamics of landscapes, the landscape approach is a manifestation of attempts to integrate previously segregated efforts of reconciling societal needs for food, fiber, and energy with the urgency of environmental integrity [24,44].

The landscape approach is both a framework and a resource management model. As a framework, the landscape approach provides the appropriate fabric, of a suitable extent, where policy can be interwoven with practice via adaptive collaborative management of natural resources, to address divergent land uses [45]. This allows the translation of the synergies and tradeoffs of development and environmental conservation into reality [40,46]. This holistic perspective enhances the potential of FLR to reasonably address complex, contemporary, and intractable challenges, the so-called "*wicked problems*" [47,48], which tend to preclude simple, complete resolution [49].

As a resource management model, the landscape approach offers the necessary tools and principles for sustainably managing land resources to meet the many competing and diverse (social, economic, political, and environmental) needs across individuals, groups, and sectors. Core principles that underscore the landscape approach include adaptive collaborative management; multi-stakeholder engagement and capacity building; transparency, trust building, and accountability; multi-level and multi-functional design; a human rights basis; and resilience seeking [30,50,51]. Scholars have pointed out the challenges of the landscape approach, including time lags; confusing terminologies, understandings, and applications due to disciplinary biases; and the lack of a consensus definition of what it entails and should achieve [24]. As imperfect as the approach may be, contend Sayer et al. [30] (p. 8349), "*we see few alternatives that are likely to address landscape challenges more effectively than an approach circumscribed by the principles outlined here*".

2.3. Sustainable Land Management and FLR

There are important similarities and synergies between FLR and sustainable land management (SLM) approaches. FLR concepts and practices generally incorporate concepts, practices, and tools from the SLM approach. Liniger et al. [52] define SLM as land-use systems that foster appropriate management practices to enable land users to maximize the socioeconomic benefits for their land-based livelihoods, while maintaining or improving the ecological functions of the land resources. Some posit SLM as the best approach to address land degradation [53]. Its promoters tout the potential of SLM practices to effectively restore land and increase agricultural production under sustainable farming systems [54]. They encourage smallholder farmers and land managers to replace practices that induce

land degradation with alternative land-use practices that can propel farm productivity in the long term and improve human well-being [55].

SLM practices often consist of simple, low-cost and local-knowledge-based farming practices, techniques, and technologies that have emerged from innovative farmers and have been tested and enhanced by state or nongovernmental organizations [56,57]. SLM practices can also positively transform communities [58,59], and they have therefore been promoted across SSA to reverse land degradation. The repertoire of SLM practices is large and applied in different environmental management initiatives and approaches across SSA. Practices include soil fertility and crop management techniques, soil erosion control, water harvesting techniques, grazing, and forest management schemes. SLM practices also take into account the packaged techniques promoted under conservation agriculture [60–63]. Climate-smart agriculture interventions also draw on these SLM techniques [64–67].

In summary, overlaps and synergies between FLR and SLM have resulted in the proponents of FLR integrating SLM concepts and practices into the conceptualization and implementation of restoration approaches and packages. This denotes the looseness of the FLR concept, which is constantly defined and redefined by different institutions according to their specific interests and views on the process. Nonetheless, the FLR/SLM marriage facilitates and reflects the spatial extension of sustainable forest management into agrarian landscapes. Blended into FLR, SLM practices are used to propel sustainable agriculture and environmental protection into agrarian landscapes and have become critical in ensuring sustainable livelihoods and food security for a growing global population. When coupled, SLM and FLR offer the potential to overcome land degradation while addressing food insecurity, losses in biodiversity and (agroecological and forest) ecosystem services, and adverse climate-change impacts [68]. They can ultimately contribute to achieving Sub-Saharan Africa's sustainable development goals [69].

2.4. Barriers and Drivers to Effective FLR Schemes

Like any natural resource management schemes, FLR initiatives are place-based interventions, the effectiveness of which is subject to multiple and diverse factors. We summarize the potential factors that may hinder or catalyze the efficacy of FLR schemes to provide a theoretical basis for the approach used to assess the literature and the factors shaping the success of FLR initiatives.

First, although FLR is a very loosely defined concept, FLR interventions are landscape-level resource management schemes [30,70,71]. This has implications for the effectiveness of modes of landscape governance, including the dynamics of their institutionalization, within the broader policy context. There are broader guiding theoretical models or frameworks of possible FLR governance forms. In particular, factors such as the nature and condition of the envisaged landscape, its restoration needs and objectives, the configuration of relevant stakeholders, and the types of institution and the tools at their disposal help in the selection of the forms of FLR governance. In Indonesia, for instance, van Oosten et al. [72] identified three distinctive and theoretically-informed modes of FLR governance including: (1) governance as a management tool; (2) governance as a multi-stakeholder decision-making process; and (3) governance as the creation of new institutional spaces for spatial decision-making. In addition, in her proposed governance framework supporting implementation of FLR, Mansourian [73] recommended the re-scaling of FLR to the landscape scale while critically avoiding the pitfall of neglecting the integration of other scales when making landscape-level decisions for restoration. She recommended polycentric FLR governance that bridges management scales and maintains collaborative flexibility by ensuring holistic and simultaneous management of landscape resources and processes. Furthermore, flexibility enhances the governance of FLR schemes [70]. Van Oosten et al. [72] (p. 1158) aptly captured this need for flexibility and for going beyond technical design principles: "*forest landscape restoration should not be based only on design criteria such as formulated by Sayer* et al.*, but rather on a good understanding of (a) the different interpretations of the substantive nature of forest landscapes and their restoration needs; and (b) the different modes of landscape governance including*

the dynamics of their institutionalization." These framings for governing FLR provide scientific insights for analyzing and prospecting the effec tiveness of FLR governance.

Second, as a planned process to rehabilitate degraded or fragmented landscapes, FLR initiatives are usually implemented as land-use development projects or interventions. They benefit from insights that inform programmatic and managerial aspects, including planning, design, implementation, and evaluation [74]. This suggests that perusing how such project-level management aspects affect the effectiveness of FLR schemes may provide insights into other sets of potential enabling or blocking elements to the processes and outcomes of FLR schemes. Specifically, understanding how restoration goals are defined, how approaches to restoration are chosen, what key features and processes are prioritized, and what levels of flexibility and adaptability are accommodated [70], will help inform the assessment of factors molding FLR success or failure.

Finally, there is no single approach, tool, or technique (silver bullet) to solve all restoration problems [75]. Landscape restoration can involve tree planting [76,77], assisted natural regeneration [78], agroforestry [79,80], or other SLM technologies and practices [81,82]. The choice of FLR approach and combinations thereof depends on the context, including land-use types and the restoration objectives [76]. Regardless of the approach, however, the critical long-standing question of the low adoption of technologies that contribute to replenishing soil productivity, vegetation cover, and biodiversity in restoration schemes in agrarian landscapes in much of SSA remains to be addressed [53,83]. This question is best answered at the level of the individual farming household where land-use decisions, including on the use of restoration techniques on degraded lands, are made and shape FLR outcomes. As such, revisiting the state of the knowledge on the micro-scale dynamics that shape the decisions of local actors on restoration interventions and strategies can unlock understanding of the low investment in the restoration of degraded agrarian landscape in SSA.

In summary, the core concepts associated with FLR, including the broad definition and unifying idea of landscape, and the diverse and multiple interacting actors operating at different, nested scales, underscores the need for a multi-scalar approach to holistically identify the major factors that influence success or failure of FLR schemes. The levels stretch from the small-scale farmer who makes land-use decisions, through the organized, concerted project/program interventions that interface with the farmer, to the broader policy and governance environment that frame the socio-structural context. These factors further provide the conceptual basis of the current review paper, including the focus on factors of both a managerial, governance and institutional nature, and guide the choice of criteria for including relevant papers for our analysis, as detailed in the methods section.

3. Materials and Methods

3.1. Literature Search and Sample Building

For the current study, we developed relevant search terms based on the author's expert knowledge of the topics of land degradation, forestry and deforestation, ecosystem services, and the landscape approach. Following a preliminary reading of the literature, we expanded and refined the search terms and tested them in the Web of Science (WoS) online database (Table 1). Limiting the search to Africa, the searches produced 3038 publications. Our search terms and strings were restricted to publications in English, and we acknowledge this as a potential limitation of the review's scope. The searches were however, not confined to a timeline.

Table 1. Main search terms used in Web of Science.

Main Terms	Expanded Terms	Search Qualifier	Operator Precedence	Publications Retrieved
Landscape	Land* restor*	Africa	AND	554
	Land* degrad*	Africa	AND	1871
	Land* restor* cultur*	Africa	AND	28
	Land* degrad* cultur*	Africa	AND	63
Forest	Forest* restor*	Africa	AND	295
	Forest* degrad*	Africa	AND	804
	Forest* restor* cultur*	Africa	AND	11
	Forest* degrad* cultur*	Africa	AND	27
	Forest* Land* restor*	Africa	AND	165
	Forest* Land* degrad*	Africa	AND	505
Ecosystems dis (services)	Ecosystem* restor*	Africa	AND	429
	Ecosystem* degrad*	Africa	AND	802
	Ecosystem* integrity	Africa	AND	129
Total sample (After a combination of the searches results using OR operator in the "Analyze results" function of Web of Science)				3038

We used the Nvivo 11 Pro qualitative data analysis and management software to refine the search to capture relevant publications from the original 3038. We stored the retrieved 3038 publications within Nvivo as "cases" using author names as a unique identifier (ID) and coded them into unique nodes by title. After a word-frequency query, we conducted 15 text searches to identify publications that documented sociocultural, institutional, governance and policy constraints/obstacles/barriers/opportunities, and we converted them into sub- or child nodes below the level of the publication titles. We refined these child nodes further using Nvivo's "Compound" option by combining each text search node with the main coding node for publication titles and searching for appropriate text in or near the coded content. This both expanded the scope of the search to capture the maximum number of titles that fit the searches and provided objective validation of the search results. Finally, we combined our compounded queries (transformed into new nodes) and extracted the cases (publications) that were coded at these new nodes. This process produced 197 publications, which we used in the next, more stringent screening for relevance. We present a summary of the coding strategy used to identify the initial 197 relevant literature results using Nvivo in Appendix A (Table A1).

3.2. Internet Searches

We further conducted searches in Google Scholar to verify the soundness of the above search methodology. The Google search also included grey literature (publications outside peer-review journals) to inform our discussions later in the study given the relative novelty of contemporary FLR. The main search terms were combined into a single query, with Africa and the regional delimiter, and entered into the Google Scholar search engine. Below are strings of the search terms used:

- Landscape AND degradation OR restoration AND Africa
- Forest AND degradation OR restoration AND Africa
- Ecosystem AND integrity OR degradation OR restoration AND Africa

Google Scholar searches yielded 83 additional publications (exclusive of the WoS hits). We combed through the bibliographies of these publications using a snowball sampling approach to uncover publications that the previous searches may have missed and produce a more comprehensive capture and discussion of the existing literature.

3.3. Study Inclusion Criteria

We established inclusion/exclusion criteria to retain the relevant publications and articles after three-stage screening. The retrieved publications—including books, book chapters, articles, and technical reports—were deemed relevant if they met our pre-established criteria on land and forest restoration. Secondly, publications had to pass an initial quality assessment requiring a scientific grounding and clear methodology. The inclusion criteria included:

- Studies investigating policy, governance, and/or institutional variables and engagement/adoption factors on land restoration and forest restoration in Africa.
- Studies investigating policy, governance, and/or institutional variables and engagement/adoption factors on ecosystem services and ecosystem integrity in Africa.
- Studies on REDD+ efficacy in Africa focusing on governance, policy and/institutional factors.
- Reviews and meta-analyses focused on the performance of land and forest resources, governance, institutional frameworks, and policies in Africa.

3.4. Information Extraction and Synthesis

Titles of the final list of 280 publications (the initial 197 and additional 83 from Google Scholar) were screened for relevance according to the above inclusion/exclusion criteria. We subsequently screened all abstracts against the same relevance criteria before moving to the next stage for full-text screening. The screening was carried out using the online version of the Mendeley citation software. The publications that passed the full-text screening represent the core data sources finally used for this review. From the 280 initial publications, 113 (including 71 from WoS-derived publications plus 42 from Google Scholar) made it through our inclusion/exclusion criteria based on their titles. Subsequently, 76 publications were relevant after abstract screening, and 30 made it through full-text screening (see Appendix B, Table A2).

Similar to a data mining approach, we extracted data from our final sample of 30 publications using a matrix created in Microsoft Excel 2016. The full data extraction and analysis revealed three convergent, scale-based themes from the publications: (1) household/farm level; (2) program or intervention level; and (3) governance-related factors for FLR and SLM. We present the results of our qualitative analysis of the selected publications in the next section.

4. Results

Our review of the literature reveals multiple factors that influence the success, failure, or mixed outcomes of FLR interventions. We present these factors in three categories that represent the scale at which the interventions and key stakeholders largely operate. We do so to highlight the multi-scale and multi-level nature of the hindrances and opportunities to achieve FLR promises in SSA.

4.1. Household and Farm-Level Factors

Farmers and landholders were the main agents of restoration at the local level and their behavior and decision-making regarding land management is important to consider. Publications that addressed questions of the adoption of and investments in natural resource management and conservation to combat degradation in SSA for land restoration revealed diverse micro-scale issues and factors affecting the processes and outcomes of FLR. The influential factors were mainly socioeconomic and financial, cultural, and biophysical.

4.1.1. Adoption of Resource Conservation Technologies

Farmers' decisions regarding how to manage their land, including whether to use selected SLM practices, depended on their perception of the extent and severity of land degradation and on other factors that were specific to their households and landholdings. In Ethiopia, Shiferaw and Holden [84] found that the decision to adopt land-conservation practices and technologies and to maintain their use

was influenced by how important farmers perceived the threat of soil erosion, and how informed and aware they were of the attributes and potential benefits of the conservation technologies in offsetting the degradation issue. The decision to adopt was also a function of household attributes and farmland characteristics, including types of land use (cropland or pasture land), the slope and aspect, the size of the land, and other micro-ecological characteristics of the location of the land. According to the authors, "*peasants' decisions to retain conservation structures are positively and significantly related to soil erosion perceptions, attitude towards new technologies, exposure to new practices, per capita availability of cultivable land, parcel area and slope, and productivity of the technology. [...] Negative significant influences for retention of conservation structures include age, family size, and location of the parcel in the main cropping zone*" [84] (pp. 243–244). Nigussie et al. [85] arrived at similar evidence from their empirical study in north-western Ethiopia and revealed that the drivers of adoption of SLM technologies at small-scale are mainly socioeconomic and farm-related in combination with the intrinsic features of the technologies.

Factors, including farm size, slope, farmer's age, engagement in off-farm economic activities, and the cost-effectiveness of the SLM technologies also emerged as important for both SLM adoption and sustenance. Research comparing farmers in East (Tanzania and Ethiopia) and West (Mali) Africa substantiated the importance of farm characteristics (farm size and steep slopes), and the profitability of terracing and erosion-control techniques [86]. The authors also highlighted the farmer's age as a very relevant factor, positively associated with the SLM adoption continuum (engagement and actual adoption phases). This suggested that targeting youth farmers in FLR and SLM interventions would bear dividends. Livestock holding size was negatively associated with the adoption of SLM techniques. Drawing from cases in Mali and Ethiopia, de Graaff et al. [86] showed that having alternative off-farm economic activities was associated with lower intensities of adoption, as did larger farm size and family size. Beyond adoption, sustaining the SLM practices was also critical, as indicated by continued use of the practices/technologies or by replication on other or new degraded lands. The authors found that farmers took up and sustained the use of technologies deemed cost-beneficial (low-cost and profitable), and for which reproduction materials were readily available.

Adimassu et al. [87] consolidated these determinants of the adoption of SLM technologies in their review and synthesis. They underscored positive factors, including farmers' capability and aptitude to invest in SLM practices; farmer motivation and rewards for investing in resource conservation and improvement; and instrumental elements such as institutional support and policies. Ajayi et al. [88] drew similar conclusions from their review of the adoption of soil-fertility replenishment technologies in southern Africa. The authors revealed that the uptake of SLM techniques by farmers was contingent on household-specific sociocultural and economic characteristics (farmer perceptions, resource endowment, household size, customs and beliefs), and on geospatial and technology-specific attributes (performance of plant species across different biophysical conditions, location of village, soil type, management regime). On choice or the development of technologies, Ajayi et al. [88] stressed looking for both adequate biophysical niches and sociocultural relevance, as a promising avenue to broaden the adoption of restoration techniques and successful upscaling of FLR (see Section 4.2.3 below).

4.1.2. Investment in Conservation Activities

Having an understanding of the factors affecting the decision to invest in land conservation and restoration practices is important to gauge the potential future success of FLR. Some of the studies investigated the conditioning elements of the level of investments that landholders can afford, and where (on which land type) they are willing to invest in the process of combating land degradation. In a study from Ethiopia's Central Rift Valley, Adimassu et al. [89] found that household resource endowment, farming experience and knowledge, access to information, social capital, and the availability of family labor positively determined decisions regarding how much investment in land rehabilitation was affordable. They recommended extension SLM strategies that augment household resource endowment, improve their access to information, and enhance collective action on land management. While resource constraints were important, farmers also engaged in risk analysis and

objective judgment to determine which land qualified for their SLM investments. Larger farmlands perceived as the most prone to water erosion and with better soil fertility potential received preference for investments in reversing degradation [89].

4.2. Elements of Design and Implementation at the Level of Projects and Programs

4.2.1. Defining Primary Objectives of Restoration

Clearly defining the primary objectives of land/forest restoration interventions is crucial in determining the choice, level of investment, and effectiveness of restoration techniques, particularly at the project and program level. This need for objective specificity may run counter to broader implicit goals of FLR. The shift in the objectives of restoration under FLR from a singular focus on eco-centric to pluralistic goals (inclusive of both ecosystem service protection and the restoration of biodiversity) commendably helps encompass multiple benefits for diverse stakeholders. However, it can also 'fuzzify' objectives and complicate the justification for investment, create a conflicting terrain among objectives and competing stakeholders, make interventions increasingly expensive, or even undermine the potential success of FLR interventions. Thus, while praising the advantages of the malleable aspects of FLR, Pistorius et al. [34] concluded, "*which FLR transitions are appropriate depends on the contextual factors specific to the landscape.*" In contrast, Bullock et al. [90] called attention to the careful consideration of the objectives of restoration interventions, whether restoring to supply ecosystem services or restoring to prevent biodiversity loss, or both. The authors suggested that if both objectives are considered, then it is critical to use the best and most appropriate approach to achieve the expected outcomes. Bullock et al. [90] further emphasized the consideration of contextual factors as important mediating factors. These included the nature and level of degradation, the availability of resources for FLR, the national land development priorities, and the levels of dependence of local people on natural resources for their livelihoods.

4.2.2. Approaches to Restoration Interventions

Closely related to clarifying the purpose of restoration and accounting for contextual factors is the choice of the appropriate restoration approach, from design to implementation. There are many pathways to achieve restoration goals. These approaches can be generalized into two categories: first approaches directly and actively targeting restoration of the composition, structure, and functional diversity, and second, indirect approaches that harness the trickle-down benefits of other conservation and land management interventions. While the literature revealed both categories, the second was particularly relevant for its potential to realize secondary restoration benefits embedded in the plethora of ongoing natural resource management schemes. Such schemes include participatory and community-based conservation; ecosystem management programs, such as payment for ecosystems services (PES); agroforestry projects/programs; REDD+ and carbon market schemes; farmer-managed natural regeneration (FMNR); and conservation agriculture (CA). The broadening of FLR objectives allows a more holistic approach to restoration, encompassing and integrating a range of conservation and restoration practices without having to reinvent the wheel.

PES schemes are an example of interactions between primary conservation efforts realizing secondary outcomes of restoration. Bullock et al. [90] argued that PES schemes, which usually entail incentivizing the conservation of ecosystems that are important for the provisioning of ecosystem services, could be a catalyst for FLR. However, there is need for clear implementation planning to ensure shared accountability and ownership of the multiple goals that are set. Additionally, Bullock et al. [90] warned of the dangers of stakeholders retreating to focusing on singular objectives if careful implementation planning is ignored.

Another pathway supported by the literature refers to the use of interlinked contracts, which offer positive economic incentives to sustainably manage land resources [91]. Rooted in market-based approaches to environmental protection, interlinked compliance approaches apply

a mixture of regulatory and economic incentives to influence behavior [91]. Basing their conclusion on land conservation programs with highland smallholders in Ethiopia, the authors argued for incentive contracts, which tie the sustainable management of natural resources and positive resource conservation behaviors to access to critical input subsidies (seeds, fertilizers, etc.), or benefits from a program (training, credits, etc.) or policy (secure land rights). Shiferaw and Holden [91] posited such approaches as promising instruments for fostering SLM in poor rural economies to address both economic and environmental objectives in landscape and resource management schemes.

In sum, FLR integrates restoration-specific projects/programs and approaches with secondary restoration benefits from the diverse conservation interventions targeting multiple or other objectives. Relying only on standalone and active restoration-style initiatives would make FLR intractable and success unlikely in reasonable timeframes, if only due to the sheer amount of new resources it would need. Finding creative institutional arrangements to coordinate and co-account for these disparate efforts will remain the weakness of FLR. Interlinked contracts show initial promise for rural farmers as a co-accounting measure.

4.2.3. Choice of Technical Practices and Technology-Related Infrastructure

Multiple SLM technologies are appropriate for FLR and are systematically co-opted [82,92]. One example of a technology that has been heralded for its potential for conserving and restoring arable land under rice production is the sawah eco-technology used in "*levelled, bunded and puddled rice fields under controlled submergence*" [93] (p. 221). The practice of sawah originates from Southeast Asia, and can improve the productivity of rice in SSA, enhance food security, and alleviate poverty while sparing forests from conversion into arable land. Applications of such technologies in SSA, however, still need large-scale testing and contextualization.

Restoration technologies contextualized to local realities and providing multiple uses and benefits are generally favored. Advancing the use of locally available and relatively cheap materials that are accessible to smallholders in the region, Kimiti et al. [94] tested different land management techniques in Kenya for erosion-control performance. The techniques were: (1) protecting ground vegetation cover from livestock/wildlife grazing; (2) mulching and trenching to conserve groundwater; and (3) stimulating soil fertility and biological activity. They found that low cost ground-erosion control practices that could be implemented by local managers and pastoralists had the greatest potential for success. Through interviews, Galabuzi et al. [95] uncovered the most preferred techniques for restoration in Uganda, and caution that the choice of technical package for restoration is context-specific and should be empirically informed. Authors from both the Kenya and Uganda case studies concurred that tailoring technologies to the local realities of smallholders and opting for techniques that hold multiple utilities and appeal to the smallholders' needs are the best possible route for effective action against land degradation.

However, the restoration infrastructure needed to meet project targets is lagging behind, considering the current surge in regional and global programs on FLR. A recent global review of the capacity of existing restoration infrastructure to meet FLR goals [96] highlights the lack of sufficient, diversified, and quality genetic materials (seeds and seedlings) to meet ongoing restoration projects and interventions in SSA, Asia, Latin America, and other developing regions. The authors suggested several solutions to assessing the size of demand and supply of seeds in the context of regional restoration projects. These include aligning funding cycles to reflect the long-term nature of restoration; fostering an culture open to sharing knowledge on the selection of genetic material; open attitudes to exchanging genetic materials across landscapes; and instituting quality control through certification methods, enforcement, and monitoring compliance.

4.2.4. Managerial Aspects at the Project/Program Level

It is now generally agreed that local people and land users are best placed to take charge of efforts to conserve and restore natural resources that are crucial for their food security, income generation,

and wellbeing. Davies [97], for instance, demonstrates that the participation of grassroots organizations and local land users is important for the legitimacy of governance structures within restoration schemes. As such, FLR efforts are likely to be better implemented and successful when local people and collectives who have a direct stake in the functional integrity of the local natural resources play an active role in the efforts.

Despite its importance, the participation of local stakeholders in restoration programs is not a panacea to solve the frequent failure of top-down schemes. Outcomes often fall below expectations, and it should not be blindly accepted as the key to successful project implementation. In a study in Uganda, Galabuzi et al. [95] reported that the conditionalities for farmers to participate in forest restoration schemes included assuring them secure access to forest resources and equitable benefit sharing. Ofoulhast-Othamot [98] highlighted the shortcomings of local participation when the conditions are not propitious. Local participation in community forest management in Dimako, Eastern Province of Cameroon, was deemed ineffective due to poor implementation by local officials, lack of accountability, and inconsistencies in implementation against project objectives. One can infer that politics and the role of incentives for locally-elected officials cannot be ignored when considering local and municipal involvement in forest governance. The findings also reflect the need to balance relations of power among the main stakeholders in community management. As noted by Galabuzi et al. [95], reinforcing the capabilities of local people in collaborative forest governance must be accompanied with effective monitoring and rule enforcement, as well as equitable benefit sharing mechanisms.

4.2.5. Knowledge, Knowledge Transfer, Capacity Building, and Monitoring of Restoration

Knowledge availability and use emerged as important in influencing FLR and SLM success and scaling up at the project/program level. Despite the availability of robust foundational knowledge on restoration practices, inadequate mobilization and use of this knowledge (including relevant scientific knowledge) undermines efforts to halt or reverse land degradation to meet the full potential of FLR [99]. Such foundational knowledge includes economic knowledge highlighted by the Economics of Land Degradation initiative [17] and knowledge on governance [100]. Managing the rehabilitation of degraded soils and managing land more sustainably involves diverse factors, including ecological, sociocultural, and economic considerations. Etter [99] contends that the challenge of inadequate financial resources remains a major constraint to mobilizing relevant existing knowledge for FLR success. Leveraging diverse sources of financing to expand restoration will require a holistic understanding of the benefits of ecosystem services and other natural resources for local economies (including attracting investments), and on general well-being.

In addition to the need for scientific knowledge, there is growing consensus on the importance of local experiential knowledge in restoration practice [97]. Local knowledge is therefore increasingly integrated into project design and implementation. However, there is little evidence of effective mechanisms to guide the integration of traditional knowledge and customs into policy. Using a case study of land-use patterns of pastoralists in Botswana, Basupi et al. [101] noticed that not only were local customs and knowledge absent from restoration policy, but the policy guidelines were also often misleading as they did not reflect the reality of land users. The authors argued for integrating local spatial knowledge on traditional land/resource tenure and supporting observed land uses to better articulate and understand the pastoral land-use rationale. Participatory mapping and Geographic Information Systems (GIS) can be used as part of integrated assessments to develop sustainable pastoral land management policy toolkits, and to inform land tenure and management decision-making for SLM interventions [101].

Knowledge transfer and capacity building also emerged as necessary for enhancing FLR. Beyond knowledge availability, there is need for adequate technical capacity to perform monitoring of FLR efforts. Badjana et al. [102] stressed the need to reinforce local capacities in restoration-related skills through adequate training and provision of disposable technical resources. In the context of local

restoration research, they state: "*It is evident that free data and software in combination with capacity building efforts can empower local practitioners in research environments lacking economic, human and technical resources, to provide new and important information on how the local landscape is changing*" from restoration and reforestation [102] (p. 22).

Finally, restoration efforts need to be measured through appropriate monitoring plans and measurable indicators to evaluate restoration success [36,103]. In review of how restoration success was measured and depicted, Ruiz-Jaen and Mitchell Aide [35] questioned the suitability of multiple indicators of restoration in use. In their recommendations on monitoring design, the authors emphasized including variables among the ecosystem attributes that explicitly relate to ecosystem functioning and using at least two reference sites to capture the variation that exists in ecosystems, while effectively assessing restoration impact and the resulting land-use transition types.

4.3. FLR Governance, Institutional, and Policy Factors at the Local and State Government Levels

4.3.1. Governance-Related Factors

The publications in this review highlight the importance of effective governance of FLR as a scheme and of an enabling governance context for fostering FLR. Governance systems, defined as "*the ways and institutions through which individuals and groups express their interests, exercise their rights and obligations, and mediate their differences*" [104] (p. 26), significantly shape SLM and FLR outcomes. Wilson and Cagalanan [100] analyzed existing and potential innovative governance approaches for FLR success. They propose that "*successful governance approaches should be people-centered, adaptable to local contexts and needs, engage a range of stakeholders across different scales and sectors, and be flexible to incorporate local practices and ideas, and changes in these over time*" [100] (p. 11).

McLain et al. [105] and Davies [97] critically discussed the enabling nature of the broader governance context for SLM and FLR interventions to succeed. Mclain et al. [105] identified several governance barriers from past restoration schemes: lack of trust, non-integration of policies and programs at national and subnational scales, absence of functioning inter-ministerial and inter-actor communication arrangements and collaboration, and lack of meaningful community engagement. Davies [97] further took a local perspective on governance and divided community engagement into local participation in decision-making, compliance with laws and rules, and empowerment. However, Ofoulhast-Othamot [98] also cautioned that local participation does not always result in ab improvement in natural resource governance and conservation if compliance and enforcement are poor. Davies [97] stressed the greater benefits that stem from strengthening governance, emphasizing the two-way influence that governance and tenure security and rights have on each other. However, he cautioned: "*[...] governance is embedded in culture and behavior as much as in legal statutes, strengthening it can be a complex task*" [97] (p. 69).

As a guide to strengthening local governance of natural resources, Davies [97] provides seven commendable principles, building on the three strategic elements of governance processes (rules, norms, and institutions) that determine how power and responsibilities are exercised, decisions made, and citizens participate. These principles are: (1) restoring the influence of traditional leadership; (2) recovering ancestral knowledge; (3) updating traditional systems; (4) empowering women through governance; (5) enhancing the social fabric and grassroots organizations; (6) legal recognition of local rules and regulations; and (7) preserving natural infrastructure. Mclain et al. [105] confirmed these local governance elements and emphasized those that are the most prominent and urgent for FLR to address, namely strengthening community capacity to engage meaningfully in FLR governance during the design, implementation, and monitoring and evaluation phases; ensuring the transparency and accountability of community leaders, NGOs, government officials, and other relevant stakeholders for FLR; and taking actions that increase connectivity across scales, sectors, and social actors.

4.3.2. Institutional Tenure Arrangements

Review findings highlight the strong need to consider the political dimensions of natural resource management and governance, in which lie the conundrums of contested issues surrounding land and forest resources [106]. These include close attention to challenges of property rights, land tenure security, local land-use practices, their regulations and customs. The findings reflect the central role of power relations in institutional issues—who supports an intervention/action, who does not; their motivations; their social status and therefore level of influence; ultimately, who wins, who loses, and how they react.

The impacts of the land tenure system on FLR can be complex and multi-faceted. In a local study of Miombo-woodland ecosystem recovery in Zambia, Chidumayo [107] found that land tenure affected the restoration success of Miombo forests, but interactions between land-use change factors, such as tree cutting and fire, were more important in determining the regeneration and regrowth processes. The study measured impact in stem and wood biomass density, and the rate of biomass accumulation. Woodland recovery was more significant in protected forests than woodlands in common-property regimes (customary land tenure), or leasehold tenure. However, tree-stem density was high on customary lands, illustrating that the common property regime did not impede the restoration process. The author recommended emphasizing regulation of land use activities more than changing land-tenure systems to secure restoration success.

The nuanced understanding provided by Chidumayo [107] on the effects of land tenure type and land use systems on restoration success is extended to a local study in Botswana. Basupi et al. [101] showed that both the misunderstanding of customary rights and an absence of clear rights over grazing worsened land degradation in the context of widespread privatization of rangelands. They highlighted the need to accurately understand the spatial patterns of the local and traditional land tenure types that undergird land use activities, especially under common property regimes, in order to enhance their regulation.

Two dimensions of tenure emerged as the most determining institutional factors for smallholder farmers to engage in SLM and FLR schemes: tenure rights and tenure security [108,109]. Two publications explored the effects of tenure security on soil conservation and the effects of clear forest-carbon ownership on the land tenure security of local landholders and communities in reforestation areas. From her compelling case study in Malawi, Lovo [110] concluded that tenure insecurity induced by the prevailing informal land rental market that grants short-term contracts impeded investments in soil conservation and tree planting. Gender-biased inheritance and marriage practices have a similar effect. She called for land reforms focusing on clarifying and securing land rights. Similarly, de Aquino et al. [111] found that endeavors to clarify forest carbon ownership had enhanced the process of securing the local land tenure of participating landholders, thereby fostering engagement in SLM and FLR activities in Niger and Kenya. Institutional arrangements, including the development of benefit-sharing agreements and formal private contracting, helped to clarify carbon ownership rights. Successes depend upon appropriate project design and implementation that strengthened rural institutions and involved national land agencies in restoration-project implementation.

A rights-based approach to tenure can provide a powerful frame to secure land rights and tenure security for FLR success. Sourcing from REDD+ interventions and existing restoration experiences, McLain et al. [105] demonstrated a rights-based approach to enhancing FLR program design and implementation and catalyzing local community empowerment. The authors strikingly argued: "*[...] what is required in many cases is rights recognition or devolving a larger array of actual rights and that doing so is not optional in most situations if FLR initiatives are to be successful. [...] We contend that rights provide communities and individuals the agency and capacity needed to withhold agreement when decisions about restoration design and implementation do not meet their understandings of what is reasonable*" [105]. The authors outlined five critical elements to a rights-based approach to tenure to enhance FLR success. These include: (1) the recognition or devolution of rights and rights actualization as a foundational base; (2) the design of FLR programs in a scheme that generates widely shared

benefits (such as PES schemes); (3) support for technical and institutional capacity building at various levels; (4) support for transforming forest agencies into extension and away from law enforcement; and (5) enhancing connectivity between scales, sectors, and social actors. We discuss policy actions and governance-related factors below.

4.3.3. Policy and Broader Institutional Factors

The review found that addressing local level challenges of tenure is not sufficient on its own to ensure sustained FLR success. Scaling up/out FLR required taking policy actions that systematically address the tenure issues at the broader national scale to assure that local level endeavors are not in vain. Concurring with Lovo's [110] call for land tenure reforms, McLain et al. [105] offer a framework to analyze tenure for the success of large-scale restoration interventions—clarify existing tenure rights and identify and elaborate new reforms needed. Vetter's [112] study on rangeland commons in rural landscapes of South Africa provides an example of tenure policy reforms that can support SLM and FLR. Applying ecological and economic models appropriate to different contexts, Vetter [112] suggested that policy reform efforts should be aligned with local realities and practices. She contended that policies should clarify access rights under common property management and strengthen tenure security, while integrating livestock development within a broader development agenda that fosters multiple livelihoods to reduce risks and enhance the resilience of smallholder farmers.

Gender inclusion also emerged as crucial for tenure policy reforms. Mclain et al. [105] underlined the importance of addressing gender and other social inequity issues related to access to rights, benefits, trust and social connectivity. Likewise, Westholm [113] highlighted the impacts of shortcomings arising from the lack of gender differentiation on the use and benefits of forest and tree resources in a study in Burkina Faso. She called for policy-making in forest conservation and landscape restoration that accounts for prevailing inequity and injustice and avoids being gender-neutral; as did Cormier-Salem [114] based on case studies across Africa.

The review also highlighted the importance of other policy and institutional arrangements beyond land tenure reforms that enhance the conditions for improving broader natural resource management. One illustration is from Milton et al. [115], who preconized alternative economic policy incentives for restoring natural capital in South Africa's rangelands. Most important were economic policies fostering income generation from nature tourism, wildlife management, and the rejuvenation of natural resources for livestock management. Knüppe and Meissner [116], who studied barriers to sustainable land and water management (SLWM) in South Africa, emphasized the positive effects of an institutional environment that favors multi-stakeholder efforts and supports grassroots organizations and advocacy for the sustainable extraction and use of water. The authors also highlighted the need for an effective monitoring system policy and enforcement of land and water conservation laws and regulations, as well as encouraging market economies that stress the equitable use of water in agricultural production chains.

When conducive policy and legal settings are lacking, SLM and FLR schemes face serious challenges. Tegegne et al. [117] illustrate this in their exploration of policy options to address forest degradation and loss in the Congo and Cameroon. The authors argued that "*it is unlikely that deforestation can be addressed effectively in Cameroon and Congo without addressing the institutional and policy factors—mainly corruption, lack of inter-ministerial communication, and the vested interests of political elites—that are driving deforestation in the [both] countries*" [117] (p. 322). In contrast, Pistorius et al. [34] stressed the need for policy reforms to facilitate FLR implementation. From their study in Ethiopia, the authors highlighted policy, legal, institutional, and governance elements constituting the broader enabling environment for FLR, arguing that their lack, limitations, and flaws undermine FLR success.

5. Discussion

Although studies specifically referencing FLR remain scant in Sub-Saharan Africa, this review illustrates that there are sufficient studies of related programs, albeit with different goals and political agendas, to provide early lessons to gauge the prospects of the success of FLR. Examples of FLR-related initiatives include natural resource conservation schemes like PES, REDD+, carbon-trading initiatives, landscape protection/conservation schemes, and agroecological interventions, including agroforestry and conservation agriculture. Our review of FLR constraints and opportunities in SSA provides a comprehensive understanding of the multilevel social and institutional factors at the household, project, and government scales, which influence the success or failure of this integrated approach to land restoration. We summarize the FLR stakeholders, dynamics, and relationships emerging from the literature review in Figure 1 below.

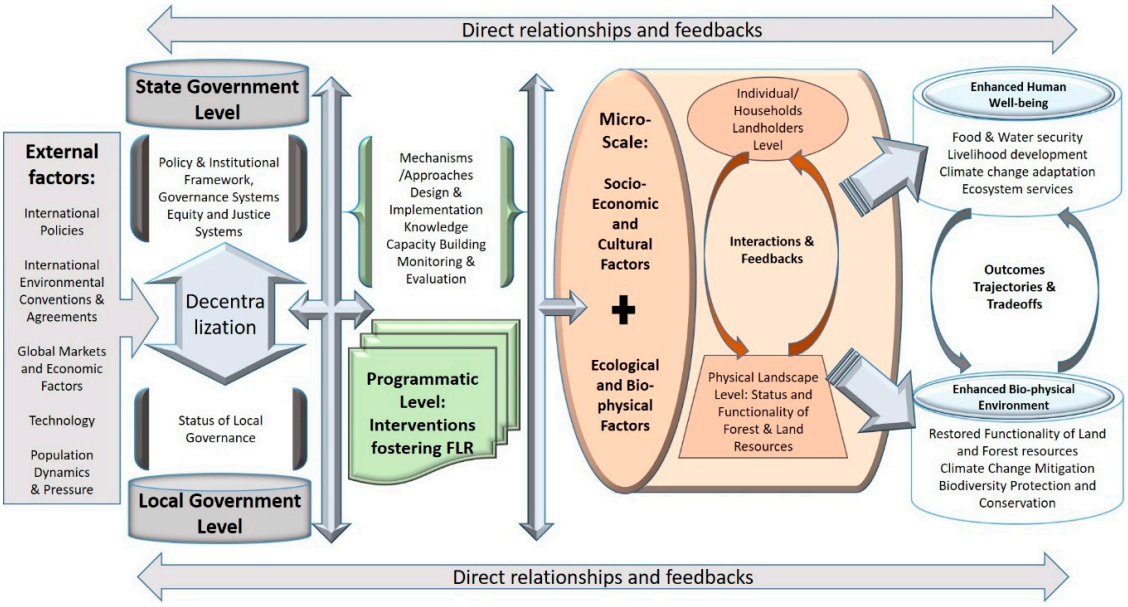

Figure 1. Multi-level and multi-scale influential factors for FLR and SLM interventions.

Figure 1 represents the FLR paradigm and the main emerging elements and interactions within and across scales. These elements and interactions reflect not only the complexities surrounding the governance of FLR as a scheme, but also illustrate potential challenges and opportunities that reveal entry points for intervention. Figure 1 underlines three socioecological characteristics of FLR, which are associated with the landscape-based model of natural resources management. The first two include the importance of scale and multi-stakeholder processes and confirm some of the principles (specifically Principles 3 and 5) of the landscape approach to natural resource governance [30]. The third characteristic of FLR, shared by nearly all reviewed studies, is its context specificity and relatedness to biophysical and ecological contexts, socio-cultural properties, and economic and political contexts [73]. The ensuing dynamic complexity calls for greater attention to the sound governance of FLR, which we elaborate on below before discussing the other influential factors that should inform ongoing and future policy agendas and potential areas of future research into FLR.

5.1. Implications for the Prospects for Governing FLR

The governance of FLR has come under increasing scrutiny in the context of holistic perspectives of the notion of landscape governance [71–73]. Reflecting this holistic perspective, our review revealed the need for meaningful engagement with the multiple stakeholders involved, and for a thorough understanding of the relationships and associated power dynamics among stakeholders. This concurs with the second pillar of FLR governance suggested by Mansourian [73] (p. 25)—the importance of "*putting stakeholders at the heart of the FLR process and mapping connections and relationships*". Our findings also underline Sayer et al.'s [30] argument that holistically integrating agricultural and environmental priorities at the (agrarian) landscape scale requires a people-centered approach applied at that scale.

In addition, as shown across our results and in Figure 1, FLR operates at and connects multiple scales. Therefore, identifying the appropriate scale of intervention while accommodating all the different scales involved is essential, as suggested by Mansourian [73]. Cross-scale institutional arrangements must, however, be established and made explicit, enforceable, properly resourced, and monitored, with clear lines of responsibility and accountability among stakeholders [100,118]. Furthermore, the review reflects and postulates some necessary governance criteria for FLR success [100]. Against the theoretically-informed approaches to FLR governance [72], it is worth noting that the orthodox "governance as management tool" was the most common form of governance in the reviewed studies, with few explicit mentions of governance modes 2 and 3 for FLR.

Finally, FLR governance forms should be flexible and evolve over time to accommodate changing contexts, including new land uses, landscape (transition) status or condition, restoration needs, and social actors. Our findings substantiate the importance of FLR interventions being context-specific [90,100], which emerged as important in the reviewed studies in terms of the definition of the restoration objectives, approaches, and techniques adopted for restoration. The findings also suggest that there are still ways to achieve ecosystem-sound, landscape-based forest restoration, which would require cross-scale linking dimensions following van Oosten et al. [72] and Mansourian [73].

5.2. Enabling Governance Context Features for Restoration

Lessons from FLR-type conservation initiatives contribute to debates on the shifting discourse of restoration and the role of institutional and governance-related obstacles [30,119]. Proposed strategies revolve around policy strengthening on tenure issues and improving broader governance systems to address the main institutional and governance bottlenecks to attain FLR aspirations. Clear and secure tenure rights emerged as the critical requirement for FLR/SLM success, as in successful afforestation and reforestation projects [120]. The strategies proposed to address tenure challenges include formalizing rights and strengthening enforcement, expanding alternative livelihood opportunities, and fostering broad-based stakeholder engagement [105]. Although the causality between landscape transition/conditions and tenure devolution remain mismatched and less certain [121] for FLR interventions under common property regimes, finding innovative ways and reforms that enhance land rights and their regulation without changing the prevailing customary tenure system is likely to enhance FLR success. Such approaches can also influence the governance processes and outcomes of FLR [73]. They can facilitate the involvement of local communities in forest and land restoration, an important prerequisite for FLR success. Combatting corruption to ensure better law enforcement, while enhancing the process of decentralization and accountability, is another major enabling factor in FLR governance [122].

5.3. Project-Level Design and Implementation Challenges

Our findings reveal that design and implementation challenges need to be recognized and addressed to avoid the failure of FLR interventions. First, to enhance the performance of FLR and SLM interventions, there is a crucial need to appropriately define restoration goals and the needs to be fulfilled [77], choose effective program mechanisms, and have a detailed implementation plan.

As Chazdon et al. [25] noted, broadening the restoration concept has double-edged implications. It allows committed countries and implementing agencies the flexibility to determine their primary objectives and choose from a range of activities, but it can also exacerbate potential conflicts regarding restoration trade-offs and priorities. Additional issues identified elsewhere, but that did not clearly emerge as important in the set of reviewed papers include, for instance, the importance to consider the starting condition of the forest or landscape (path dependency) in determining appropriate management approaches and outcomes [121]. Further, FLR activities may take other forms, such as traditional land-use agencies (e.g., traditional watershed management programs), and activities of commercial firms, including the rehabilitation of mining areas or commercial plantation establishment. In any case, good planning is important for accountability in such multi-stakeholder initiatives, as it also creates a culture of cooperation among project partners focusing on shared goals.

On the selection of appropriate restoration technologies and infrastructure, important criteria to be considered by/for projects include the fit to the ecological conditions, cost-effectiveness for local land users and local preferences. Some ambitious restoration initiatives in SSA, including the Great Green Wall initiative commissioned by the African Union (AU) in 2006, are already plagued by challenges to meet local suitability, including the relevance of the restoration tree species which were chosen, from a regional perspective [123]. In addition, FLR schemes that integrate technology infrastructure, and support the management of trade-offs between natural resource conservation and sustainable development [124,125], exhibited higher probabilities of success.

In an effort to help overcome design and implementation impediments, Stanturf et al. [74] propose a practical guide for implementing FLR. The guide complements existing FLR tools supporting sound design and implementation to help countries meet their restoration commitments. The support tools include IUCN's Restoration Opportunity Assessment Methodology (ROAM), the World Resource Institute's (WRI) analytical framework, and the Landscape Restoration Diagnostic [126,127]. While these tools are useful, they are not panaceas for curbing landscape degradation issues. Practitioners find it hard to scale down or customize globally designed blueprints into locally adapted interventions [126]. Nonetheless, all such tools converge on the principle that the success of FLR relies on the active involvement and consideration of the needs of diverse stakeholders, including local communities, in restoring the function and productivity of denuded forests and degraded lands. This concurs with conclusions from studies on the management of shared resources with diverse stakeholders, holding competing claims to natural resources [128]. This is key, as described in the core principles of landscape approaches by Sayer et al. [30].

Similar to the need to be inclusive are the challenges around the successful implementation of appropriate participation. These challenges of effective collaboration and engagement with multiple stakeholders in land resource management appear in the review [24,129]. Thus, workable, formalized and funded cross-scale institutional arrangements are essential for ecosystem-or landscape-wide restoration. We argue that relying more on participatory action research (PAR) would enable and ease collaborative implementation. This calls for a revitalization of known social science methods in new problem-solving approaches of collaborative and adaptive governance, as illustrated by researchers engaged in a land use planning scheme in South Sulawesi in Indonesia [130].

5.4. Micro-Scale Socioecological Factors in Achieving FLR and SLM Interventions

At the micro-scale, our review of the literature on SSA reflects that farmer or household-level factors influencing the adoption of and investments in restoration are a function of their sociocultural, economic, and broader contextual realities, following some known features of adoption of sustainable agricultural technologies in SSA [131]. These are similar to non-African developing countries and regions. Examples from Peru and Bangladesh showed that the progressiveness and economic status of farmer households are critical determinants of the adoption of restoration practices [86], with more open-minded and wealthier farmers being early adopters.

The review reveals a constellation of factors that promote FLR/SLM adoption and sustenance. The nature of those factors resonates in part with evidence that resource endowments underpin farmer decisions on developing strategies to combat land degradation or deforestation [132]. Devising and promoting appropriate motivation and reward systems can catalyze the decision of farmers to invest in restoration schemes that target agrarian landscapes. Incentive systems include encouraging farmers to consider the implications of natural resource depletion when making agricultural production decisions [86] or improving farmer awareness of the benefits of restoration [95]. Interlinked contracts [86] that support forest/land resource restoration behavior can also provide the mechanism for explicit socioeconomic incentives and benefits to promote FLR/SLM adoption. On the biophysical side, the challenge remains regarding how to contextualize mechanisms to local ecological conditions and to achieve holistic, ecosystem-level restoration that confers resilience to environmental change [70]. In sum, FLR/SLM interventions should target both enabling household-level socioeconomic factors and cultural contexts, along with the integration of appropriate FLR/SLM technologies that meet the ecological needs of prevailing ecosystems [88].

Nonetheless, deepening the knowledge of the micro-scale factors is important, and scholars have called for improved research methods that enhance our understanding of enabling behaviors of investment in restoration schemes in agrarian landscapes and their space–time dynamics and pathways. [83,133]. Arguments for consistent analyses of the micro-scale factors include a broadened lens that incorporates multiple perspectives, approaches, and dimensions, such as market aspects, institutional and policy environments [53]. These are reflected in Figure 1. As a source of guidance for scale-relevant policy formulation, Schlecht et al. [134] point to modeling approaches and scenario analyses to account for both agroecological and socioeconomic differences at various scales in the assessment of suitability of technologies. Addressing those research needs is imperative and timely to guide the accelerated scaling up of restoration under FLR.

5.5. Overarching Issues of Knowledge, Capacity Building, and Monitoring and Evaluation

Knowledge is highly contested in natural resource studies, and FLR is no exception, but there is growing consensus that both scientific and local (indigenous) knowledge is important for FLR success. Multi-stakeholder resource management following landscape approaches are negotiation processes. It is common in many negotiation processes that local land users do not possess the requisite scientific expertise that often dominates such negotiation arenas. Hence, they miss the opportunity to express agency and their priorities in terms of their livelihoods' needs and priorities, which may be compromised in the process. The scenario is the same for the efficacy of FLR efforts in the absence of integrated local and scientific knowledge within restoration programs. Reed et al. [129] noticed that there is a dearth of grounded evidence from long-term trialing of local-level ecosystems-management initiatives to guide development practitioners in the implementation of restoration and sustainable management. Gathering and disseminating knowledge resources from non-governmental and grassroots projects that achieve functional restoration outside the limelight of academic publishing and international conferences remains a challenge.

Previous authors have stressed the importance of local capacity-building arrangements within natural resource management [24,51]. Sayer et al. [30] posited "strengthened stakeholder capacity" in the case of land users and local stakeholders as a core principle for effective participation in complex negotiation processes concerning landscape management. Within Ghana's Modified Taungya System (MTS), Ros-Tonen et al. [51] also highlighted the importance of capacity building for knowledge transfer, and knowledge co-creation with explicit consideration of local knowledge.

On monitoring and evaluating FLR success, our findings are aligned with a recent review study of ecological success evaluation for restoration that suggested that assessing landscape transitions with an emphasis on ecosystem functional diversity, composition, and structural diversity [135].

6. Conclusions

This review has shed light on the origins, common concepts, experiences, enabling factors and obstacles, and prospects for forest and landscape restoration in SSA to inform researchers, policy-makers, and practitioners as the contemporary promotion of FLR approach begins to catch on. The shift in FLR discourse and practice from an eco-centric mindset advancing forest/land restoration to some untouched original state, to a pluralistic socio-centric mindset, offers opportunities for win–win (and sometimes triple-win) scenarios that can achieve ecological restoration while simultaneously delivering food security, poverty alleviation, and broader socioeconomic development goals. However, the paradigm shift and the broadening and reordering of restoration objectives under FLR does not remove the challenges associated with eco-centric conservation; if anything, it multiplies them. Therefore, successful FLR implementation still needs to be informed by experiences and lessons from past schemes. This review has illustrated that there are useful lessons to be drawn from the past 15–20 years of research and development practice to inform and catalyze the renewed interest in restoration interventions under the FLR banner.

The study uncovered multi-level and multi-scale challenges to scaling up and out successful small-scale restoration and sustainable land management initiatives in Sub-Saharan Africa. It offers pathways to overcoming pervasive institutional, policy, and governance challenges at all stages of FLR project conception, design, and implementation. However, which of these factors work best in specific areas and in what combinations to address a specific environmental problem ultimately depends on the context and restoration objectives. Our findings have also highlighted research gaps/needs to guide future research emphasizing holistic FLR management for accelerated adoption on the continent. We summarize such potential areas of future research into FLR as follows:

- Development of creative cross-scale and cross-sector governance and institutional arrangements to coordinate, account for, and promote holistic FLR initiatives (these include effective stakeholder processes).
- Empirical measures of restoration intervention impacts in SSA contexts, particularly in agrarian landscapes and at the forest/agriculture interface.
- Promotion of truly participatory management in agrarian landscapes.
- Robust methodologies that can contribute to informing decision-making and behavioral change towards SLM and restoration activities.
- Determining and using best-bet technologies under particular settings.
- Development of the best incentive mechanisms for scaling up FLR at local, intermediate/commercial, and large scales.

The evidence synthesized here is valuable to inform the FLR policy agenda and guide effective FLR and SLM interventions on the ground. Supported with adequate or increased financial resources, we believe that following the principles, insights, and lessons gleaned in this review sets the scene for FLR success.

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Author Contributions: L.C.Z. recommended the review and fed it with initial perspectives. I.N.S.D. conceived and designed the review and its processes. S.F. and I.N.S.D. conducted the structured literature review processes detailed in the Methods section. S.F. and I.N.S.D synthesized and analyzed the data (publications sampled). I.N.S.D, S.F., and L.C.Z. wrote the paper.

Conflicts of Interest: The authors declare that they have no conflict of interest.

Appendix A

Table A1. Title coding in NVIVO and subsequent screening to sample relevant papers.

Text Search Queries	Retrieved Papers	Compound Queries	Retrieved Papers
Governance	19	Text search expanded to papers' title	19
Governance [AND] factors	2	Text search expanded to papers' title	1
Governance [OR] Constraints	28	Text search expanded to papers' title	28
Governance [OR] Barriers	26	Text search expanded to papers' title	26
Institutional	11	Text search expanded to papers' title	11
Institutional [AND] Factors	0	Text search expanded to papers' title	0
Institutional [OR] Constraints	20	Text search expanded to papers' title	19
Institutional [OR] Barriers	18	Text search expanded to papers' title	18
Opportunities [OR] enabling	22	Text search expanded to papers' title	21
Incentives	4	Text search expanded to papers' title	4
Land tenure	26	Text search expanded to papers' title	11
Polic* (To account for policies and policy)	51	Text search expanded to papers' title	51
Capacity [OR] building	15	Text search expanded to papers' title	14
Capacity [AND] building	1	Text search expanded to papers' title	1
Cultur* (To account for cultural, culture, culturally)	12	Text search expanded to papers' title	12
Soci* OR cultur*	71	Text search expanded to papers' title	70
Adoption [AND] Factor*	4	Text search expanded to papers' title	2

Appendix B

Table A2. Synopsis of the final sampled and reviewed papers.

Title	Authors	Year	Source	FLR_Influential Factors Studied	Category of the Studied Factors
Low-cost grass restoration using erosion barriers in a degraded African rangeland.	Kimiti, D. W., Riginos, C. & Belnap, J.	2017	Restoration Ecology, 25(3), 376–384.	Low-cost erosion barrier technologies (Enabling factors: opportunities for rangeland restoration in Kenya)	Technologies/technical practices; Knowledge about adequate and context-relevant land management techniques and technologies
Resource degradation and adoption of land conservation technologies in the Ethiopian Highlands: A case study in Andit Tid, North Shewa	Shiferaw, B. & Holden, S. T.	1998	Agricultural Economics, 18(3), 233–247.	Explicit factors that underscore farmers behavior toward SLM and continued participation in FLR: Determinants of the adoption of resource conservation technologies; Determinants of investment in conservation techniques	Household-level and farmer-level compound factors (socio-economic, cultural, institutional, etc.)
Restoration of ecosystem services and biodiversity: conflicts and opportunities	Bullock, J. M., Aronson, J., Newton, A. C., Pywell, R. F. & Rey-Benayas, J. M.	2011	Trends in Ecology and Evolution, 26(10), 541–549.	A. Implications of the significant shift in the objectives of restoration: Potential conflicts between seemingly opposing objectives of restoration B. Examples of Market-based mechanisms that may support renewed restoration movement	Favorable approaches or mechanisms to restoration interventions
Sawah eco-technology—A trigger for a rice green revolution in Sub-Saharan Africa: Basic concept and policy implications	Abe, S. S. & Wakatsuki, T.	2011	Outlook on Agriculture, 40(3), 221–227.	SAWAH eco-technology: a sustainable rice cultivation technique with potential for conservation and restoration of upland forests and agricultural rice fields	Appropriate technologies/technical practices
Can Forest Carbon Finance Influence Land Tenure Security in Project Areas? Preliminary Lessons from Projects in Niger and Kenya: In	de Aquino, A. R., Aasrud, A. & Guimarães, L.	2011	In Carbon Sequestration Potential of Agroforestry Systems (pp. 231–246). Springer Netherlands.	Links between land tenure security and carbon finance mechanism A. Processes to trigger local land tenure securitization. B. Ways of designing and implementing Carbon finance transactions and their effects on land tenure security	Enabling institutional and governance related factors to FLR and SLM; Managerial aspects in relation to interventions/projects
Mapping and estimating land change between 2001 and 2013 in a heterogeneous landscape in West Africa: Loss of forestlands and capacity building opportunities.	Badjana, H. M., Olofsson, P., Woodcock, C. E., Helmschrot, J., Wala, K. & Akpagana, K.	2017	International Journal of Applied Earth Observation and Geo-information, 63 (February), 15–23.	Human resources and technical capacity: Knowledge-related factors that may positively support FLR	Knowledge transfer/capacity building for monitoring restoration and over land cover change under reforestation

Table A2. *Cont.*

Title	Authors	Year	Source	FLR_Influential Factors Studied	Category of the Studied Factors
Using participatory mapping and a participatory geographic information system in pastoral land use investigation: Impacts of rangeland policy in Botswana	Basupi, L. V., Quinn, C. H. & Dougill, A. J.	2017	Land Use Policy, 64, 363–373.	Lack of accurate understanding of local and traditional land tenure and its integration in policy	Impeding institutional and governance related factors
Changes in Miombo woodland structure under different land tenure and use systems in central Zambia	Chidumayo, E. N.	2002	Journal of Biogeography, 29(12), 1619–1626.	The interplay of land tenure and land use activities as a positive factor for FLR	Triggering institutional and governance related factors
Let the women harvest the mangrove. Carbon policy, and environmental injustice	Cormier-Salem, M. C.	2017	Sustainability (Switzerland), 9(8).	Gender issues, lack of inclusion and jeopardization of women's livelihood activities	Inequity and injustice related factors as challenges to FLR success
Enabling Governance for Sustainable Land Management	Jonathan Davies	2015	In Chabay, I., Frick, M. & Helgeson, J. (2015). Land Restoration: Reclaiming landscapes for a sustainable future, 67.	Government's role and principle factors in strengthening local governance over resources.	Both enabling and challenges governance-related factors to FLR scaling up
Land Degradation: An Economic Perspective	Hannes Etter	2015	In Chabay, I., Frick, M. & Helgeson, J. (2015). Land Restoration: Reclaiming landscapes for a sustainable future, 67.	Application or not of available knowledge on SLM and potential for FLR as limit to the adoption of SLM practices. Obstacles: lack of financial resources to switch to SLM and other economic, technical, legal, political, social, cultural, and environmental barriers	Knowledge-related factors and financial bottlenecks as obstacles to scaling up restoration interventions: insufficient efforts to reverse or even halt global land degradation
Policy instruments for sustainable land management: The case of highland smallholders in Ethiopia	Shiferaw, B. & Holden, S. T.	2000	Agricultural Economics, 22(3), 217–232.	The use of interlinked contracts which create positive incentives for land conservation	Mechanism/policy-related opportunity for FLR take up by local landholders
Implementing Forest Landscape Restoration Initiatives Tenure, Governance, and Equity Considerations	McLain, R., Guariguata, M. R., and Lawry, S.	2017	Forests, 8(3), 1–8.	Clear rights to land and natural resources, and efforts to enhance tenure security and rights of self-governance over resources: Six detailed specific challenges of tenure and three broad strategies for addressing tenure challenges.	Governance-related as well as policy-related factors (interaction of tenure with broader governance systems)
The Quest for Sustainable and Decentralized Forest Governance in Eastern Cameroon: The Dimako Council Forest Case Examined	Ofoulhast-Othamot, G.	2015	Small-Scale Forestry, 14(3), 363–379.	Involvement of local elected officials and rural governments in forest management and its impacts in terms of improvement in forest governance and conservation (and reforestation objectives) in Cameroon's forest regions	Local governance: local participation

Table A2. *Cont.*

Title	Authors	Year	Source	FLR_Influential Factors Studied	Category of the Studied Factors
Implementing Forest Landscape Restoration in Ethiopia	Pistorius, T., Carodenuto, S. & Wathum, G.	2017	Forests, 8(3), 1–19.	Policy, legal, institutional, and governance elements and limitations dictating the success (or lack thereof) of specific FLR options.	Enabling environment for FLR
Restoration success: How is it being measured?	Ruiz-Jaen, M. C. & Mitchell Aide, T.	2005	Restoration Ecology, 13(3), 569–577.	Most often used indicators to measure ecological restoration: Diversity, vegetation structure, and ecological processes	Indicators of ecological restoration success
Fruits from the Forest and the Fields: Forest Conservation Policies and Intersecting Social Inequalities in Burkina Faso's REDD+ Program	Westholm, L.	2016	International Forestry Review, 18(4), 511–521.	Use, access and rural organization within NTFP commercialization in Burkina Faso	Gendered policies in forest conversation and landscape restoration
Drivers and barriers towards sustainable water and land management in the Olifants-Doorn Water Management Area, South Africa	Knüppe, K. & Meissner, R.	2016	Environmental Development, 20, 3–14.	Sustainable land management policy, multi-stakeholder efforts, and effectiveness of monitoring systems in land and water conservation.	Enabling policies, managerial, and governance practices that support sustainable water and land management
Economic incentives for restoring natural capital in southern African rangelands	Milton, S. J., Dean, W. R. J. & Richardson, D. M.	2003	Frontiers in Ecology and the Environment, 1(5), 247–254.	Social and international policies and economic opportunities as well as threats	Policies and economic (dis)incentives
Evolution of drivers of deforestation and forest degradation in the Congo Basin forests: Exploring possible policy options to address forest loss	Tegegne, Y. T., Lindner, M., Fobissie, K. & Kanninen, M.	2016	Land Use Policy, 51, 312–324.	Peculiarities of the policy and institutional fabric in the Congo Basin as prominent factors influencing land degradation and deforestation	Institutional fabric and policy context as either enabling or hindering effective resource governance
Development and sustainable management of rangeland commons—aligning policy with the realities of South Africa's rural landscape	Vetter, S.	2012	African Journal of Range & Forage Science, 30(1–2), 1–9.	Rangeland tenure and access policy in South Africa	Policy reforms as enabling factor in landscape restoration
Exploring determinants of farmers' investments in land management in the Central Rift Valley of Ethiopia.	Adimassu, Z., Kessler, A. & Hengsdijk, H.	2012	Applied Geography, 35(1–2), 191–198	Farmers' decision making factors on how much and where to invest in land management: Five major influential factors of farmers' decisions and three major characteristics of plots where farmers are willing to invest	Household-level and farm-level factors determining investments in SLM (socio-economic, cultural, biophysical, ecological.)

Table A2. *Cont.*

Title	Authors	Year	Source	FLR_Influential Factors Studied	Category of the Studied Factors
Understanding determinants of farmers' investments in sustainable land management practices in Ethiopia: review and synthesis.	Adimassu, Z., Langan, S. & Johnston, R.	2016	Environment, development and sustainability, 18(4), 1005–1023.	Major determinants of farmers' investments in SLM practices in Ethiopia, East Africa and subsequent recommendations for policy prescriptions to enhance adoption. Three categories of factors, including farmers' capacity to invest, farmers' incentives for investments, and external factors beyond the control of farmers.	Farmer-level factors and external factors determining investments in SLM.
Factors influencing small-scale farmers' adoption of sustainable land management technologies in north-western Ethiopia.	Nigussie, Z., Tsunekawa, A., Haregeweyn, N., Adgo, E., Nohmi, M., Tsubo, M., ... & Abele, S.	2017	Land Use Policy, 67, 57–64.	Underlying factors determining the adoption of SLM technologies in the Upper Blue Nile Basin: Socio-economic and farm-related factors in combination with the characteristics of the technologies themselves. Warning against "one size fits all" and "across the board" strategies in policies and program design.	Individual household-level factors and external factors determining investments in SLM.
Adoption of renewable soil-fertility replenishment technologies in the southern African region: Lessons learnt and the way forward.	Ajayi, O. C., Akinnifesi, F. K., Sileshi, G. & Chakeredza, S.	2007	Natural Resources Forum, 31(4), 306–317	Factors determining the uptake of renewable soil fertility replenishment (RSFR) technologies by farmers: technology-specific attributes, household-specific factors, geographic elements, and policy and institutions context.	Micro scale factors at household-farm level influencing adoption of restoration technologies (biophysical and social niches of RSFR technologies)
Factors influencing adoption and continued use of long-term soil and water conservation measures in five developing countries.	de Graaff, J., Amsalu, A., Bodnar, F., Kessler, A., Posthumus, H. & Tenge, A.	2008	Applied Geography, 28(4), 271–280.	Adoption process of investments in soil and water conservation (SWC) measures (SLM practices): factors influencing adoption and continued use of SWC.	Household-level and farm-level factors determining investments in SLM (socio-economic, cultural, ecological.)
Tenure insecurity and investment in soil conservation. Evidence from Malawi.	Lovo Stefania	2016	World Development, 78, 219–229.	Sources of tenure insecurity and its effects on soil conservation investments. Land reforms on informality of the land rental market	Limiting institutional and policy factors for FLR
Strategies for empowering the local people to participate in forest restoration	Galabuzi, C., Eilu, G., Mulugo, L., Kakudidi, E., Tabuti, J. R. S. & Sibelet, N.	2014	Agroforestry systems, 88(4), 719–734.	Technology related/tree and soil related conservation techniques of forest restoration	Farmers preferences on techniques and SLM practices to restore degraded forests

Table A2. *Cont.*

Title	Authors	Year	Source	FLR_Influential Factors Studied	Category of the Studied Factors
Governing restoration: Strategies, adaptations and innovations for tomorrow's forest landscapes	Wilson, S. J. & Cagalanan, D.	2016	World Development Perspectives, 4, 11–15	Past and present illustration of governance approaches that improve success of FLR (innovative ways of implementing traditional governance structures and new governance structures tested)	Governance structures to accommodate ongoing and future restoration interventions
Forest and landscape restoration severely constrained by a lack of attention to the quantity and quality of tree seed: Insights from a global survey.	Jalonen, R., Valette, M., Boshier, D., Duminil, J. & Thomas, E.	2017	Conservation Letters, e12424.	Tree species seeds, seedlings, and other genetic materials for tree planting in restoration interventions	Technology infrastructure: availability and diversity of tree seed supply chains supporting scaling up of FLR

References

1. Neumann, R. *Making Political Ecology*; Hodder Arnold: London, UK, 2005.
2. Bassett, T.J.; Crummey, D. *African Savannas: Global Narratives & Local Knowledge of Environmental Change*; James Currey: Oxford, UK, 2003.
3. Blaikie, P.; Brookfield, H. *Land Degradation and Society*; Routledge: London, UK, 2015.
4. Fairhead, J.; Leach, M. Rethinking the Forest-Savanna Mosaic: Colonial Science and Its Relics in West Africa. In *The Lie of the Land: Challenging Received Wisdom on the African Environment*; Leach, M., Mearns, R., Eds.; International African Institute in association with James Currey: Oxford, UK, 1996.
5. Brockington, D.; Homewood, K. *Wildlife, Pastoralists and Science: Debates Concerning Mkomazi Game Reserve, Tanzania*; Challenging Received Wisdom on the African Environment, International African Institute: Oxford, UK, 1996.
6. Richards, P. Ecological Change and the Politics of African Land Use. *Afr. Stud. Rev.* **1983**, *26*, 1–72. [CrossRef]
7. Mabogunje, A.L. Poverty and environmental degradation: Challenges within the global economy. *Environ. Sci. Policy Sustain. Dev.* **2002**, *44*, 8–19. [CrossRef]
8. Etongo, D.; Djenontin, I.; Kanninen, M. Poverty and Environmental Degradation in Southern Burkina Faso: An Assessment Based on Participatory Methods. *Land* **2016**, *5*, 20. [CrossRef]
9. Gray, L.C.; Moseley, W.G. A geographical perspective on poverty–environment interactions. *Geogr. J.* **2005**, *171*, 9–23. [CrossRef]
10. Moseley, W. Environmental degradation and 'poor'smallholders in the West African Sudano-Sahel: Global discourses and local realities. In *African Environment and Development: Rhetoric, Programs, Realities*; Ashgate Publishing Limited: Burlington, VT, USA, 2004; pp. 41–62.
11. Angelsen, A.; Jagger, P.; Babigumira, R.; Belcher, B.; Hogarth, N.J.; Bauch, S.; Börner, J.; Smith-Hall, C.; Wunder, S. Environmental income and rural livelihoods: A global-comparative analysis. *World Dev.* **2014**, *64*, S12–S28. [CrossRef]
12. Tully, K.; Sullivan, C.; Weil, R.; Sanchez, P. The State of Soil Degradation in Sub-Saharan Africa: Baselines, Trajectories, and Solutions. *Sustainability* **2015**, *7*, 6523–6552. [CrossRef]
13. WCED. *Our Common Future*; World Commission on Environment and Development: New York, NY, USA, 1987.
14. Binswanger-Mkhize, H.P.; Meinzen-Dick, R.S.; Ringler, C. *Policies, Rights, and Institutions for Sustainable Management of Land and Water Resources*; SOLAW Background Thematic Report-TR09; Food and Agricultural Organization of the United Nations (FAO): Rome, Italy, 2012.
15. Etongo, D.; Djenontin, I.N.S.; Kanninen, M.; Fobissie, K.; Korhonen-Kurki, K.; Djoudi, H. Land tenure, asset heterogeneity and deforestation in Southern Burkina Faso. *For. Policy Econ.* **2015**, *61*, 51–58. [CrossRef]
16. Nkonya, E.; Gerber, N.; Baumgartner, P.; von Braun, J.; De Pinto, A.; Graw, V.; Kato, E.; Kloos, J.; Walter, T. *The Economics of Desertification, Land Degradation, and Drought toward an Integrated Global Assessment*; ZEF-Discussion Papers on Development Policy No. 150; International Food Policy Research Institute: Washington, DC, USA, 2011.
17. Nkonya, E.; Mirzabaev, A.; Von Braun, J. *Economics of Land Degradation and Improvement: A Global Assessment for Sustainable Development*; Springer International Publishing: Cham, Switzerland, 2016.
18. Turner, K.G.; Anderson, S.; Gonzales-Chang, M.; Costanza, R.; Courville, S.; Dalgaard, T.; Dominati, E.; Kubiszewski, I.; Ogilvy, S.; Porfirio, L.; et al. A review of methods, data, and models to assess changes in the value of ecosystem services from land degradation and restoration. *Ecol. Model.* **2016**, *319*, 190–207. [CrossRef]
19. Gibbs, H.K.; Ruesch, A.S.; Achard, F.; Clayton, M.K.; Holmgren, P.; Ramankutty, N.; Foley, J.A. Tropical forests were the primary sources of new agricultural land in the 1980s and 1990s. *Proc. Natl. Acad. Sci. USA* **2010**, *107*, 16732–16737. [CrossRef] [PubMed]
20. FAO. *State of the World's Forests 2016. Forests and Agriculture: Land Use Challenges and Opportunities*; Food and Agriculture Organisation of the United Nations (FAO): Rome, Italy, 2016; p. 125.
21. Sachs, J.D.; Baillie, J.E.M.; Sutherland, W.J.; Armsworth, P.R.; Ash, N.; Beddington, J.; Blackburn, T.M.; Collen, B.; Gardiner, B.; Gaston, K.J.; et al. Biodiversity Conservation and the Millennium Development Goals. *Science* **2009**, *325*, 1502–1503. [CrossRef] [PubMed]

22. Scherr, S.J.; Shames, S.; Friedman, R. From climate-smart agriculture to climate-smart landscapes. *Agric. Food Secur.* **2012**, *1*, 12. [CrossRef]
23. Sunderland, T.; Baudron, F.; Ickowitz, A.; Padoch, C.; Ros-Tonen, M.; Sandbrook, C.; Vira, B.; Chambers, J.; Deakin, E.; Foli, S. Response options across the landscape. In *Forests and Food: Addressing Hunger and Nutrition Across Sustainable Landscapes*; Open Book Publishers: Cambridge, UK, 2015.
24. Reed, J.; Van Vianen, J.; Deakin, E.L.; Barlow, J.; Sunderland, T. Integrated landscape approaches to managing social and environmental issues in the tropics: Learning from the past to guide the future. *Glob. Chang. Biol.* **2016**, *22*, 2540–2554. [CrossRef] [PubMed]
25. Chazdon, R.L.; Brancalion, P.H.; Lamb, D.; Laestadius, L.; Calmon, M.; Kumar, C. A Policy-Driven Knowledge Agenda for Global Forest and Landscape Restoration. *Conserv. Lett.* **2017**, *10*, 125–132. [CrossRef]
26. Ding, H.; Faruqi, S.; Wu, A.; Anchondo Ortega, A.; Verdone, M.; Zamora Cristales, R.; Chazdon, R.L.; Vergara, W. *Roots of Prosperity: The Economics and Finance of Restoring Land*; WRI: Washington, DC, USA, 2017.
27. Faruqi, S.; Wu, A.; Brolis, E.; Anchondo Ortega, A.; Batista, A. *The Business of Planting Trees: A Growing Investment Opportunity*; World Resources Institute (WRI): Washington, DC, USA; The Nature Conservancy: Arlington, VA, USA, 2017; p. 66.
28. Dewees, P.; Place, F.; Scheer, S.J.; Buss, C. *Investing in Trees and Landscape Restoration in Africa*; The World Bank Group: Washington, DC, USA, 2011.
29. Laestadius, L.; Maginnis, S.; Minnemeyer, S.; Potapov, P.; Saint-Laurent, C.; Sizer, N. Mapping opportunities for forest landscape restoration. *Unasylva* **2011**, *62*, 47–48.
30. Sayer, J.; Sunderland, T.; Ghazoul, J.; Pfund, J.-L.; Sheil, D.; Meijaard, E.; Venter, M.; Boedhihartono, A.K.; Day, M.; Garcia, C. Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. *Proc. Natl. Acad. Sci. USA* **2013**, *110*, 8349–8356. [CrossRef] [PubMed]
31. IISD. Summary of the International Expert Meeting on Forest Landscape Restoration, February 2002. In *Sustainable Developments*; IISD: Winnipeg, MB, Canada, 2002; Volume 71, pp. 1–8.
32. WWF; IUCN. Forests Reborn: A Workshop on Forest Restoration. In Proceedings of the WWF/IUCN International Workshop on Forest Restoration, Segovia, Spain, 3–5 July 2000; pp. 3–5.
33. Laestadius, L.; Buckingham, K.; Maginnis, S.; Saint-Laurent, C. Before Bonn and beyond: The history and future of forest landscape restoration. *Unasylva* **2015**, *66*, 11–18.
34. Pistorius, T.; Carodenuto, S.; Wathum, G. Implementing Forest Landscape Restoration in Ethiopia. *Forests* **2017**, *8*, 61. [CrossRef]
35. Ruiz-Jaen, M.C.; Mitchell Aide, T. Restoration success: How is it being measured? *Restor. Ecol.* **2005**, *13*, 569–577. [CrossRef]
36. SER. The SER International Primer on Ecological Resotoration. In *SER Science and Policy Working Group*; Society for Ecological Restoration International: Tuscon, AZ, USA, 2004.
37. Tomblin, D.C. The ecological restoration movement: Diverse cultures of practice and place. *Organ. Environ.* **2009**, *22*, 185–207. [CrossRef]
38. Kumar, C.; Begeladze, S.; Calmon, M.; Saint-Laurent, C. *Enhancing Food Security through Forest Landscape Restoration: Lessons from Burkina Faso, Brazil, Guatemala, Viet Nam, Ghana, Ethiopia and Philippines*; IUCN: Gland, Switzerland, 2015; pp. 5–217.
39. Carucci, R. *Trees Outside Forests: An Essential Tool for Desertification Control in the Sahel*; UNASYLVA-FAO: Rome, Italy, 2000; pp. 18–24.
40. Kozar, R.; Buck, L.E.; Barrow, E.G.; Sunderland, T.C.; Catacutan, D.E.; Planicka, C.; Hart, A.K.; Willemen, L. *Toward Viable Landscape Governance Systems: What Works? Ecoagriculture Partners, on Behalf of the Landscapes for People*; Food, and Nature Initiative: Washington, DC, USA, 2014.
41. Sayer, J. Reconciling Conservation and Development: Are Landscapes the Answer? *Biotropica* **2009**, *41*, 649–652. [CrossRef]
42. Lawrence, R.J. Beyond disciplinary confinement to imaginative transdisciplinarity. In *Tackling Wicked Problems through the Transdisciplinary Imagination*; Earthscan: London, UK, 2010; pp. 16–30.
43. Laven, D.N.; Mitchell, N.J.; Wang, D. Examining Conservation Practice at the Landscape Scale. *George Wright Forum* **2005**, *22*, 5–9.
44. Phalan, B.; Onial, M.; Balmford, A.; Green, R.E. Reconciling food production and biodiversity conservation: Land sharing and land sparing compared. *Science* **2011**, *333*, 1289–1291. [CrossRef] [PubMed]

45. Reed, M.S.; Stringer, L.C.; Dougill, A.J.; Perkins, J.S.; Atlhopheng, J.R.; Mulale, K.; Favretto, N. Reorienting land degradation towards sustainable land management: Linking sustainable livelihoods with ecosystem services in rangeland systems. *J. Environ. Manag.* **2015**, *151*, 472–485. [CrossRef] [PubMed]
46. Sandker, M.; Ruiz-Perez, M.; Campbell, B.M. Trade-offs between biodiversity conservation and economic development in five tropical forest landscapes. *Environ. Manag.* **2012**, *50*, 633–644. [CrossRef] [PubMed]
47. Coyne, R. Wicked problems revisited. *Des. Stud.* **2005**, *26*, 5–17. [CrossRef]
48. Rittel, H.W.; Webber, M.M. Dilemmas in a general theory of planning. *Policy Sci.* **1973**, *4*, 155–169. [CrossRef]
49. Balmford, A.; Green, R.; Phalan, B. What conservationists need to know about farming. *Proc. R. Soc. B Biol. Sci.* **2012**. [CrossRef] [PubMed]
50. Foli, S.; Ros-Tonen, M.A.F.; Reed, J.; Sunderland, T. Natural Resource Management Schemes as Entry Points for Integrated Landscape Approaches: Evidence from Ghana and Burkina Faso. *Environ. Manag.* **2017**. [CrossRef] [PubMed]
51. Ros-Tonen, A.M.; Derkyi, M.; Insaidoo, F.T. From Co-Management to Landscape Governance: Whither Ghana's Modified Taungya System? *Forests* **2014**, *5*, 2996–3021. [CrossRef]
52. Liniger, H.; Mekdaschi-Studer, R.; Hauert, C.; Gurtner, M. *Guidelines and Best Practices for Sub-Saharan Africa, Field Application*; FAO: Rome, Italy, 2011.
53. Cordingley, J.E.; Snyder, K.A.; Rosendahl, J.; Kizito, F.; Bossio, D. Thinking outside the plot: Addressing low adoption of sustainable land management in sub-Saharan Africa. *Curr. Opin. Environ. Sustain.* **2015**, *15*, 35–40. [CrossRef]
54. Chabay, I.; Frick, M.; Helgeson, J. *Land Restoration: Reclaiming Landscapes for a Sustainable Future*; Academic Press: Waltham, MA, USA, 2016.
55. Winterbottom, R.; Reij, C.; Garrity, D.; Glover, J.; Hellums, D.; McGahuey, M.; Scheer, S.J. *Improving Land and Water Management*; World Resources Institute: Washington, DC, USA, 2013.
56. Lenhardt, A.; Glennie, J.; Intscher, N.; Ali, A.; Morin, G. *A Greener Burkina-Sustainable Farming Techniques, Land Reclamation and Improved Livelihoods*; Development Progress Case Study Report (Environment); Gallimard: Paris, France, 2014.
57. Reij, C.; Tappan, G.; Smale, M. Re-greening the Sahel: Farmer-led innovation in Burkina Faso and Niger. In *Millions Fed: Proven Successes in Agricultural Development*; International Food Policy Research Institute (IFPRI): Washington, DC, USA, 2009; pp. 53–58.
58. Gabathuler, E.; Hauert, C.; Giger, M. *Benefits of Sustainable Land Management*; WOCAT (World Overview of Conservation Approaches and Technologies): Bern, Switzerland; CDE (Centre for Development and Environment): Bern, Switzerland; University of Bern: Bern, Switzerland, 2009.
59. Schwilch, G.; Bestelmeyer, B.; Bunning, S.; Critchley, W.; Herrick, J.; Kellner, K.; Liniger, H.; Nachtergaele, F.; Ritsema, C.; Schuster, B. Experiences in monitoring and assessment of sustainable land management. *Land Degrad. Dev.* **2011**, *22*, 214–225. [CrossRef]
60. Giller, K.E.; Witter, E.; Corbeels, M.; Tittonell, P. Conservation agriculture and smallholder farming in Africa: The heretics' view. *Field Crops Res.* **2009**, *114*, 23–34. [CrossRef]
61. Hobbs, P.R. Conservation agriculture: What is it and why is it important for future sustainable food production? *J. Agric. Sci.* **2007**, *145*, 127. [CrossRef]
62. Meena, B.P.; Shirale, A.O.; Dotaniya, M.L.; Jha, P.; Meena, A.L.; Biswas, A.K.; Patra, A.K. Conservation Agriculture: A New Paradigm for Improving Input Use Efficiency and Crop Productivity. In *Conservation Agriculture: An Approach to Combat Climate Change in Indian Himalaya*; Bisht, J.K., Meena, V.S., Mishra, P.K., Pattanayak, A., Eds.; Springer: Singapore, 2016; pp. 39–69.
63. Knowler, D.; Bradshaw, B. Farmers' adoption of conservation agriculture: A review and synthesis of recent research. *Food Policy* **2007**, *32*, 25–48. [CrossRef]
64. Kimaro, A.A.; Mpanda, M.; Rioux, J.; Aynekulu, E.; Shaba, S.; Thiong'o, M.; Mutuo, P.; Abwanda, S.; Shepherd, K.; Neufeldt, H.; et al. Is conservation agriculture 'climate-smart' for maize farmers in the highlands of Tanzania? *Nutr. Cycl. Agroecosyst.* **2016**, *105*, 217–228. [CrossRef]
65. Kpadonou, R.A.B.; Owiyo, T.; Barbier, B.; Denton, F.; Rutabingwa, F.; Kiema, A. Advancing climate-smart-agriculture in developing drylands: Joint analysis of the adoption of multiple on-farm soil and water conservation technologies in West African Sahel. *Land Use Policy* **2017**, *61*, 196–207. [CrossRef]

66. Powlson, D.S.; Stirling, C.M.; Thierfelder, C.; White, R.P.; Jat, M.L. Does conservation agriculture deliver climate change mitigation through soil carbon sequestration in tropical agro-ecosystems? *Agric. Ecosyst. Environ.* **2016**, *220*, 164–174. [CrossRef]
67. Thierfelder, C.; Rusinamhodzi, L.; Setimela, P.; Walker, F.; Eash, N.S. Conservation agriculture and drought-tolerant germplasm: Reaping the benefits of climate-smart agriculture technologies in central Mozambique. *Renew. Agric. Food Syst.* **2015**, *31*, 414–428. [CrossRef]
68. Barrett, C.B.; Reardon, T.; Webb, P. Nonfarm income diversification and household livelihood strategies in rural Africa: Concepts, dynamics, and policy implications. *Food Policy* **2001**, *26*, 315–331. [CrossRef]
69. Leakey, R. *Multifunctional Agriculture: Achieving Sustainable Development in Africa*; Academic Press: London, UK, 2017.
70. Newton, A.; Tejedor, N. *Principles and Practice of Forest Landscape Restoration: Case Studies from the Drylands of Latin America (p. xxvi+ 383)*; UICN: Gland, Switzerland, 2011.
71. Van Oosten, C. Restoring Landscapes—Governing Place: A Learning Approach to Forest Landscape Restoration. *J. Sustain. For.* **2013**, *32*, 659–676. [CrossRef]
72. Van Oosten, C.; Gunarso, P.; Koesoetjahjo, I.; Wiersum, F. Governing Forest Landscape Restoration: Cases from Indonesia. *Forests* **2014**, *5*, 1143–1162. [CrossRef]
73. Mansourian, S. Governance and forest landscape restoration: A framework to support decision-making. *J. Nat. Conserv.* **2017**, *37*, 21–30. [CrossRef]
74. Stanturf, J.; Mansourian, S. Implementing forest landscape restoration, a practitioner's guide. *Int. Union For. Res. Organ.* **2017**, *2017*, 1–128.
75. Mansourian, S.; Vallauri, D. *Forest Restoration in Landscapes: Beyond Planting Trees*; Springer Science & Business Media: New York, NY, USA, 2005.
76. Mansourian, S.; Lamb, D.; Gilmour, D. Overview of technical approaches to restoring tree cover at the site level. In *Forest Restoration in Landscapes*; Springer: New York, NY, USA, 2005; pp. 241–249.
77. Mansourian, S.; Stanturf, J.A.; Derkyi, M.A.A.; Engel, V.L. Forest Landscape Restoration: Increasing the positive impacts of forest restoration or simply the area under tree cover? *Restor. Ecol.* **2017**, *25*, 178–183. [CrossRef]
78. Crouzeilles, R.; Ferreira, M.S.; Chazdon, R.L.; Lindenmayer, D.B.; Sansevero, J.B.; Monteiro, L.; Iribarrem, A.; Latawiec, A.E.; Strassburg, B.B. Ecological restoration success is higher for natural regeneration than for active restoration in tropical forests. *Sci. Adv.* **2017**, *3*, e1701345. [CrossRef] [PubMed]
79. Asaah, E.K.; Tchoundjeu, Z.; Leakey, R.R.; Takousting, B.; Njong, J.; Edang, I. Trees, agroforestry and multifunctional agriculture in Cameroon. *Int. J. Agric. Sustain.* **2011**, *9*, 110–119. [CrossRef]
80. Erdmann, T. Agroforestry as a tool for restoring forest landscapes. In *Forest Restoration in Landscapes: Beyond Planting Trees*; Springer: New York, NY, USA, 2005; pp. 274–279.
81. Pye-Smith, C. *The Quiet Revolution: How Niger's Farmers Are Re-Greening the Croplands of the Sahel*; World Agroforestry Centre: Nairobi, Kenya, 2013.
82. Reij, C.; Garrity, D. Scaling up farmer-managed natural regeneration in Africa to restore degraded landscapes. *Biotropica* **2016**, *48*, 834–843. [CrossRef]
83. Andersson, J.A.; D'Souza, S. From adoption claims to understanding farmers and contexts: A literature review of Conservation Agriculture (CA) adoption among smallholder farmers in southern Africa. *Agric. Ecosyst. Environ.* **2014**, *187*, 116–132. [CrossRef]
84. Shiferaw, B.; Holden, S.T. Resource degradation and adoption of land conservation technologies in the Ethiopian Highlands: A case study in Andit Tid, North Shewa. *Agric. Econ.* **1998**, *18*, 233–247. [CrossRef]
85. Nigussie, Z.; Tsunekawa, A.; Haregeweyn, N.; Adgo, E.; Nohmi, M.; Tsubo, M.; Aklog, D.; Meshesha, D.T.; Abele, S. Factors influencing small-scale farmers' adoption of sustainable land management technologies in north-western Ethiopia. *Land Use Policy* **2017**, *67*, 57–64. [CrossRef]
86. De Graaff, J.; Amsalu, A.; Bodnár, F.; Kessler, A.; Posthumus, H.; Tenge, A. Factors influencing adoption and continued use of long-term soil and water conservation measures in five developing countries. *Appl. Geogr.* **2008**, *28*, 271–280. [CrossRef]
87. Adimassu, Z.; Langan, S.; Johnston, R. Understanding determinants of farmers' investments in sustainable land management practices in Ethiopia: Review and synthesis. *Environ. Dev. Sustain.* **2016**, *18*, 1005–1023. [CrossRef]

88. Ajayi, O.C.; Akinnifesi, F.K.; Sileshi, G.; Chakeredza, S. Adoption of renewable soil fertility replenishment technologies in the southern African region: Lessons learnt and the way forward. *Nat. Resour. Forum* **2007**, *31*, 306–317. [CrossRef]
89. Adimassu, Z.; Kessler, A.; Hengsdijk, H. Exploring determinants of farmers' investments in land management in the Central Rift Valley of Ethiopia. *Appl. Geogr.* **2012**, *35*, 191–198. [CrossRef]
90. Bullock, J.M.; Aronson, J.; Newton, A.C.; Pywell, R.F.; Rey-Benayas, J.M. Restoration of ecosystem services and biodiversity: Conflicts and opportunities. *Trends Ecol. Evol.* **2011**, *26*, 541–549. [CrossRef] [PubMed]
91. Shiferaw, B.; Holden, S.T. Policy instruments for sustainable land management: The case of highland smallholders in Ethiopia. *Agric. Econ.* **2000**, *22*, 217–232. [CrossRef]
92. Adams, C.; Rodrigues, S.T.; Calmon, M.; Kumar, C. Impacts of large-scale forest restoration on socioeconomic status and local livelihoods: What we know and do not know. *Biotropica* **2016**, *48*, 731–744. [CrossRef]
93. Abe, S.S.; Wakatsuki, T. Sawah Ecotechnology—A Trigger for a Rice Green Revolution in Sub-Saharan Africa: Basic Concept and Policy Implications. *Outlook Agric.* **2011**, *40*, 221–227. [CrossRef]
94. Kimiti, D.W.; Riginos, C.; Belnap, J. Low-cost grass restoration using erosion barriers in a degraded African rangeland. *Restor. Ecol.* **2017**, *25*, 376–384. [CrossRef]
95. Galabuzi, C.; Eilu, G.; Mulugo, L.; Kakudidi, E.; Tabuti, J.R.S.; Sibelet, N. Strategies for empowering the local people to participate in forest restoration. *Agrofor. Syst.* **2014**, *88*, 719–734. [CrossRef]
96. Jalonen, R.; Valette, M.; Boshier, D.; Duminil, J.; Thomas, E. Forest and landscape restoration severely constrained by a lack of attention to the quantity and quality of tree seed: Insights from a global survey. *Conserv. Lett.* **2017**. [CrossRef]
97. Davies, J. Enabling Governance for Sustainable Land Management A2—Chabay, Ilan. In *Land Restoration*; Frick, M., Helgeson, J., Eds.; Academic Press: Boston, MA, USA, 2016; Chapter 1.4; pp. 67–76.
98. Ofoulhast-Othamot, G. The Quest for Sustainable and Decentralized Forest Governance in Eastern Cameroon: The Dimako Council Forest Case Examined. *Small-Scale For.* **2015**, *14*, 363–379. [CrossRef]
99. Etter, H. Land Degradation: An Economic Perspective A2—Chabay, Ilan. In *Land Restoration*; Frick, M., Helgeson, J., Eds.; Academic Press: Boston, MA, USA, 2016; Chapter 4.5, pp. 311–317.
100. Wilson, S.J.; Cagalanan, D. Governing restoration: Strategies, adaptations and innovations for tomorrow's forest landscapes. *World Dev. Perspect.* **2016**, *4*, 11–15. [CrossRef]
101. Basupi, L.V.; Quinn, C.H.; Dougill, A.J. Using participatory mapping and a participatory geographic information system in pastoral land use investigation: Impacts of rangeland policy in Botswana. *Land Use Policy* **2017**, *64*, 363–373. [CrossRef]
102. Badjana, H.M.; Olofsson, P.; Woodcock, C.E.; Helmschrot, J.; Wala, K.; Akpagana, K. Mapping and estimating land change between 2001 and 2013 in a heterogeneous landscape in West Africa: Loss of forestlands and capacity building opportunities. *Int. J. Appl. Earth Obs. Geoinf.* **2017**, *63*, 15–23. [CrossRef]
103. McDonald, T.; Gann, G.; Jonson, J.; Dixon, K. *International Standards for the Practice of Ecological Restoration–Including Principles and Key Concepts*; Society for Ecological Restoration: Washington, DC, USA, 2016.
104. Colfer, C.J.P.; Pfund, J.-L.; Boucard, A.; Boissière, M.; Feintrenie, L.; Ingram, V.; Lyimo, E.; Martini, E.; Rantala, S.; Roberts, M. An introduction to five tropical landscapes, their people and their governance. In *Collaborative Governance of Tropical Landscapes*; Earthscan: Washington, DC, USA, 2011.
105. McLain, R.; Guariguata, M.R.; Lawry, S. Implementing Forest Landscape Restoration Initiatives Tenure, Governance, and Equity Considerations. In *Accelerating Restoration of Degraded Forest Landscapes: The Role of Tenure Security and Local Forest Governance in Catalyzing Global Restoration Initiatives*; CIFOR: Bonn, Germany, 2017.
106. Larson, A.M.; Springer, J. *Recognition and Respect for Tenure Rights*; International Union for Conservation of Nature and Natural Resources (IUCN): Gland, Switzerland, 2016.
107. Chidumayo, E.N. Changes in miombo woodland structure under different land tenure and use systems in central Zambia. *J. Biogeogr.* **2002**, *29*, 1619–1626. [CrossRef]
108. Robinson, B.E.; Masuda, Y.J.; Kelly, A.; Holland, M.B.; Bedford, C.; Childress, M.; Fletschner, D.; Game, E.T.; Ginsburg, C.; Hilhorst, T.; et al. Incorporating Land Tenure Security into Conservation. *Conserv. Lett.* **2017**. [CrossRef]
109. Sikor, T.; He, J.; Lestrelin, G. Property Rights Regimes and Natural Resources: A Conceptual Analysis Revisited. *World Dev.* **2017**, *93*, 337–349. [CrossRef]

110. Lovo, S. Tenure Insecurity and Investment in Soil Conservation. Evidence from Malawi. *World Dev.* **2016**, *78*, 219–229. [CrossRef]
111. De Aquino, A.R.; Aasrud, A.; Guimarães, L. Can Forest Carbon Finance Influence Land Tenure Security in Project Areas? Preliminary Lessons from Projects in Niger and Kenya. In *Carbon Sequestration Potential of Agroforestry Systems: Opportunities and Challenges*; Kumar, B.M., Nair, P.K.R., Eds.; Springer Netherlands: Dordrecht, The Netherlands, 2011; pp. 231–246.
112. Vetter, S. Development and sustainable management of rangeland commons–aligning policy with the realities of South Africa's rural landscape. *Afr. J. Range Forage Sci.* **2013**, *30*, 1–9. [CrossRef]
113. Westholm, L. Fruits from the Forest and the Fields: Forest Conservation Policies and Intersecting Social Inequalities in Burkina Faso's REDD+ Program. *Int. For. Rev.* **2016**, *18*, 511–521. [CrossRef]
114. Cormier-Salem, M.-C. Let the Women Harvest the Mangrove. Carbon Policy, and Environmental Injustice. *Sustainability* **2017**, *9*, 1485. [CrossRef]
115. Milton, S.J.; Dean, W.R.J.; Richardson, D.M. Economic incentives for restoring natural capital in southern African rangelands. *Front. Ecol. Environ.* **2003**, *1*, 247–254. [CrossRef]
116. Knüppe, K.; Meissner, R. Drivers and barriers towards sustainable water and land management in the Olifants-Doorn Water Management Area, South Africa. *Environ. Dev.* **2016**, *20*, 3–14. [CrossRef]
117. Tegegne, Y.T.; Lindner, M.; Fobissie, K.; Kanninen, M. Evolution of drivers of deforestation and forest degradation in the Congo Basin forests: Exploring possible policy options to address forest loss. *Land Use Policy* **2016**, *51*, 312–324. [CrossRef]
118. Zulu, L.C. Politics of scale and community-based forest management in southern Malawi. *Geoforum* **2009**, *40*, 686–699. [CrossRef]
119. Mansourian, S. Understanding the Relationship between Governance and Forest Landscape Restoration. *Conserv. Soc.* **2016**, *14*, 267–278. [CrossRef]
120. Unruh, J.D. Carbon sequestration in Africa: The land tenure problem. *Glob. Environ. Chang.* **2008**, *18*, 700–707. [CrossRef]
121. Yin, R.; Zulu, L.; Qi, J.; Freudenberger, M.; Sommerville, M. Empirical linkages between devolved tenure systems and forest conditions: Challenges, findings, and recommendations. *For. Policy Econ.* **2016**, *73*, 294–299. [CrossRef]
122. Arevalo, J. Improving wood fuel governance in Burkina Faso: The experts' assessment. *Renew. Sustain. Energy Rev.* **2016**, *57*, 1398–1408. [CrossRef]
123. Kjelgren, R. Isohydric and Anisohydric Water Use Considerations in Species Selection for the Great Green Wall of Africa. In Proceedings of the Great Green Wall of Africa Conference, Dakar, Senegal, 11–12 February 2009.
124. Groot, J.C.; Rossing, W.A.; Jellema, A.; Stobbelaar, D.J.; Renting, H.; Van Ittersum, M.K. Exploring multi-scale trade-offs between nature conservation, agricultural profits and landscape quality—A methodology to support discussions on land-use perspectives. *Agric. Ecosyst. Environ.* **2007**, *120*, 58–69. [CrossRef]
125. Sayer, J.; Margules, C.; Boedhihartono, A.K.; Dale, A.; Sunderland, T.; Supriatna, J.; Saryanthi, R. Landscape approaches; what are the pre-conditions for success? *Sustain. Sci.* **2015**, *10*, 345–355. [CrossRef]
126. Hanson, C.; Buckingham, K.; Dewitt, S.; Laestadius, L. *The Restoration Diagnostic: A Method for Developing Forest Landscape Restoration Strategies by Rapidly Assessing the Status of Key Success Factors*; World Resources Institute Report; World Resources Institute: Washington, DC, USA, 2015.
127. IUCN; WRI. *A Guide to the Restoration Opportunities Assessment Methodology (ROAM): Assessing Forest Landscape Restoration Opportunities at the National or Sub-National Level*; IUCN: Gland, Switzerland, 2014.
128. Chazdon, R.L.; Harvey, C.A.; Komar, O.; Griffith, D.M.; Ferguson, B.G.; Martínez-Ramos, M.; Morales, H.; Nigh, R.; Soto-Pinto, L.; Van Breugel, M. Beyond reserves: A research agenda for conserving biodiversity in human-modified tropical landscapes. *Biotropica* **2009**, *41*, 142–153. [CrossRef]
129. Reed, J.; van Vianen, J.; Foli, S.; Clendenning, J.; Yang, K.; MacDonald, M.; Petrokofsky, G.; Padoch, C.; Sunderland, T. Trees for life: The ecosystem service contribution of trees to food production and livelihoods in the tropics. *For. Policy Econ.* **2017**, *84*, 62–71. [CrossRef]
130. Fisher, M.R.; Workman, T.; Mulyana, A.; Balang, I.; Moeliono, M.; Yuliani, E.L.; Colfer, C.J.P.; Adam, U.E.F.B. Striving for PAR excellence in land use planning: Multi-stakeholder collaboration on customary forest recognition in Bulukumba, South Sulawesi. *Land Use Policy* **2017**. [CrossRef]

131. Kassie, M.; Jaleta, M.; Shiferaw, B.; Mmbando, F.; Mekuria, M. Adoption of interrelated sustainable agricultural practices in smallholder systems: Evidence from rural Tanzania. *Technol. Forecast. Soc. Chang.* **2013**, *80*, 525–540. [CrossRef]
132. Swinton, S.M.; Quiroz, R. Is Poverty to Blame for Soil, Pasture and Forest Degradation in Peru's Altiplano? *World Dev.* **2003**, *31*, 1903–1919. [CrossRef]
133. Sietz, D.; Van Dijk, H. Land-based adaptation to global change: What drives soil and water conservation in western Africa? *Glob. Environ. Chang.* **2015**, *33*, 131–141. [CrossRef]
134. Schlecht, E.; Buerkert, A.; Tielkes, E.; Bationo, A. A critical analysis of challenges and opportunities for soil fertility restoration in Sudano-Sahelian West Africa. *Nutr. Cycl. Agroecosyst.* **2006**, *76*, 109–136. [CrossRef]
135. Gatica-Saavedra, P.; Echeverría, C.; Nelson, C.R. Ecological indicators for assessing ecological success of forest restoration: A world review. *Restor. Ecol.* **2017**, *25*, 850–857. [CrossRef]