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Bachelorthesis

Placing value on nature – A stakeholder approach for promoting the transition to regenerative agriculture through the valuation of resulting ecosystem services

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We must prioritize regeneration over extraction, cooperation over competition, and nourishment over profit.

– Dan Barber, The Third Plate

Abstract

This thesis investigates the role of valuing ecosystem services to facilitate the transition to regenerative agriculture, a critical approach to addressing global environmental and social challenges. As agriculture contributes significantly to climate change, biodiversity loss, and water resource depletion, regenerative practices offer a pathway to mitigate these impacts while enhancing soil health, biodiversity, and farmer livelihoods. However, these benefits are often undervalued, posing barriers to adoption and financing. The research explores the theoretical and practical dimensions of ecosystem service valuation within the context of regenerative agriculture, emphasizing stakeholder cooperation to bridge the financing gap. Central themes include the conceptual frameworks of natural capital and ecosystem services, the benefits of regenerative agriculture categorized as ecosystem services, and mechanisms for their valuation and monetization. A stakeholder approach is employed to map key actors involved in the transition to regenerative agriculture, analyze their interests, and assess their roles in valuing and financing ecosystem services. A case study with Followfood then illustrates practical applications of the concepts and shows the relevance of stakeholder contributions to promoting regenerative agriculture in practice. The findings highlight the potential of multi-stakeholder cooperation to integrate ecosystem service values into decision-making as to realize tangible benefits for multiple stakeholders. By embedding the findings within the relational economics framework, this study contextualizes the generation of ecosystem services resulting from regenerative agriculture within the concept of cooperation rent of multiple stakeholders in a process of shared value creation. The research ultimately contributes to bridging theoretical and practical gaps in promoting regenerative agriculture.

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List of Abbreviations

AgTech	Agriculture Technology
BCA	Biodiversity Credit Alliance
BCG	Boston Consulting Group
CEO	Chief executive officer
CICES	Common International Classification of Ecosystem Services
CO_2	Carbon dioxide
CSRD	Corporate Sustainability Reporting Directive
EEA	European Environmental Agency
ESF	Ecosystem services framework
ESMC	Ecosystem Services Market Consortium
ESVD	Ecosystem Service Value Database
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FOLU	Food and Land Use Coalition
GFM	Global Farm Metric
GHG	Greenhouse gas
HGB	Handels- und Gesetzbuch (German commercial code)
IR	Integrated Reporting
MCDA	Multiple-criteria decision analysis
MEA	Millennium Ecosystem Assessment
MRV	Measurement, reporting and verification
NCC	Natural Capital Coalition
NGO	Non-governmental organization

OP2B	One Planet Business for Biodiversity
PES	Payment for ecosystem services schemes
RA	Regenerative agriculture
SEEA	System of Environmental-Economic Accounting
SEEA EA	SEEA Ecosystem Accounting
SEEA EEA	SEEA Experimental Ecosystem Accounting
SMI	Sustainable Markets Initiative
SOC	Soil organic carbon
SVC	Shared value creation
TEEB	The Economics of Ecosystems and Biodiversity
TEV	Total economic value
TLG	The Landbanking Group
TNFD	The Taskforce on Nature-related Financial Disclosures
UN	United Nations
WBCSD	World Business Council for Sustainable Development
WEF	World Economic Forum
WTP	Willingness to pay
WTA	Willingness to accept

1. Introduction

Agriculture and food are not only vital to human life but both major contributors to and promising solutions for the world's most pressing environmental and social challenges. Food systems are responsible for approximately one-third of global greenhouse gas emissions (FAO, 2022) and are a leading driver of accelerating biodiversity loss and species extinction worldwide (Benton et al., 2021; IPBES, 2019). Additionally, agriculture accounts for 70% of all freshwater withdrawals globally (TEEB, 2018; Fuis & Kashiwase, 2023), draining vital water resources. Current agricultural practices have led to widespread land degradation, reducing land productivity, diminishing carbon storage and biodiversity, and accelerating climate change (IPBES, 2018). This also poses severe risks to global food security, particularly as climate shocks increasingly threaten crop yields. Transforming agricultural practices is thus essential for meeting urgent socio-economic demands as well as for halting the rapid degradation of ecosystems and the loss of vital goods and services they provide (Havemann et al., 2022). Agriculture itself holds immense potential to mitigate the very damages it contributes to. Food, as Westhoek et al. (2016) note, is "the essential connecting thread between people, prosperity, and planet" (p. 10).

The urgency of addressing climate change and biodiversity loss has hence placed food and agriculture at the center of global sustainability agendas. Regenerative agriculture (RA) has emerged as a promising approach to transforming agricultural practices by reducing and removing carbon, enhancing biodiversity, improving water use, and realizing tangible social benefits for farmers, local communities, and wider society. The Food and Land Use Coalition (FOLU) has identified scaling regenerative agriculture as one of ten critical transitions necessary to transform food and land use systems (FOLU, 2019). Transitioning to RA could effectively address the aforementioned challenges, realizing several tangible benefits. However, these benefits, often referred to as ecosystem services, are currently not adequately reflected and undervalued in economic decision-making, which hinders the financing needed to support the transition. Recent reports suggest that valuing these ecosystem services could be a solution to integrate them into the decision-making processes of various stakeholders who benefit from RA outcomes (WEF & Bain & Company, 2024). This, in turn, could lead to the development of payment mechanisms to support farmers and help close the existing financing gap (ibid.). While many stakeholders stand to gain from RA, their contributions to its promotion remain insufficient. There is a need to foster effective multi-stakeholder cooperation to establish necessary standards for valuing ecosystem services and enabling the widespread adoption of RA.

The purpose of this thesis is thus to investigate the potential of valuing the ecosystem services resulting from regenerative agriculture to promote its transition. This entails fundamental questions regarding the concept of natural capital and ecosystem services, what they mean for humans and in how far they can be valued. Additionally, the thesis examines the benefits of RA, conceptualizes them as ecosystem services, and investigates how these benefits serve as value propositions for multiple stakeholders. Not only does this thesis aim to address methodological questions of valuation and monetization, but also does it aspire to embed the findings within a theory of value creation. To achieve this, the following approach is taken. First, background on natural capital and ecosystem services is provided. The subsequent chapter introduces the concept of regenerative agriculture, outlining its main benefits and defining the primary ecosystem services of interest. This section highlights the need for a transition from conventional to regenerative agriculture, which forms the core transaction of this thesis. A stakeholder approach is then employed to identify key stakeholders of this transaction and analyze their interests and benefits. This is followed by an exploration of the valuation of ecosystem services and already existing mechanisms through which stakeholders can pay for them. As a practical case study, the thesis examines Followfood's engagement with RA as a food business stakeholder. Finally, the findings are contextualized within relational economics theory, focusing on shared value creation and cooperation rent.

Understanding how to finance and promote this transition is not only an environmental and social imperative, but also an economic necessity, impacting food security and resilience. By focusing on ecosystem services valuation and stakeholder cooperation, this thesis contributes to bridging the gap between theoretical benefits of RA and practical pathways for its widespread implementation. It categorizes ecosystem services specifically for RA and establishes a stakeholder model uniquely suited to this context, offering a structured approach for analysis. By engaging with the controversial debates around the valuation of nature within the ecosystem services framework, the thesis sheds light on the complexities of this issue. It also examines practical mechanisms for valuation and facilitating payments from stakeholders to farmers, specifically applied to RA. Additionally, this thesis gives a concrete example of a company actively supporting RA, demonstrating how such efforts can be implemented in practice. Finally, it contextualizes these findings within the relational economics framework, serving as a practical application of its theoretical concepts and highlighting the role of shared value creation.

2. Natural capital and ecosystem services

To lay the groundwork for this thesis, the concepts of natural capital and ecosystem services will be explored as key pillars of this analysis. For the purposes of this thesis, it is important to clarify that the term "ecosystem" here is not examined through the lens of systems theory but is instead used in its more conventional, colloquial sense.

2.1. Natural capital: Stocks, flows and values

First, the terms natural capital and ecosystem services and how they are linked must be explained. In the Natural Capital Protocol, natural capital is introduced as one of several forms of capital such as financial, manufactured human, social or intellectual capital (Capitals Coalition, 2021). It lays the foundation for all these other forms of capital and is thus inseparably integrated in them (ibid.). The Capitals Coalition (2021) defines natural capital as the stock of renewable and non-renewable natural resources on earth such as plants, animals, air, water or soils and minerals. Similarly, The Economics of Ecosystems and Biodiversity (TEEB, 2018) refers to natural capital as a stock of physical and biological resources on earth, emphasizing the limited character of this stock. Importantly, this stock of resources yields a flow of benefits to people, that can be ecosystem services or abiotic services (Capitals Coalition, 2021). Ecosystem services are the benefits to people resulting from ecosystems (ibid.). Thus, natural capital refers to the stock and ecosystem services describe the flows originating from this stock. The two terms are intertwined, and so do definitions of the one refer to the other. When defining a stock, physical observable quantities are described that are the fundament for flows within that system, whereas flows are per definition the costs or benefits from the use of a stock (TEEB, 2018). The aspect of resulting flows is of central relevance here, as they make natural capital more than just a depletable stock, but a stock that actively yields benefits. Biodiversity has an interesting role here, as it is crucial for maintaining the health and stability of natural capital and without it, many fundamental processes could not function. It is thus at the same time a part of natural capital and an integral aspect of ecosystem services (Capitals Coalition, 2021).

Importantly, the term natural capital does not just describe physical materials that can be found in nature, but it is a concept constructed through its formulation and communication. Natural capital is not an inherent property of nature, but rather a construct assigned by humans when they conceptualize it as such.

2.2. The evolvement of the term ecosystem services

The concept of ecosystem services is commonly attributed to the foundational work of two key authors. In a highly cited article on the value of the world's ecosystem services and natural capital, Costanza et al. (1997) define ecosystem services as benefits human beings can derive from "habitat, biological or systems properties or processes of ecosystems" (ibid., p. 1). In another early definition by Daily (1997), ecosystem services are defined as "the conditions and processes through which natural ecosystems, and the species that make them up, sustain and fulfill human life" (p. 3). Both early definitions focus on the notion of providing some form of value for human beings. These moments when nature was framed as providing ecosystem services to humans initiated "an explosion of research, policy, and applications of the idea" (Costanza et al., 2017, p. 1). This is often referred to as the ecosystem services framework (ESF), highlighting the role healthy ecosystems play for human wellbeing (Turner & Daily, 2007).

Over the years, several initiatives have defined, classified, and categorized ecosystem services. A commonly used definition proposed by the Millennium Ecosystem Assessment (MEA) defines ecosystem services as the "benefits people obtain from ecosystems" (MEA, 2005, p. 9). Ecosystem services are here divided into the four categories supporting, provisioning, regulating and cultural services (ibid.). Supporting services are those necessary as a fundament to produce all other ecosystem services such as soil formation whereas provisioning services refer to the products obtained from ecosystem services such as food (Baveye et al., 2016; MEA, 2005). Regulating services are those benefits that result from the regulation through ecosystems, such as flood or drought regulation and land degradation (MEA, 2005). Lastly, the category of cultural services refers to nonmaterial or intangible benefits such as spiritual meaning, aesthetic qualities, or recreational experiences in relation to ecosystems (ibid.). Several suggestions have been made to refine the classifications proposed by the MEA (Baveye et al., 2016). The most cited and recent initiative to unify the definition and classification of ecosystem services is the Common International Classification of Ecosystem Services (CICES) developed by the European Environment Agency (EEA). The CICES revises the categories and divides ecosystem services into the three sections Provisioning, Regulation and Maintenance, and Cultural (Haines-Young & Potschin, 2018). Provisioning services refer to the provision of food, fiber or energy, and regulating services to the maintenance and regulation of for example climate. The category of cultural services again refers to recreation or spiritual use of nature (ibid.).
Ultimately, it can be summarized that ecosystem services are commonly understood to contribute to human well-being in various forms (TEEB, 2018).

2.3. On value and the connection between natural capital, humans, and economic activity

To fully understand the interplay between natural capital and human systems, it is important to consider the underlying assumptions about nature, its value to humanity, and its linkages with economic processes. Focusing on the benefit for humans, the definitions of natural capital and ecosystem services adopt an inherently anthropocentric perspective, which is a controversial aspect that has caused frequent debate in literature. This has been on distinguishing between instrumental and intrinsic value, value that arises because something has a purpose or function for humans, or a form of value that does not relate to humans at all. Davidson (2013) describes that intrinsic value pertains to the roles and processes that benefit nature itself, rather than humans. For instance, it is argued that biodiversity possesses an inherent worth that is independent of any human use or association (TEEB, 2018). This viewpoint is often related to ethical responsibilities, such as a duty of care for nature, and implies stewardship of the environment, irrespective of any human-centered advantages (Capitals Coalition, 2021). Arguments of the intrinsic value of nature have fundamentally justified nature conservation efforts in the past (Turner & Daily, 2007). However, such arguments alone have not sufficed to effectively foster ecosystem conservation, as they have not stressed the utter multifaceted dependence of humans on ecosystems (ibid.).

The formulation of the term ecosystem services by Costanza et al. (1997) followed the intention to demonstrate the fundamental importance of ecosystems for human wellbeing, as up to this point conventional economic thinking only captured and valued ecosystems when products could be harvested and sold in markets (Costanza et al., 2017). Value had only been assigned to nature if it delivered products, but not to the numerous other benefits arising from it (ibid.). Now, Costanza et al's (1997) focus on the importance of biodiversity and ecosystems specifically for human wellbeing has often been understood as a clear emphasis on the instrumental value of nature (Arias-Arévalo et al., 2018). This value of nature to humans can be use value or non-use value (Bastien-Olvera & Moore, 2021), which Davidson (2013) calls passive use value. In the context of nature and natural capital, use values result from the inputs natural systems give that are actively used by or of use for humans, for instance for economic activity (Agarwala et al., 2014). Non-use values, however, arise from the sheer existence of nature that is not affected by whether there is any direct

use or form of consumption associated with it (Bastien-Olvera & Moore, 2021). Turner et al. (2003) mention that such non-use values can be existence value from the knowledge that certain natural systems exist or bequest value from knowing that future generations will benefit from natural systems. The Capitals Coalition (2021) also highlights that total economic value includes "existence value," referring to the importance people place on the mere survival of species or ecosystems, even if they never interact with or directly benefit from them.
Costanza et al. (2017) summarize that ecosystem services are “functions and processes of ecosystems that benefit humans, directly or indirectly, whether humans perceive those benefits or not” (p. 5). This is not meant to be human-centric, but to actually highlight humanity's deep interdependence with nature and the health of ecosystems, rather than positioning humans as superior or isolated from it (ibid.).

This also challenges common notions of how nature is linked to economic activity. The term natural capital is still often used as interchangeable with natural resources, as a stock that is depleted and used as an input for the economic system. The Capitals Coalition (2021) defines natural capital as a stock of resources, of renewable or non-renewable materials in nature that can be used for production or consumption. Several approaches understand natural capital as a production factor that can simply be integrated in aggregate production functions (Döhring et al., 2023). However, the concept of ecosystem services represents a significant shift in how nature's role in supporting human well-being and economic systems is understood. It is now not just a stock of resources, that is used and depleted for inputs in economic production, but also something that can yield dividends for humans if it is protected and kept intact. Ecosystems are increasingly seen as “capital assets, with the potential to generate a stream of vital life-support services” (Turner & Daily, 2007, p. 25). Bastien-Olvera and Moore (2021) modelled three pathways to show how the stock of natural capital affects human welfare: not only as an input to the production of market goods, but also the production of ecosystem goods and services and as a source for non-use goods related to existence and bequest values, capturing a wider range of the ways in which nature plays into economic activity.

The question, whether and in how far there is value to nature that is entirely detached from human beings, cannot be solved here, but it is important to mention and be aware of this stream of literature. Reports such as the TEEB (2018) mention the intrinsic value of nature but establish for their analysis that it is only within the scope to adopt an anthropocentric perspective and focus on human wellbeing. For instance, the value of biodiversity within the scope is only that value derived from the ways biodiversity supports economic activity, and not as a benefit for the environment itself (TEEB, 2018). Ultimately, these ideas are rooted in the neoclassical revolution of economic theory, where value is not perceived as an inherent quality to objects, but only shows in the relation of the object, to the subjective perceiver and their pleasure and pain. For the scope of this thesis, it shall be established that only the value to humans is of relevance.

2.4. The evolvement of the term natural capital as a construct to account for nature

It is this value of nature that humans have to account for. There is a necessity to translate the benefits of nature into the economic language as to make nature visible and integrable in economic decision-making. Initiatives such as the TEEB have evolved out of acknowledging the fact that nature is so far invisible in decision-making, aiming to shed light on the positive effects of biodiversity and ecosystem services on human well-being (Sukhdev et al., 2010). Underlying this undertaking is not just the need to factor in the multiple benefits provided through ecosystem services, but it is “part of a much broader effort to integrate the whole of nature into economic activities” (Baveye et al., 2016, p. 2).

The sheer creation of the term natural capital can be seen as a construct that serves exactly this purpose and gives nature a name that is tangible for the economic sphere. The concept of natural capital and ecosystem services has evolved at the intersection of economics and ecology, with two major schools of thought framing their development. In environmental economics, the concept of natural capital is grounded in neoclassical and natural resource economics, while ecological economics, pioneered by figures like Robert Costanza, is deeply rooted in ecosystem science (Sullivan, 2014). This is where understandings of environmental and ecological economics conflict. One approach integrates the environment into existing economic concepts, while the other understands value pluralism and capturing nature in its full complexity as fundamental principles for the valuation of nature for humans (Arias-Arévalo et al., 2018).

Sullivan (2014) has called the creation of the term the moment where nature is being consolidated as natural capital and thus made legible and actionable. Enabling this moment is a discursive shift, where nonhuman natures are reframed in economic and financial terms (ibid.). This eventually facilitates the possibility to "account for" nature, raising the need for a transformation of accounting frameworks that can transcribe natural capital into measurable, exchangeable, and offsetable units (ibid.). On the one hand, this has been criticized, especially from the ecological economics school of thought, arguing that in the process, nature in all its diversity, complexity and interconnectedness is cut into measurable units, reducing the nonlinear relations into numerical one-dimensional scores (ibid.). On the other hand, this formulation of nature into natural capital could be understood as nothing less than an effort of environmental care. Peterson et al. (2010) describe this as "reframing ecosystem functions and biodiversity as ecosystem services to humanity" (p. 119) with the goal "to garner political support for conservation and to increase public interest in preserving global biodiversity" (p.113). From this perspective, the creation of such a term is useful or maybe even necessary. Åkerman (2003) already emphasized the role of metaphor in the economic understanding of the environment, arguing that the concept of natural capital was as successful because it offers the properties of a metaphor, approaching "the relationship between nature and economy in a new way with familiar economic terms" (ibid., p. 436). The term further offers a perspective on nature as an active source of welfare for humans, evoking a sense of responsibility for its care (ibid.). According to Costanza et al. (2017), "the term 'capital' is useful to reconnect the human economy with its ecological dimensions" (p. 3) and the idea of conceptualizing ecosystem services "has become an effective bridge between ecological and economic approaches" (p. 13).

Eventually, the evolvement of the term natural capital has served to create a concept that is understandable from the economic sphere and make the necessity to care for it visible. This paper aims to be a part of this effort to work towards the integration of nature in economic decision-making as to benefit environmental, economic, and social sustainable development. As such, this paper will examine the benefits provided through RA and different approaches to measure and value these approaches as to promote and finance the transition towards regenerative agriculture.

3. The transition towards regenerative agriculture

As the world is facing problems such as land degradation, the climate crisis, biodiversity loss, freshwater shortage and global nutrition, regenerative agriculture is considered a nature-based solution for many of these problems. Nature-based solutions are "actions to protect, sustainably manage and restore natural and modified ecosystems in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits" (Cohen-Shacham et al., 2016). As such, the idea of RA is to create a healthy soil ecosystem that provides services that are a natural remedy for many of these societal challenges. RA is therefore in line with the Sustainable Development Goal 2 Target 2.4, which aims to promote sustainable food production and resilient agricultural practices that enhance productivity, protect ecosystems, adapt to climate change, and improve soil and land quality (UN, n.d.; Khangura et al., 2023). Moreover, RA and its outcomes align with the EU Farm to Fork Strategy (European Commission, 2020; McMahon, 2024) and are considered a nature-based solution to achieve the European Green Deal's objectives (OP2B, 2020). In this section, the different approaches to define regenerative agriculture will be presented to then discuss its economic, but most importantly its wider benefits. The aim is to explore how the event of transitioning to regenerative agriculture can be framed using the concept of ecosystem services discussed in the previous chapter, to make their benefits visible for economic decision-makers and encourage broader adoption.

3.1. A review of definitions

Regenerative agriculture has increasingly been used as a buzzword but there is no unified legal or regulatory definition for it and the landscape of proposed definitions is heterogeneous to date (Newton et al., 2020; Sands et al., 2023). Several scholars have reviewed definitions of regenerative agriculture and grouped them in three categories: principle-oriented, practices-oriented, and outcome-oriented definitions (Jayasinghe et al., 2023; Newton et al., 2020). Different studies use distinct terms for these categories and often principles and practices overlap. In general, principles describe applications in a broader sense that can be applied to different contexts and translated into different practices depending on these contexts (Sands et al., 2023). This section aims to clarify the concept of regenerative agriculture, providing a foundational understanding for the rest of the paper.

3.1.1. Process-oriented definition

The first category of attempts to define regenerative agriculture focuses on the processes themselves—specifically, the farming principles and practices employed, and the activities occurring on the farm. These definitions emphasize practices rather than outcomes (Newton et al., 2020). In an extensive literature review, Newton et al. (2020) identified key processes frequently associated with regenerative agriculture, including reduced tillage, the use of cover crops, crop rotation, increased crop biodiversity, and intercropping. Another central concept involves minimizing external inputs, avoiding synthetic pesticides and fertilizers. Instead, farmers are encouraged to rely on ecological systems for pest control and fertilization, such as compost, green manure, or crop residues. Advanced practices include agroforestry—integrating trees into agricultural systems—and incorporating livestock with rotational grazing (ibid.). Complementing this, a review by Schreefel et al. (2020) categorized activities and objectives into practice and outcome themes, highlighting seven key practice themes: minimizing external inputs, mixed farming, reduced tillage, crop rotation, use of manure and compost, adoption of perennials, and other soil-enhancing activities.

Another approach to define regenerative agriculture is to use a set of principles. Khangura et al. (2023) mention keeping the soil covered, minimizing soil disturbance, preserving living roots in the soil at any time in the year, increasing species diversity, integrating livestock and limiting or eliminating the use of synthetic inputs as the fundamental principles of RA. Lacanne and Lundgren (2018) have set up four overarching unifying principles that are consistent across regenerative farming systems and can be translated into measures adapted to different contexts: (1) abandoning tillage, (2) eliminating bare soil, (3) fostering plant diversity on the farm, and (4) integrating livestock and cropping operations on the land. Fenster et al. (2021) added a fifth principle of reducing or eliminating synthetic agrochemicals and have condensed the five principles into two central ones: Reducing uniform disturbance on the one hand and increasing diversity in terms of biodiversity and economic revenue diversity on the other hand.

3.1.2. Outcome-oriented definition

Considering there is a vast range of possible principles and practices to follow, and every farm is situated in a different environment and context and might have different possibilities, it is more pragmatic to define the outcomes RA aims to achieve. Outcome-oriented definitions are more flexible about the processes that lead to the defined outcomes (Newton et al., 2020). Newton et al. (2020) have also aggregated the most mentioned outcomes from their literature review with the most frequently occurring being to improve soil health, to increase biodiversity, to improve ecosystem health including ecosystem services, to improve the social and environmental well-being of communities, to increase carbon sequestration, to increase farm profitability, to improve water health and to improve food nutritional quality and human health. In general, outcomes can be categorized in the three groups environmental, social, and economic (Jayasinghe et al., 2023) and many proposed definitions combine these outcomes. Rhodes (2017) sees the intention to achieve the outcomes of soil health improvement or soil restoration as the crucial characteristic of RA, as these automatically lead to improved water quality and land productivity.

Schreefel et al. (2020) address multiple categories of outcomes in their proposed provisional definition and see RA as “an approach to farming that uses soil conservation as the entry point to regenerate and contribute to multiple provisioning, regulating and supporting services, with the objective that this will enhance not only the environmental, but also the social and economic dimensions of sustainable food production". A similar multidimensional outcome-based definition is proposed by Khangura et al. (2023), defining regenerative agriculture as a farming strategy that aims to increase biological activity, enhance soil health, improve nutrient cycling, restore landscape function, and produce food and fiber while at the same time preserving or even increasing farm profitability. The overarching goal is to create systems that leverage nature's ecological processes for agriculture and improve the overall health of the farming system, rejuvenating soil and land and providing benefits to the wider community (ibid.). Many definitions explicitly mention the provision of ecosystem services as the defining and desired outcome. The World Economic Forum recognizes that RA is a system that uses practices that vary from field to field, but overall has the goal to increase the provision of multiple ecosystem services while improving economic outcomes (WEF & Bain & Company, 2024).

Several recent reports have adopted the definition that has been proposed by One Planet Business for Biodiversity (OP2B) and the World Business Council for Sustainable Development (WBCSD) (Petry et al., 2023; SMI, 2023). This definition is a holistic and outcome-based approach and focuses on the four key objectives of (1) protecting and enhancing biodiversity, (2) improving or preserving carbon and water retention in the soil leveraging plant functions, livestock, and agricultural practices, (3) enhancing resilience of crops and nature with a reduced input of fertilizers and pesticides and (4) the social and economic dimension of supporting farmers and local livelihoods (OP2B, 2021).

3.1.3. Other approaches

In other proposed definitions, there is an almost philosophical connotation. Brown et al. (2021), besides focusing on the aspect of farmer wellbeing in RA, stress broader principles of incorporating natural systems, continuous practice evaluation as well as on-farm learning as characteristic for RA. Gordon et al. (2022) take a different approach and analyze the discourses related to RA. They find that discourses of RA situate agricultural work in the context of complex living systems and emphasize the relational character of farms. This relational nexus revolves around the co-evolution of humans and nature. As a broad abstract principle, they also describe maintaining an openness to alternative thinking, which also relates to the continuous learning mentioned by Brown et al. (2021).

It has often been criticized that the focus on finding a unified definition instead of finding pragmatic solutions impedes actual progress. Newton et al. (2020) suggest that individual users of the term define it comprehensively for their own purpose and context. Thus, for the purpose and context of this paper, RA shall be defined based on its holistic approach and targeted outcomes. RA describes a holistic farming approach that works with nature instead of against it and involves practices and principles with the intention to achieve environmental outcomes of improving soil health as to sequester carbon, foster the retention of water and water quality, and enhancing biodiversity, while at the same time achieve social and economic outcomes of improved farmer livelihoods, enhanced nutrient density and maintaining farm profitability.

3.2. Benefits of regenerative agriculture

The aim of this thesis is to examine how the conceptualization, measurement, and valuation of the various benefits of RA can contribute to its promotion. It is thus a crucial step to establish what exactly these benefits are. Following the discussion in chapter 2.3. on the value of natural capital, RA will be assessed in terms of its benefits specifically for humans. Therefore, even environmental benefits refer to those environmental outcomes of RA that ultimately benefit humans and their well-being. Some of these benefits and their exact extent are still frequently discussed in literature and public discourse. However, it is beyond the scope of this thesis to offer a detailed discussion on all benefits. This section merely aims to highlight the key benefits commonly associated with regenerative agriculture and some of the existing empirical evidence. These benefits will then be formulated and classified as ecosystem services following the frameworks presented in section 2.2. as a foundation for the rest of this paper.

3.2.1. Economic benefits: the business case for regenerative agriculture

A common critique of regenerative agriculture is that it may result in lower yields, raising concerns about its economic viability and attractiveness as an investment. However, regenerative systems possess distinct characteristics that contribute to economic profitability, including improved input efficiency, diversified income streams, and enhanced resilience to external shocks.

Several actions drive input efficiency and facilitate operational savings. First, regenerative agriculture requires a minimal amount of fertilizers and pesticides, significantly reducing input costs (Kurth et al., 2023). Furthermore, reduced tilling means that there are fewer costs for labor and fuel. Methods such as cover cropping lead to increased water retention, thus reducing costs for irrigation (Petry et al., 2023). Second, regenerative agriculture offers opportunities to unlock additional revenue streams. Practices like crop rotation or intercropping inherently diversify income sources, reducing farmers' reliance on a single crop and mitigating the financial risks of market shocks. When integrating livestock that is owned by other farmers, grazing fees can be charged (ibid.). Moreover, once the system is in balance and fully transitioned, there can be financial benefits from increased yields due to more productive soils. Producers can sometimes even ask for premiums through communicating sustainability aspects in marketing (Raes et al., 2023). Focusing on cultivating food that stands out for its superior quality can attract a premium on the market. This shift reflects a response to the challenges of conventional farming, where growers face rising input costs and unpredictable market prices, factors that limit their financial stability. Regenerative agriculture aims to empower farmers economically and make the profession more appealing to future generations by offering greater financial autonomy (McMahon, 2024). Last, RA fosters greater resilience in severe weather conditions, reducing the risk of losses in yields and thus losses in revenue (Kurth et al., 2023).

An analysis by the Boston Consulting Group (ibid.) has shown that regenerative agriculture can increase farm profits by up to 60%. Another study building on this analysis has even demonstrated that in the long run profits with RA could lie 120% above farmer profits using conventional practices (Petry et al., 2023). This occurs after the three- to five-year transition period, during which farmers face risks and must adapt to new practices and expenses that are not yet balanced by increased profits, as the soil biology takes time to adjust to the changes. After this adjustment period that often entails initial profit loss, the most significant drivers for long-term profit were found to be increased revenue from diversifying cash crops for crop rotations, reducing tillage and thus costs for fuel and labor and integrating grazing systems for external cattle (ibid.). LaCanne and Lundgren (2018) even found that profitability was about two times higher for some US regenerative farms as opposed to conventional farms.

3.2.2. Environmental benefits

Regenerative agriculture is often highlighted for its significant environmental benefits, that will be explained in this section.

Healthier soils

Fundamentally, RA creates healthier soils. This is at the heart of most of the definitions proposed in the previous section. Regenerative agriculture significantly reduces soil erosion by improving the physical structure, chemical properties, and microbial life of soils. These improvements prevent erosion, make nutrients more available to plants, and reduce the occurrence of soil-borne diseases (McMahon, 2024). Conservation management techniques, which include regenerative agriculture, have been shown to decrease surface runoff and soil erosion, with studies indicating notable improvements in soil stability (Du et al., 2022). A review by Khangura et al. (2023). concluded that regenerative farming has strong potential to enhance soil health. In an extensive review of studies, Rehberger et al. (2023) found that several practices associated with RA can effectively build up soil organic carbon (SOC) and improve overall soil quality.

Greenhouse gas (GHG) reduction and carbon sequestration

One of the most recognized benefits of RA is its role in climate change mitigation, as it not only reduces GHG emissions through reduced inputs and measures such as less tilling, but it directly fosters carbon sequestration (Raes et al., 2023). Soils globally have lost 50-70% of their original carbon stock because of unsustainable land use, and it has been shown that soil carbon sequestration has the largest potential as a carbon sink among terrestrial and agroecosystems (FAO, n.d.). Soils naturally capture and store carbon by integrating dead and decomposing organic material over time (Lal, 2007; Lal, 2016; Lal, 2018, cited after Keenor et al., 2021). Agricultural management that builds up soil carbon plays a major part in this (FAO, n.d.). Enhancing soil organic carbon (SOC) levels in agricultural soils helps draw carbon dioxide from the atmosphere, playing a key role in achieving carbon neutrality (Paul et al., 2023). Building up soil organic matter can thus turn farms into net carbon sinks (McMahon, 2024).

Positive biodiversity impact

RA has been shown to significantly enhance biodiversity by adopting practices that promote ecological balance. Reducing or eliminating pesticide use, diversifying crop rotations, maintaining non-productive areas, and avoiding bare soil can lead to increased biodiversity both on farms and in nearby ecosystems (McMahon, 2024). Supporting this, a McKinsey report shows that changes in agricultural practices could potentially account for 72% of the total improvements needed to mitigate biodiversity loss (Aminetzah et al., 2022, p.10). Additionally, a study by the FOLU found that crop diversification and minimal tillage positively influence biodiversity (Ewer et al., 2023). Fenster et al. (2021) further underscore this connection, identifying a clear correlation between regenerative farming methods and increased diversity of plants and invertebrates on farms.

Water conservation and reduction of pollutants in runoff

Furthermore, RA offers significant benefits in terms of water conservation and the reduction of pollutants in agricultural runoff (WEF & Bain & Company, 2024). Increasing soil organic matter enhances soil structure, which in turn improves water infiltration, storage, and the buffering capacity of the hydrological cycle (Franzluebbers, 2002). RA practices, including no-till or reduced tillage, mulching, crop rotation, and cover crops, have been shown to improve water retention and soil moisture infiltration (Smith, 2018). These improvements help optimize water use efficiency, often allowing farmers to optimize the ratio of grown crops per water input (McMahon, 2024). Beyond water retention, regenerative practices also help mitigate water pollution. Conventional farming methods have contributed to soil erosion and nutrient runoff, leading to problems such as eutrophication and biodiversity loss in freshwater systems (Jiménez Cisneros et al., 2014). By adopting regenerative techniques like reduced tillage and cover cropping, farmers can reduce nutrient loss in runoff – a study has shown nitrogen loss reductions of up to 43% in the United States Midwest (Perry, 2015). These practices thus not only conserve water but also safeguard water quality by preventing the excess loading of chemicals into natural water bodies.

<u>Climate adaptation and resilience</u>

RA plays a vital role in enhancing climate change adaptation and resilience by promoting practices that reduce the impact of extreme weather events. By implementing regenerative farming techniques, soil erosion, flooding, and pest outbreaks are reduced, and improving agrobiodiversity creates more resilient agricultural systems (Raes et al., 2023). Soils enriched with organic matter function like a sponge, absorbing water during heavy rainfalls and gradually releasing it during dry periods. This can lead to more stable crop production and less vulnerability to climate shocks (Oldfield, 2019). A study by the Soil Health Institute, which surveyed 100 farmers across nine U.S. states, found that 97% reported increased crop resilience to extreme weather after adopting soil health practices (Soil Health Institute & Cargill, 2021). This contributes to maintaining productive farming systems despite climate volatility, providing a pathway for climate adaptation by strengthening the resilience of agricultural landscapes (Buckwell et al., 2022; McMahon, 2024).

3.2.3. Social benefits

Next to economic and environmental benefits, a number of social benefits related to RA are frequently mentioned.

<u>Enhanced food security</u>

As discussed above, the climate adaptation and resilience benefits of RA contribute to improved food security (Raes et al., 2023). The primary objective of

RA is to establish a more stable system with greater biodiversity, which enhances resilience to shocks. As a result, yields are less affected by such disruptions, reducing risk and stabilizing food supply.

Nutrient density

Another frequently mentioned benefit of regenerative agriculture is that healthier soils enhance the nutrient density of food, with growing empirical evidence supporting this claim (WEF & Bain & Company, 2024; McMahon, 2024). Hepperly et al. (2018) show that organic farming practices, which improve SOC and nitrogen, lead to significant increases in crop mineral nutrients, antioxidants, and disease resistance. This indicates a positive influence of soil health on the nutritional quality of food. Montgomery et al. (2022) also found that regenerative farming practices, including no-till, cover cropping, and diverse rotations, improve the nutrient density of crops and livestock compared to conventional methods. Their research showed higher levels of vitamins, minerals, and phytochemicals in crops from regenerative farms, suggesting that soil health significantly influences the nutritional quality of food.

Improvement in local livelihoods

Improving farmer livelihoods is central to many outcome-based definitions (OP2B, 2021) and a key benefit of regenerative agriculture, as it enhances social capital and revitalizes local economies. This is closely linked to the economic benefits already discussed. By restoring degraded landscapes and adopting regenerative practices, new business opportunities can be created, particularly benefiting women and youth, and reducing rural out-migration (Raes et al., 2023). RA also enhances human capital by improving skills, knowledge, and capacity within farming communities. By offering training in new production techniques and strengthening capacity around value chains for emerging products, regenerative practices contribute to poverty reduction and food security (ibid.). This focus on education and skill development empowers communities, leading to long-term improvements in livelihoods and resilience. Additionally, Commonland (2020) in their framework of the four returns on landscape restoration, mention a return on inspiration, fostering a shared and inclusive vision for the future of the landscape, inspiring innovation, and giving communities a renewed sense of purpose and potential for positive change. Restoring agricultural landscapes also brings additional benefits to local communities, such as enhanced recreational opportunities and improved aesthetic value (Keenor et al., 2021).

3.2.4. Regenerative agriculture benefits as ecosystem services

Having established what the most important economic, environmental, and social benefits of RA are, they now have to be conceptualized within the framework of natural capital and ecosystem services introduced in chapter two.
Essentially, regenerative agriculture per definition enhances soil health and biodiversity, building up soils. Soils are increasingly perceived as ecosystems in themselves (Buckwell, 2022), as a form of natural capital that is built up through sustainable agricultural soil management such as regenerative practices. Various functions and ecosystem services originate from such soil ecosystems, many of which have been mentioned in the previous section on benefits of regenerative agriculture. It is now merely a question of terminology to translate these benefits into the categories of ecosystem services.

Many initiatives have already linked benefits of RA with the ecosystem services concept. The Taskforce on Nature-related Financial Disclosures (TNFD) has published an additional sector guidance for food and agriculture, outlining that common practices of RA, such as no-tillage, crop rotation or integrated farming, affect ecosystem services such as water supply, quality regulation and purification, soil quality regulation, flood mitigation and air filtration (TNFD, 2024). The application of organic fertilizers can affect ecosystem services related to pollution removal as well as global climate regulation (ibid.). A few frameworks already exist for classifying the ecosystem services of soils (Dominati et al., 2010). The TEEB AgriFood also gives a table on the classification of ecosystem services from agriculture based on the CICES (TEEB, 2018, p. 254). However, the focus of this paper are those ecosystem services that are specifically associated with regenerative agriculture.

In Figure 1, the specific benefits of section 3.2. have been grouped and categorized according to the CICES classification in provisioning, regulation and maintenance, and cultural ecosystem services (Haines-Young & Potschin, 2018).

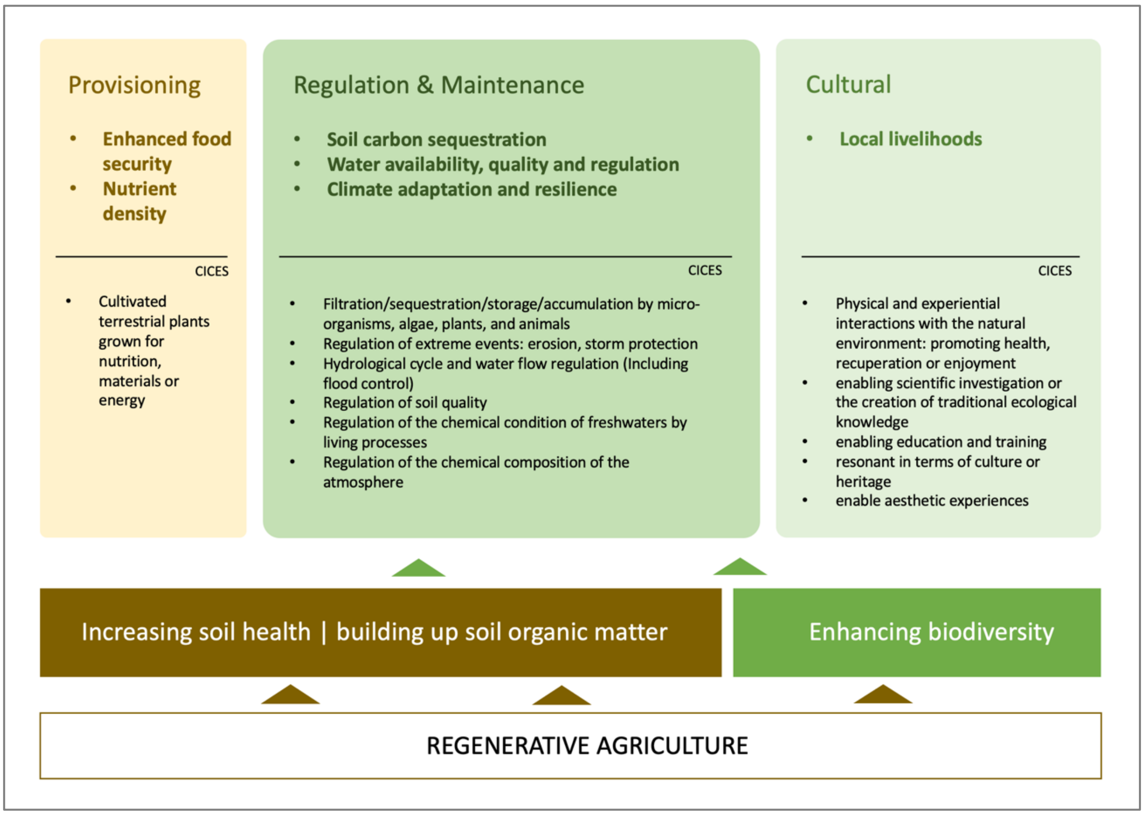

Figure 1: *Classification of ecosystem services resulting from regenerative agriculture.*
Own illustration based on the CICES classification of ecosystem services (Haines-Young & Potschin, 2018).

The foundation of this are RA practices, which lead to increased soil health and build up the soil ecosystem. Biodiversity again plays a particular role here, as already explained in section 2.1., as it is not directly an ecosystem service but a fundament that underpins many of these services. It occupies a function between the capital stock and the resulting ecosystem services but is often referred to as an ecosystem service in many reports. The enhanced soil ecosystem and biodiversity give rise to the benefits grouped into three categories of ecosystem services. The benefits highlighted in this chapter are shown in bold and color, while the corresponding ecosystem services as listed in the CICES classification are given below (Haines-Young & Potschin, 2018). Many of the social benefits have been grouped as cultural services under local livelihoods. According to Satama-Bermeo et al. (2024), cultural services of agriculture refer to the relation between people and nature that results in cultural identity, local ecological knowledge as well as spiritual experiences and mental and physical health. This mainly affects local livelihoods in this case.

It is also important to note that the economic benefits of agriculture in general and RA especially are largely omitted here, since increased profits from RA practices do not represent an ecosystem service. Moreover, it has posed a particular challenge to separate common provisioning services from agriculture from the extra benefits of regenerative practices. To highlight this, the provisioning category for instance presents the enhanced food security and higher nutrient density characteristic for RA, instead of just the provision of food.

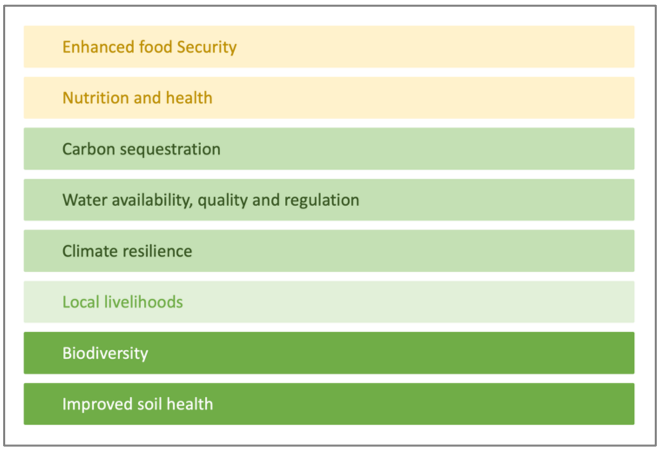

Figure 2: *Main categories of ecosystem services resulting from regenerative agriculture. Own illustration.*

Based on Figure 1, the main categories of ecosystem services relevant for the rest of the thesis are established in Figure 2. Increased soil health and biodiversity, while enjoying a separate status, are included as categories here as they are key outcomes of regenerative agriculture and often referred to as ecosystem services related to RA.

3.3. Challenges and barriers

RA not only delivers economic returns but also offers broader societal benefits, providing substantial ecological, social, and long-term economic advantages. However, transitioning to these practices presents challenges. Understanding these economic, technical, and social barriers from a farmer's perspective is crucial to facilitating the shift (WEF & Bain & Company, 2024).

A key challenge in adopting regenerative agriculture is the significant upfront investment and potential for short-term financial losses. Higher initial costs, such as for seeds or equipment, may not yield benefits until later, creating a timing gap that many farmers struggle to bridge (ibid.). The unpredictability of costs and returns, coupled with yield declines during soil adjustment, adds further risk, making it difficult for farmers without sufficient financial resources to realize long-term benefits (Petry et al., 2023; Monast et al., 2021). Furthermore, from a technical perspective, farmers often face challenges in accessing the necessary agronomic advice, training, and inputs required for the transition to regenerative practices (WEF & Bain & Company, 2024). The lack of clear, independent technical guidance on which practices to implement, how to adapt them to local conditions, and how to track progress further complicates adoption (Buckwell, 2022). Farmers need more autonomy in choosing the regenerative practices most suited to their land, along with support to measure and optimize outcomes. Social dynamics within farming communities present another significant barrier to the adoption of regenerative agriculture. Farmers may be reluctant to adopt practices proposed by organizations they do not fully trust, particularly if it involves sharing detailed operational data (WEF & Bain & Company, 2024). Moreover, the unconventional nature of some regenerative practices can create hesitancy and the social fabric of farming communities can make it difficult for farmers to embrace regenerative agriculture without broader support and understanding from their peers and landowners (ibid.).

The current financing landscape to support farmers in RA adoption is subject of several reports that have been published in the past years. Financial support for farmers includes several programs and offers such as cost-share and lending programs that offer farmers support during the transition phase, insurance products that are adjusted to farmers conditions, or certain leasing agreements meant to support farmers (Petry et al., 2023). Public funding for RA does exist but alone will not be sufficient to catalyze the transition. It is essential that additional private finance is mobilized to fill in the gap (Havemann et al., 2022).

3.4. Proposing the monetization of ecosystem services

Farmers bring a significant contribution when transitioning to regenerative agriculture but face challenges that they struggle to overcome alone. In other words: transitioning to RA represents a crucial, and perhaps essential, shift; however, adoption remains slow due to the barriers outlined above. To address this, it is proposed that framing the benefits within the ecosystem services framework, as discussed in section 3.2, can help highlight the multifaceted advantages of RA and make them more compelling to decision-makers.

Across several recent reports on the regenerative agriculture transition and the need for financing in this regard have mentioned that one possible solution could be the monetization of ecosystem services resulting from RA (WEF & Bain & Company, 2024; Petry et al., 2023; KPMG, 2024). Havemann et al. (2022) emphasize the need for market-based mechanisms, such as Results-Based Financing, to compensate farmers, including carbon finance and other innovative solutions to bridge the financing gap. A report by the World Economic Forum and Bain & Company (2024) has presented a new “breakthrough model” for financing the transition that highlights the monetization of all ecosystem services of RA as the crucial mechanism. The idea is that those who benefit from the ecosystem services provided pay farmers also pay for them, generating a financing stream. Farmers receive these payments upfront and the resulting services such as enhanced biodiversity, carbon sequestration, freshwater or nutrient density will benefit these stakeholders once the system is transformed. Upfront payments could be a solution to bridge the transition phase that is characterized by high risk (ibid.). At this point, there are public and private stakeholders in- and outside the agricultural value chain that benefit directly or indirectly from regenerative farming. For example, regional public water authorities benefit from cost savings due to reduced pesticide runoff into groundwater (ibid.). While this provides clear value, it is not economically quantified or reflected in pricing, underscoring the need for mechanisms to fully capture and value the ecosystem services generated by regenerative agriculture (ibid.).

According to McMahon (2024), there are encouraging signs that society could pay for positive outcomes of RA, creating new revenue streams for farmers. This approach also highlights that transitioning to RA involves a nexus of stakeholders that need to collaborate to drive change within the agricultural sector. It requires every actor that benefits from the transition to commit to contribute resources for environmental outcomes (ibid.). The importance of stakeholder collaboration in advancing and financing the transition to regenerative practices has often been emphasized. To effectively place value on natural capital and ecosystem services in the context of RA, it is essential to involve all relevant actors.

4. A Stakeholder Approach: Cooperation for the regenerative transition

To assess whether and in how far the regenerative transition could be supported and financed by multiple stakeholders through ecosystem service valuation, a stakeholder approach must be taken. The implementation of RA can only work if a range of stakeholders such as farmers, investors, government agencies and NGOs cooperate successfully (KPMG, 2024). To effectively reward ecosystem services as outlined in the previous section, solutions need to be supported by multi-stakeholder partnerships (FAO, 2018).

Following the stakeholder model after Josef Wieland (Wieland, 2014; Wieland, 2020), the relevant transaction must first be defined. In the case of this paper, the transaction of interest is the transition to regenerative agriculture, which involves farmers changing their practices as to achieve certain outcomes that are associated with RA. The aim of this chapter is to identify the relevant stakeholders of the transaction and their key interests to finally analyze who benefits from which ecosystem services.

4.1. Key stakeholders and interests

Several stakeholders have an interest in or are ultimately affected by the transition to RA, especially considering the far-reaching benefits like climate change mitigation. It is therefore difficult to distinguish primary from secondary stakeholders. This paper will focus on the most central stakeholders of the transition towards RA and their specific interests regarding this transaction.

Some publications mention that there is a distinction to make between the regional, national, and global level of actors in RA. For the scope of this thesis, there is not a detailed differentiation of these three levels, but a more general mapping of the stakeholders that are called upon by the transaction of the regenerative transition. Wieland and Hellpap (2024) have used the term regio-global value networks to refer to “the networking of local or regional economic activity in and between national, transnational, and global spaces” (p. 4). This is inherent to agricultural systems, as agricultural production always occurs at a regional level, but is inseparably connected with and embedded in inter-regional and global value chains. Put differently, the relationship between economic systems and global society cannot be done at a spatial level, but it “seems far more promising to conduct the analysis at the level of collaborative events” (Wieland, 2020, p. 2). The transition to RA as a central transaction now forms such a relational space, a collaborative event that involves “regional and/or supra-regional actors” (Wieland & Hellpap, 2024, p. 3) and representatives from organizations and institutions at local, national, and international levels (ibid.). As such, local communities are included as stakeholders from the regional level and international organizations on the global level. Governments and policymakers might also refer to regional, national but also to international policymaking.

The chosen stakeholders and their key interests in the transaction of agricultural systems transitioning to regenerative agriculture will be presented in the following and summarized in Figure 3. A particular focus lies on the agricultural value chain, since businesses within the value chain will potentially play a central role for the stakeholder involvement discussed later-on in this thesis.
The central stakeholders of the agricultural value chain, summarized as farmers and landowners, and agribusinesses form the core of the stakeholder map. As already discussed, there are tangible benefits from regenerative farming systems for farmers. In a survey of the WBCSD, most farmers mentioned reduced input costs and soil health benefits as most motivating to transitioning (Petry et al.,

2023). Apart from notably healthier soil and greater biodiversity, farmers profit directly from reduced input costs and fewer compilations from fertilizer run-off since the use of fertilizers is significantly reduced. This means higher productivity and profitability. Moreover, adopting regenerative practices leads to systems more resilient to extreme weather and climate shocks (ibid.), minimizing risk and securing long-term viability of land. However, transitioning towards RA poses significant challenges for farmers, since they are carrying the risk during the transition period (ibid.). In contrast to conventional farming, often associated with pollution and health concerns, regenerative farmers, who prioritize sustainability, are well-positioned to access high-value markets, making regenerative agriculture a more resilient and future-proof choice (McMahon, 2024). This ultimately also gives farmers more recognition in society.

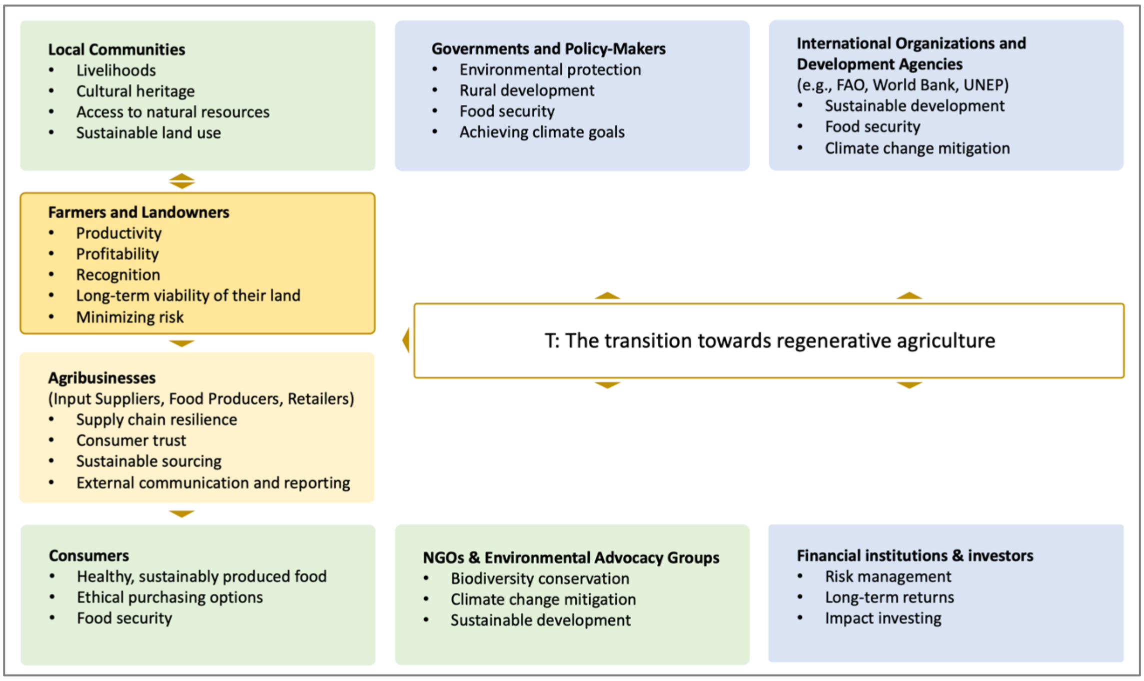

Figure 3: *Stakeholders of the transition towards regenerative agriculture and their interests. Own illustration. Stakeholder approach based on Wieland (2014)*

A key actor in the restoration of natural capital in agriculture are companies in agricultural value chains, predominantly food and beverage companies, that have a particular interest in these supply chains due to several reasons. First, they must ensure supply chain resilience. These businesses are heavily reliant on land that is degrading now, with agriculture ranking among the top three industries most dependent on nature, alongside the food and beverage sectors (WEF & PwC, 2020). With RA practices implemented, agribusinesses will ultimately benefit from better resilience in their supply chains and ensured supply (WEF & Bain & Company, 2024). Transforming supply chains is not only about resilience, but in general about sustainable sourcing. Food companies increasingly respond to consumer pressure by screening their suppliers and asking for reporting on environmental impacts and GHG emissions, strengthening consumer trust (McMahon, 2024). This also serves reporting and external communication purposes (Raes et al., 2023). Companies' interest in RA in their supply chains is therefore also a possible enhancement of multidimensional accounting standards such as the Triple Bottom Line (Raes et al., 2023) and the general expectation for companies to measure and report their impact on nature, underlined by initiatives such as the Taskforce on Nature-related Financial Disclosures (TNFD) (McMahon, 2024; TNFD, n.d.). KPMG (2024) also highlights that regulatory developments related to non-financial reporting indicate a lasting shift in market standards. Early adopters incorporating the valuation of externalities into financial planning can stay ahead of regulations, strengthen their market reputation, and attract more investment (ibid.).

Stakeholders from the civil sphere, including local communities, consumers, and non-governmental organizations (NGOs), are highlighted in green. These groups are identified as primary stakeholders in the regenerative transition due to their direct impact and involvement. While society as a whole benefits from climate change mitigation and sustainable transformation, local communities and consumers are emphasized as the most directly affected groups. Local communities represent regional interests in the regenerative transition, as its implementation begins at the landscape level. Residents of areas surrounding agricultural land benefit from improved water quality, reduced chemical use, and flourishing landscapes. The shift to regenerative agriculture also acknowledges the value of agricultural land, rural culture, and heritage, and supports sustainable development in these regions. Consumers, as the final recipients of agricultural value chains, are also key stakeholders. Their interests include access to healthy, nutrient-rich foods and ethical purchasing options that provide transparency regarding the origins of their nutrition. Additionally, they benefit from greater price stability, as regenerative practices help mitigate climate-related shocks and yield disruptions. Last, from the civil sphere, NGOs and especially environmental advocacy groups must be included as stakeholders. Apart from general acceptance and reputation, their specific interests with regard to the regenerative transition are climate change mitigation, biodiversity conservation and sustainable development.

Other chosen stakeholders are financial institutions and investors, governments and policymakers, and international organizations and development agencies. In fact, the financial system is a key stakeholder of the transition to RA, as it is highly dependent on the functioning and stability of the economy, which rely on healthy ecosystems (Bosma et al., 2022). Initiatives such as Finance for Biodiversity have shown the interest of the financial sector in biodiversity preservation. Loss in biodiversity disequilibrates ecosystems, directly affecting the financial sector in the form of financial risk (ibid.). RA can mitigate these risks by lowering the likelihood of crop failures caused by floods, droughts, and pests, reducing insurance payouts (WEF & Bain & Company, 2024). Enhanced soil health also boosts agricultural land value, providing financial stability for both institutions and landowners. Furthermore, regenerative practices help financial institutions comply with emerging regulatory requirements, such as green asset ratios (ibid.). Governments and policymakers are focused on environmental protection, food security, and meeting climate targets, alongside promoting rural development, and enhancing the appeal of rural livelihoods. Additionally, international organizations and development agencies such as the World Economic Forum or UN programs are included as stakeholders, having been pivotal in advancing the global dialogue on RA. Their primary interests include fostering sustainable development, ensuring food security, and addressing climate change through resilient agricultural practices.

4.2. Allocation of ecosystem services

This section aims to align the ecosystem services generated through RA with the stakeholders and their interests, i.e., to allocate them to those actors who benefit from them. It must be noted here that again, it is difficult to distinguish exactly who benefits from what or has a primary interest, since many ecosystem services overlap or result from another and ultimately many actors benefit from them to some extent. For instance, all stakeholders have an interest in carbon sequestration, but agribusinesses face a particular pressure to decarbonize supply chains and policymakers to achieve climate goals; thus, this ecosystem service is explicitly allocated to those with a stronger interest. It is merely the purpose here to make structured considerations on who places particular value on what. An overview of this allocation is given in Figure 4.

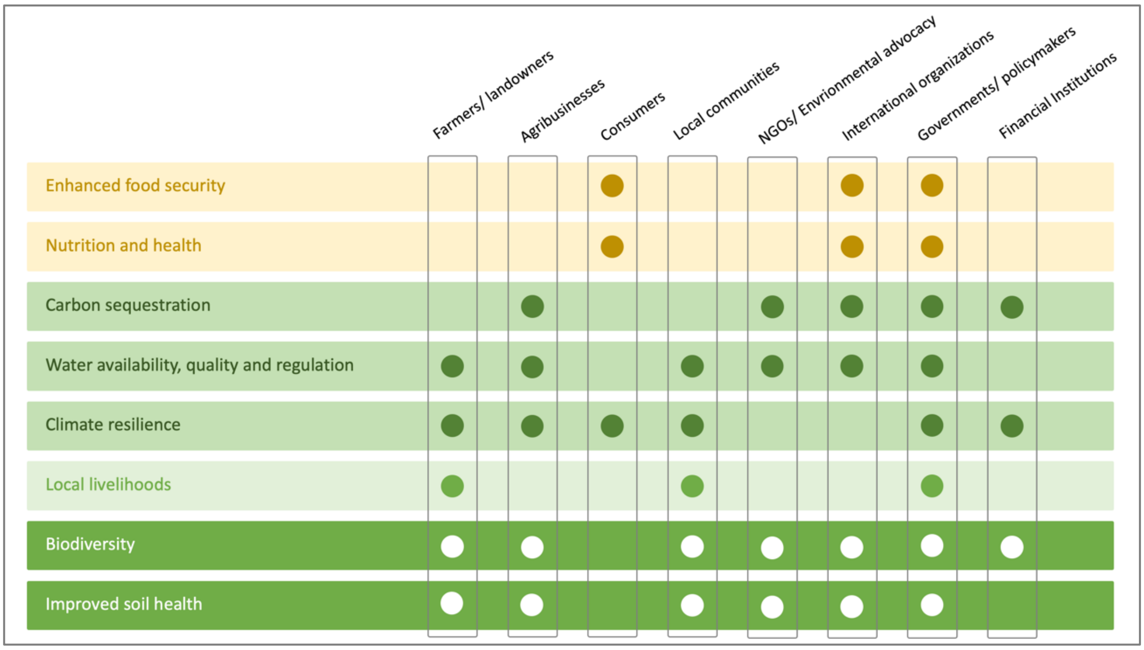

Figure 4: *Allocation of ecosystem services to stakeholder groups and their interests. Own illustration.*

All main categories of ecosystem services can be allocated to at least three main stakeholder groups based on their key interests. The question will be whether the interest of an individual stakeholder in a single ecosystem service is strong enough to initiate financial contributions. For this to work, it must be ensured that each stakeholder has a sufficiently attractive value proposition to motivate engagement (WEF & Bain & Company, 2024)

4.3. Facilitating stakeholder co-operation for ecosystem services monetization

There are several stakeholders involved with an interest in at least a subsection of the ecosystem services resulting from RA, that have to effectively cooperate to realize contributions. Summarized from the WEF's proposition for a multi-stakeholder financing model based on ecosystem services monetization, there are three types of cooperation needed: (1) farmers must have simple access to financial, technical, and measurement reporting and verification (MRV) service providers, (2) ecosystem services must be quantified, aggregated, and marketed to a mix of buyers to capture full value and (3) capital must be pooled from multiple providers (WEF & Bain & Company, 2024). It has been argued that a central actor is needed to facilitate this co-operation and aggregate the value of monetized ecosystem services across various stakeholders to pool capital from multiple sources and compensate farmers (ibid.). The key role would be to provide or facilitate upfront payments or guarantees to farmers, which helps offset income dips during the early transition to regenerative practices (ibid.). They later recoup this investment by selling environmental outcomes (ibid.).

In general, this actor or mechanism must be capable of accurately projecting the economic costs and benefits of regenerative practices and assessing the resulting environmental outcomes for each farmer involved. This involves the expertise to develop a market for these outcomes, forecast risks tied to offering payments and guarantees before they materialize, and secure financing to support these risks across a farmer portfolio (ibid.). The actor or mechanism could take different forms and can be one of the stakeholders or an external facilitator of co-operation. It can be comprised of one or more actors, with examples including growers' associations, financial service providers or AgTech companies (ibid.). There are several already existing models with different mechanisms, that will be reviewed in section 5.3.

5. Valuing ecosystem services to promote regenerative agriculture

So far in this thesis, the concept of ecosystem services has been used to formulate the benefits to humans from transitioning to regenerative agriculture and the relevant stakeholders who may value these services have been identified. The next crucial step is to examine the specific value assigned to these ecosystem services and explore how they can be measured, quantified, and valued in the context of regenerative agriculture. This section will start with a discussion on placing value on nature, based on backgrounds in economic theory, and then go on to examine existing methods, frameworks and standards for quantification, valuation, and monetization of ecosystem services. As it is ultimately the goal to unlock finance for regenerative agriculture through the valuation of its ecosystem services, already existing payment schemes and approaches will be examined in the third larger part of this chapter.

5.1. Theoretical background on the valuation and monetization of ecosystem services

Ultimately, it is necessary for the purposes of this paper to know how much ecosystem services of RA are worth to different stakeholders. In section 2.3., the concept of value has already been discussed to some extent, establishing that value here does refer to a human perspective. Now, further thought will be given to the concept of value of nature to humans. For this, controversial aspects regarding the valuation of nature that have frequently been discussed in literature and their theoretical background will be presented in this first section of Chapter 5. Here, the different perspectives that have framed this discussion from environmental economics and ecological economics might become apparent. Environmental economics has often been criticized for incorporating nature into existing neoclassical economic constructs and mechanisms, while representatives from the ecological economics side of the ESF advocate for a value-pluralistic approach to understanding the importance of nature for humanity.

5.1.1. Placing value on nature – meaning and critical reflection

When discussing the valuation or even monetization of nature, it has to be clarified what value and valuation here mean. Value can mean different things. In its broader meaning, "value" is linked to a notion of importance (Arias-Arévalo et al., 2018). Valuation, in this sense, is a form of assigning importance (Jacobs et al., 2016), of expressing appreciation (Costanza et al., 2017) or the process of analyzing or assessing the values of nature (Arias-Arévalo et al., 2018). It can be a preference for actors in their subjective perception, it can be the importance of something, it can be a measurement or an intersection of all of these (Pascual et al., 2017). Chapter two introduced the debate on instrumental versus inherent values. Another idea suggests that the process of valuation itself may be the source of nature's value, shaped through social construction and human discourse (Arias-Arévalo et al., 2018). Ultimately, it is argued that the value of nature is a construct, attributed by humans to nature and originating from a relational domain of subjects and objects and resulting valuation (ibid.). From this perspective, the value of ecosystem services is neither inherently located in them, nor are they subjective, but they become explicit through the process of reflection, recognition, and articulation (ibid.).

Regarding economic valuation, Costanza et al., (2017) describe economic value as an aggregate willingness-to-pay for ecosystem services or compensation for their loss, stemming from aggregated individuals' assessments of the contribution of nature to their welfare. It therefore means that humans express the importance they assign to nature in economic terms, in how far they would equate it to an amount of money. The question has often been raised whether it is ethically acceptable to value nature in this sense. As a counterargument, every decision made as a society does imply valuation either way, whether they are expressed in monetary terms or not (ibid.). Whether explicitly or implicitly, making a choice always goes along with performing some form of valuation (ibid.). Having established that valuation is inevitable, the question rather becomes what kind of valuation is the most appropriate for the cause (ibid.)

In many studies, valuation has been used as a synonym for monetization (Costanza et al., 1997; Arias-Arévalo et al., 2018). Economists are increasingly divided when it comes to the question of whether to use the metric of money when valuing nature and its services (Kallis et al., 2013). The call for monetization raises the question of what putting a price tag on soil ecosystem services means for how their value is perceived. Can such a value be reflected in price or won't price always just remain a proxy for the real value, that can never be fully captured?

5.1.2. A short history of value and price

To understand this criticism of putting a monetary value, a price, on nature, this section turns to the disconnect between value and price as a core problem. Historically, this is strongly tied to the distinction between value in use and value in exchange. Thus, to understand the concepts of and the relation between value and price, a short background on the history of economic theory from Aristotle over classic to neoclassic economics must be given.

Value in use refers to the practical utility or benefit derived from a good, while value in exchange pertains to its worth in the context of market trade (Kallis et al., 2013). This distinction can already be traced back to Aristotle (Sandelin et al., 2014), who understood that the value of something is based on its usefulness and humans can derive this value if they have the knowledge to make use of it. To Aristotle, exchange was merely a practical means to an end—a way to obtain one thing in return for another. Its purpose was not the act of exchange itself, nor the pursuit of wealth for its own sake, but rather the acquisition of goods that have value because they are of use (Aristoteles & Gigon (Ed. & Trans.), 2011). The realization, that the exchange of goods will require money, and this might lead to the abstraction of monetary values away from actual values, underscores that the usefulness and true value of a good is not always aligned with its market price.
Later, classical economists like Adam Smith explored and established this dual concept of value already understood in its roots by Aristotle. Smith famously illustrated the distinction with the "diamond-water paradox," questioning why essentials like water, which have high use value, are often cheap, while non-essentials like diamonds command high prices despite their low use value (Smith, 1981). For classical economists, use value represented the intrinsic benefit of a

good, whereas exchange value was its market-driven monetary worth. Classical thinkers further advanced value theory by introducing the labor theory of value, which proposed that the value of a good, more specifically its real intrinsic value, is fundamentally tied to the labor required to produce it (ibid.). Of course, it has to be noted here that the labor theory does not apply to nature's services, as there is no human labor involved here. However, Peterson et al. (2010) draw an intriguing parallel with the labor theory, suggesting that, much like human labor contributes to the intrinsic value of goods but is inadequately represented in market prices, the intricate mechanisms of nature are similarly obscured by commodification and poorly captured in their market valuation.

Exchange value, closely tied to price, became the primary focus of market analysis, overshadowing value in use. With the advent of the marginalist revolution, economic thought underwent a major transformation. This shift brought the concept of marginal utility to the forefront, redefining value based on the additional satisfaction obtained from consuming one more unit of a good. Unlike the classical labor theory, which linked value to production costs, marginal utility tied value directly to consumer perceptions and individual preferences, marking a shift away from intrinsic notions of worth. In the neoclassical era, economists such as William Stanley Jevons and Léon Walras formalized this shift by declaring that value is derived solely from utility. Jevons (2013) argued that value in use was no longer relevant and only value in exchange, determined by a good's utility, mattered. This new framework positioned value as a subjective quality rooted in individual preferences rather than in the labor embedded in a product. Walras (2010) took this further by associating value with scarcity. He argued that only goods that are limited in supply could be exchanged, and thus only scarce goods acquire value. Consequently, price became the mechanism through which utility and scarcity were reflected in economic transactions. According to neoclassical theory, value does not lie in any intrinsic property of an item, but in its capacity to satisfy preferences within a market context. As already briefly mentioned in section 5.3., this thought ultimately underlies the idea of ecosystem services monetization and the sheer concept of ecosystem services from the start, as they are defined and their worth solely constituted by their benefits to humans. This would imply that humans can only understand and account for their worth if it is translated into a market price.

5.1.3. Scarcity, public goods, and the tragedy of the commons

This already mentioned concept of scarcity poses some complications in the context of the valuation of ecosystem services. While most provisioning ecosystem services, related to the production of food, are private goods with a market price, especially regulating services are not (Satama-Bermeo et al., 2024). Being non-rival and non-excludable, many ecosystem services exhibit characteristics of public goods, where one person's use does not diminish another's, and no one can be excluded from their benefits (Döhring et al., 2023; TEEB, 2018). As a result, public goods remain difficult to incorporate into traditional financing models, which rely on clear ownership and exclusivity to drive investment (Havelmann et al., 2022). For example, the carbon sequestration provided by regenerated soils benefits society as a whole by contributing to climate stability and improving air quality. However, since this service cannot be exclusively claimed by any one actor, no individual or organization has a direct incentive to invest in it.

However, there is a growing recognition that many natural resources, traditionally viewed as infinite, are, in fact, limited and potentially exhaustible. Resources like water, land, and clean air are increasingly seen as rivalrous and finite, challenging the assumption that they can be universally categorized as public goods (Dominati et al., 2016). Nevertheless, even if some ecosystem services are finite, there is often no clear assignment of responsibility for their upkeep, leading to underinvestment and further complicating the management of natural resources. Many actors benefit from soil health, biodiversity, and other ecosystem services, yet the responsibility to maintain and restore them remains diffuse. This situation exemplifies the tragedy of the commons, where shared resources are overused and degraded because individuals lack incentives to preserve them for collective benefit (The Landbanking Group, 2024). This expression illustrates that whenever many individuals use a scarce resource in common, the degradation of the environment is inevitable (Ostrom, 2003). Lant et al. (2008) have even introduced the expression of the tragedy of ecosystem services, describing that economic incentives promote land use to produce marketable commodities rather than ecosystem services that benefit the public. Governance mechanisms that assign responsibility and value to ecosystem services could incentivize investments in these public goods. For instance, if firms are required to reduce their carbon footprint, certificates for carbon removals could become a scarce commodity. Through carbon credits, the benefits of carbon sequestration could be assigned to firms, effectively commodifying ecosystem services by transforming them into excludable and tradable goods. This market-based approach would treat ecosystem services as economic goods with assignable value, providing a structured pathway for financing their preservation and enhancement. However, Ostrom has already observed that "neither the state nor the market is uniformly successful in enabling individuals to sustain long-term, productive use of natural resource systems" (2003, p. 1) and to address the tragedy of the commons, alternative governance structures are needed to allocate benefits and costs more clearly among stakeholders. The next section will further elaborate on criticism on the market as a governance structure for ecosystem services and the question of commodification.

5.1.4. Commodification of nature and limits of the market

The call for commodification of ecosystem services as an effort of nature conservation is seen as highly controversial. Making ecosystem services a commodity means turning them into a good or service that was previously not meant for sale but now enters this market sphere and can be exchanged (Kallis et al., 2013). Translating the value of ecosystem services into economic language, namely the language of price, thus making them integrable into the market system, could be an essential step to make their importance more visible. From this perspective, monetization as a form of valuation serves the purpose of getting a wider audience for the communication of the relevance of nature conservation and regeneration (Baveye et al., 2016). In a later review on the progress of their first work, Costanza et al. (2014) defended that expressing value in price does not necessarily imply ecosystem services should be treated as commodities but is merely meant as a metaphor to express and underline value as well as make it usable for financial institutions to unlock investments.

At the same time, this has divided scholars and the commodification of nature has been frequently criticized. The TEEB, for instance, clearly distances itself from any form of commodification of nature, underlining that “our living planet is most definitely not for sale” (TEEB, 2018, p. 4f). Underlying this skepticism is the question and uncertainty of what happens with these prices once ecosystem services receive a price tag and are open for trade on a market (Baveye et al., 2016). Arguing that the core of economics is the optimal allocation of scarce resources, translating nature into the economic sphere would automatically lead to an optimal outcome that is then ideally also optimal for nature. However, this is merely the neoclassical point of view (ibid.) and there are several flaws to the neoclassical market framework regarding the valuation of nature.

A key aspect where the market fails here is the problem of the substitutability of natural resources and soil services specifically (Baveye et al., 2016, Döhring et al., 2023). The issue with the substitutability of soil services as "goods" highlights a key limitation in neoclassical economic theory. The market views ecosystem services primarily through the lens of their functions, which are often viewed as substitutable with other approaches or technologies that deliver similar outcomes (Arias-Arévalo et al., 2018). However, this ignores their underlying complexity and monetary values cannot account for the limited degrees of substitutability and non-linearities (ibid.). Soils are multifunctional systems, meaning they provide multiple, interconnected ecosystem services simultaneously, such as nutrient cycling, water retention, and support for biodiversity. While it might be feasible to replace one of these services (e.g., nutrient supply with synthetic fertilizers), finding substitutes for all services at once is practically impossible (Baveye et al., 2026). Neoclassical models often assume that natural resources can be swapped with man-made or "built" capital, but this simplification overlooks the complexity and irreplaceability of natural systems (Döhring et al., 2023). Splitting natures interconnected services up into tradable units fails to capture the full value and uniqueness of soil ecosystems.

5.1.5. On externalities and recalibrating the compass of profits

Another criticism on markets is that in the core of their idea, they can solely pursue and measure private profits, neglecting positive and negative externalities and wider impacts (TEEB, 2018). It is therefore often argued that it cannot be relied upon markets to deliver efficient solutions that consider these externalities (ibid.) as market prices in the neoclassical framework generally fail to express them. An externality is defined as a positive or negative consequence of a transaction or an economic activity that is not reflected in the price, but has an effect on third parties (TEEB, 2018). Hence, to meet the demands of a green transition, the goal should be to internalize externalities. What if the purpose of monetizing ecosystem services as positive externalities was for them to be reflected in the market price?

Private actors often neglect social and environmental externalities due to a focus on short-term gains and a lack of standardized measurement. In his book In *The Spirit of Green*, Nobel laureate William Nordhaus (2021) emphasizes the need to recalibrate the "compass of profits." Profits, he argues, drive investments, economic growth, and decision-making, as firms rely on profit maximization to survive. Nordhaus's key point here is that "Profits are like a compass that points managers of a firm in a certain direction" (ibid., p. 184). Ideally, this mechanism ensures efficient resource allocation and maximizes value for consumers. However, Nordhaus points out that this only works if profits align with social value, which is rarely the case. Distorted pricing and incentives often misguide firms toward socially harmful activities. His solution is to recalibrate the profit compass so that prices reflect all societal costs and benefits (ibid.).

Now coming back to valuing the ecosystem services provided through nature and RA specifically, this is a central argument. Farmers operate within an economic landscape that is heavily distorted by negative but also positive externalities (TEEB, 2018), that are not yet reflected in the economic language of price. This oversight means that the broader social and environmental benefits of RA are undervalued, while harmful practices persist (KPMG, 2024). Therefore, it is the core aim of initiatives such as the TEEBAgriFood to "'correct the economic compass by presenting appropriate ways of recognizing, demonstrating, and then capturing the value of nature.” (TEEB, 2018, p. 7). This relates to the basic idea that decision-making incentives for economic actors need to accurately reflect and integrate all wider positive and negative outcomes. Using the terminology of this section, monetizing ecosystem services resulting from RA as to translate them into the economic language of price could, from a theoretical perspective, internalize the positive externalities of RA into the market price and, in the sense of Nordhaus, recalibrate the compass of profit for individual actors. It is intuitive to say that this could happen through monetization as this is still the common metric used in current economic accounting and decision-making frameworks.

Nevertheless, it can still be questioned whether in some cases, other forms of valuation are more suitable and better reflect the complexity of what is at stake. Moreover, the term "externalities" in itself can be criticized as it stems from neoclassical market and pricing concepts, which might render it inadequate for fully capturing the transformative shift required, as critiqued earlier in this chapter. According to Wieland (2020), the long-standing assumption of single-sided markets, rooted in ideas of Smith and neoclassical economics, is no longer applicable to key segments of the modern economy. Notably, this market paradigm tends to dismiss factors outside its narrow scope as externalities, showing little interest in whether these externalities contribute positively or negatively to value creation (ibid.). Nevertheless, especially in the short term, the idea of externalities remains a useful framework for emphasizing the importance of integrating nature’s value and the positive impacts of the transition to RA into mainstream economic language and, by extension, decision-making processes.

5.2. Measurement, valuation, monetization, and assessment

In this section, an overview will be given of the actual methods used for valuation to accommodate the formulation of ecosystem services in their value. Though frequently used synonymous with monetization, valuation can take different forms. Underlying any form of valuation is a first quantitative assessment and form of measurement. Valuation can then take forms of qualitative valuation or lastly monetization. This section will also introduce selected frameworks for assessment and ecosystem services accounting.

5.2.1. Biophysical measurement and quantification

The foundation and prerequisite for any form of valuation of ecosystem services resulting from regenerative agriculture is their measurement on a biophysical level and quantification. To go into details on on-farm biophysical measurement is not the focus of this thesis, however a short overview and examples of farm-level measurement and quantification shall be given here. Jayasinghe et al. (2023) have put together a comprehensive review of indicators, tools and frameworks, and advanced analytical methods for assessing impacts of RA. They mention biophysical indicators regarding the environmental impact such as a biodiversity index (ratio or percentage) for measuring biodiversity, GHG emissions in CO_2-equivalent, soil organic matter in percentage or weight or a score for water quality. They have also reviewed indicators to quantify the social impact, such as a score for farmer satisfaction, a measure for awareness and consciousness of environmental sustainability or input self-sufficiency, which is the number of external inputs per farm size (ibid.). Generally, measuring and assessing biodiversity due to the complexity revolving around the term has been subject of research with numerous approaches evolving. The Finance for Biodiversity Foundation (2024) has published a comprehensive overview of biodiversity measurement approaches, specifically targeting financial decision-makers. Other initiatives have analyzed and selected indicators for the assessment of sustainable agriculture in terms of economic, social well-being and governance dimensions (FAO, 2011; Reytar et al., 2014). More specifically for the measurement of the impacts of RA, the WBCSD and OP2B (2024) have co-developed a list of outcomes from regenerative agriculture together with suggested key metrics for their measurement, especially for biodiversity, soil health, climate, and water. These are summarized in Figure 5 to give an overview of suggested indicators and metrics on a biophysical level. Some indicators can be used for multiple outcomes as these are overlapping (e.g. for water and soil).

Such indicators and metrics can serve as input data for different monetization techniques and methods. In addition, a number of tools and technological innovations have emerged in the past years to facilitate measurement of biophysical outputs of RA. AI, big data analytics, machine learning, mapping and tracking technologies such as remote sensing are among the most promising technologies (Jayasinghe, 2023).

	Indicators	Possible metrics
Climate	Minimize GHG emissions	GHG emissions
	Increase above- and below-ground carbon sequestration	→ Total carbon sequestration → Soil carbon sequestration
Water	Improved environmental flows: blue water	Blue water withdrawal (m3/ha) – split by level of water stress risk
	Minimized water pollution: Nutrient loss	Nutrient use efficiency (%)
	Soil water services	Green water: Soil water holding capacity (%) [Additional water metric]
Increased soil health		Infiltration rate: mm/hr
	Soil organic carbon	MT CO2e total [Core climate metric]
		SOC/Area or tons of carbon/ha
		% organic carbon content
	Bulk density	Dry weight of soil in a given volume, g/cm3
	Availability of soil nutrients to plants	Amount (mg/kg) of plant available macro/ micronutrient in soil sample (N, P, K, SOM)
	Soil invertebrate diversity	Species richness and abundance of macroinvertebrates (incl. earthworms where relevant)
	Soil microbial diversity	Microbial biomass
		DNA-based metrics
	Soil erosion	Tons/ha
	Pesticide	Environmental Impact Quotient field-use ratings (EIQ score ecological
Biodiversity	Improved ecological integrity: Natural/restored habitat in agricultural landscapes	Natural/semi-natural habitat (NSH) in agricultural land (% per km2)
	Increased cultivated biodiversity: Crop diversity	Crop diversity per km2 (modification of the Hill-Shannon Diversity Index) Intermediate metrics: Crops grown, Spatial extent (ha), Number of months grown

Figure 5: *Key indicators and metrics for the measurement of regenerative agriculture outcomes. Own illustration, content based on WBCSD & OP2B (2024)*

5.2.2. Methods of monetization

Monetization so far has been extensively discussed regarding the question in how far it is adequate for the valuation of nature. What hasn't been discussed yet is what methods exist for monetization. This is not specific to soils but evolved out of a history of attempts to value intangible costs and benefits related to the environment. In the 1940s and 1950s, growing concern emerged that without assigning monetary values to natural areas, economic and financial decision-making would overlook conservation, leading to harmful environmental impacts (Baveye et al., 2016). This awareness drove the creation of various valuation methods to quantify the benefits of nature. Hotelling's (1949, cited after Baveye et al., 2016) exploration of travel costs to measure park value sparked interest in revealed preference methods, including hedonic pricing techniques introduced by Ridker and Henning (1967). Around the same time, Ciriacy-Wantrup (1947) proposed concepts that evolved into stated preference approaches like contingent valuation (Davis, 1963). These foundational ideas laid the groundwork for modern environmental valuation methods (Baveye et al., 2016).

The techniques for estimating ecosystem services from agricultural activity can largely be drawn from these already existing and well-established techniques of valuing environmental intangibles (TEEB, 2018). These methods can be classified into the three major categories market-based valuation, revealed preference and stated preference (Baveye et al., 2016; TEEB, 2018). Valuing goods and services, whether traded in markets or not, is fundamentally grounded in how much individuals are willing to pay for them. The goal of each method is thus to determine the willingness to pay from existing, surrogate, or hypothetical markets. The methods covered here build on this core idea (TEEB, 2018).

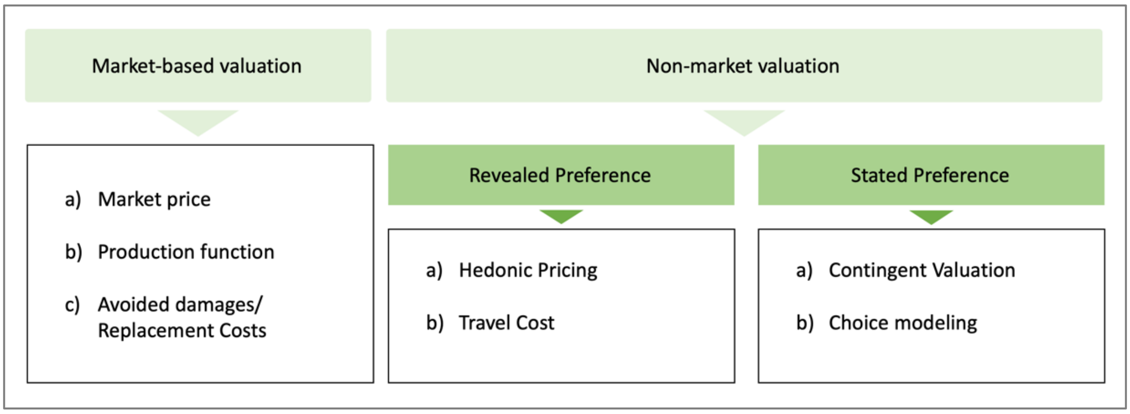

Figure 6: *Methods of monetization.*
Own illustration adapted from Baveye et al. (2016).

A starting point to valuing ecosystem services is direct market valuation, particularly through **market pricing**. The market-based category also includes factor income or production function methods and various cost-based approaches. When reliable market data is available, direct market valuation is the most used valuation approach, especially for provisioning services (De Groot et al., 2012). Valuing ecosystem services, however, requires assessing various inputs in agricultural production, many of which, like soil quality or pollination, lack market prices. The **production function** method addresses this by modeling the relationship between inputs and outputs. Farmers use combinations of resources, such as land, labor, and fertilizers, to produce goods, with some inputs substituting for others. Estimating a production function begins with selecting relevant inputs, such as labor, capital, but also environmental factors that impact farm output. Each input’s contribution to production is then quantified through econometric methods and as a result, a value for individual environmental input factors can be derived (TEEB, 2018).

Replacement cost or restoration cost techniques estimate the value of environmental quality by calculating the expenses associated with replacing or restoring ecosystem services through artificial technologies (ibid.). These methods are applicable only when replacement is feasible and cost-effective (ibid.), which is an issue as ecosystem services cannot easily be replaced by manufactured or other human produced goods or services (Döhring et al., 2023).

The averting expenditures method estimates what individuals, businesses, or governments pay to prevent negative outcomes from environmental degradation (TEEB, 2018). When exposed to reduced environmental quality, such as pollution or degraded natural resources, agents take actions to protect productivity or health. These protective measures are associated with direct monetary values from purchasing protective equipment, health prevention, or indirectly from time invested. These expenditures together provide an economic estimate of the value placed on avoiding the adverse effects of environmental decline. This method is sometimes also categorized as a revealed preference method (ibid.)

Direct market valuation using data from existing markets only applies to a limited range of ecosystem services (ibid.). When market data is unavailable or no market exists, non-market valuation methods such as revealed preference techniques can be used to assess ecosystem services. Revealed preference methods infer value based on people’s observed behavior in related markets (ibid.; Baveye et al., 2016). By examining actual and observable choices made by individuals and the prices paid, the value of marginal changes in various environmental attributes can be estimated (TEEB, 2018).

The **hedonic pricing** method assesses how much extra people are willing to pay for properties with desirable environmental features (ibid.). Rosen (1974) established this method showing that homogeneous goods such as houses, or land can be regressed on the different characteristics that implicitly contribute to its value. As such, the productivity of agricultural land depends on different variables and land prices reflect the value that consumers or producers assign to these characteristics and environmental attributes, such as the soil quality or biodiversity on this land (TEEB, 2018). This method then employs econometrics to measure the marginal value of a characteristic (ibid.). The econometric estimation results in the hedonic price function, which allows for the calculation of the implicit price associated with changes in significant attributes, including specific environmental or ecosystem service attributes (ibid.).

The **travel cost** method estimates the value individuals place on recreational sites by observing how much they spend to visit these places (ibid.). Data is gathered from a sample of tourists at the site through surveys (ibid.). A demand curve is then created, with the number of visits over a given time as the dependent variable and surveyed factors like distance, trip costs, availability of substitute sites, and socio-economic conditions as independent variables (ibid.). This demand curve allows for the estimation of the willingness to pay for the integrity of this place, assuming that individuals will choose to visit a site only if the marginal benefit of recreation is at least equal to the marginal cost (ibid.).

In contrast, stated preference methods directly ask people about their willingness to pay (WTP) or willingness to accept (WTA) compensation in hypothetical scenarios, making them useful for valuing ecosystem services that lack tangible markets (TEEB, 2018; Baveye et al., 2016). Stated preference methods simulate markets to determine how much people value certain benefits, such as habitat preservation or cultural services (TEEB, 2018). For instance, the **contingent valuation** method relies on stated preferences and is widely used for valuing non-marketed environmental resources. It involves directly collecting individual preferences through surveys that simulate hypothetical market scenarios (ibid.). Participants are presented with a description of the good, the current state of the environment, and potential changes resulting from different management options. In these surveys, respondents indicate their WTP to avoid adverse changes or their WTA for beneficial changes, using various methods and payment options such as taxes or user fees (ibid.). Finally, the demand for the environmental good is analyzed using econometric techniques (ibid.).

Choice experiments involve presenting respondents with a series of choice sets that feature various environmental attributes, including differences in quantity, quality, and associated costs. By analyzing the preferred options selected by respondents, individuals' changes of WTP or WTA for these attributes can be determined, allowing for the calculation of welfare changes based on trade-offs between different preferences (ibid.).

Though some may question the accuracy of preferences not revealed through actual transactions, research has shown that, when carefully applied, both revealed and stated preference methods provide reliable valuations that can complement or substitute for market-based data (ibid.).

5.2.3. Brief evaluation: Which ecosystem services resulting from RA could be monetized with which methods?

Different methods can be used to monetize the ecosystem services resulting from regenerative agriculture, depending on the type of service.

Cost-based methods such as avoided cost, restoration cost, and replacement cost are commonly applied to valuing regulating services like water regulation or erosion control (De Groot et al., 2012). For instance, the replacement cost method could potentially be used for assessing water regulation from RA, although it is controversial since every detail of water-related functions would have to be reflected in a technological equivalent, which is often not feasible. Revealed preference techniques, such as the travel cost method, are used for valuing cultural services, such as the recreational benefits of agricultural landscapes (ibid.). For RA, this could help estimate the value of improved local livelihoods, landscape beauty, and interaction with nature, by analyzing the costs and time people incur to visit regenerative fields. Stated preference methods can be useful here for local communities who don't need to travel, as they can reveal willingness to pay for these benefits.

For provisioning services, direct market-based valuation approaches are most common, especially for agricultural products like food, fiber, and other goods, where market prices already exist (TEEB, 2018). However, it's more challenging to monetize the additional benefits of RA, such as enhanced nutrient density in food. In this case, stated preference methods could be applied to examine consumer preferences directly. Similarly, market prices could be used to estimate the value of enhanced food security by comparing yields from resilient RA fields with those impacted by climate shocks.
The ecosystem service of soil carbon sequestration, a key benefit of RA, is easier to monetize due to existing markets for carbon credits. Since carbon is already commodified in this sense, its market price can be used to reflect the value of RA's climate change mitigation benefits, though variations in carbon prices exist, particularly within voluntary markets. As Keenor et al. (2021) point out, pricing soil carbon remains challenging as it requires a holistic valuation framework that accounts for the interconnected benefits of soil ecosystems, beyond what is reflected in current market mechanisms.
For other regulating services such as soil health, the production function approach could be used to estimate the economic value of ecosystem services like soil fertility, water retention, and pollination. This method links biophysical factors from RA to agricultural outputs, allowing for a valuation of their contribution to yield and reduced costs (e.g., less reliance on synthetic fertilizers). Finally, hedonic pricing models can be used to estimate the value of healthy soils, for instance the implicit price for soil (Miranowski & Hammes, 1984) or impacts of soil erosion (Gardner & Barrows, 1985; Ervin & Mill, 1985 cited after TEEB, 2018). It could also be used to estimate the value of resulting ecosystem services such as water regulation, biodiversity, or erosion control (Palmquist & Danielson, 1989) for the agricultural land, estimating a price tag for these services (TEEB, 2018).

To get an understanding of the monetary values of ecosystem services, a paper by De Groot et al., (2012) screened a wide range of publications on the monetary value of ten main biomes and stored approximately 1350 value estimations in a searchable Ecosystem Service Value Database (ESVD).

5.2.4. Valuation beyond monetization

Many articles have been dedicated to the valuation of ecosystem services, but only a share of these have attempted to put a price tag on soil services (Baveye et al., 2016). As already discussed, there is a debate whether monetization is necessary or even suitable to adequately reflect nature's value. Because of this uncertainty and doubts, many initiatives have instead devoted their work to finding alternative and multidimensional ways of valuing and assessing ecosystem services, that goes beyond just monetary metrics and explores other approaches (ibid.). For instance, the Capitals Coalition (2021) uses qualitative, quantitative, and financial methods, or sometimes a mix of these for natural capital valuation, to capture a fuller understanding of its value. In a review, Johnson et al. (2024) show for soil ecosystem services what monetization or valuation approaches were taken and that valuation can use both monetary or non-monetary methods or integrative approaches, accounting for a diversity of values. Pascual et al. (2017) argue for "value pluralism" (p., 9), a more integrated approach that aims at bridging different value dimensions. Even though monetization is still the dominant language of valuation, the call for value pluralism has been echoed by several scholars, grounded in ecological economics (Arias-Arévalo et al., 2018; Fanny et al., 2015). Valuing something involves assessing its worth or significance and encompasses more than just monetary value. Instead of asking whether to use money to value nature, the question should rather be when and how to do so (Costanza et al., 2017). Kallis et al. (2013) recommend four imperatives when making this choice, including to maintain plural value-articulating institutions and confronting commodification under neoliberalism.

5.2.5. Selected integrative tools and frameworks for assessment

There are several frameworks for integrative assessment and decision-making regarding RA. Assessment frameworks are not the focus of this paper, but a brief overview of frequently mentioned tools and central frameworks shall be given here. First, Jayasinghe et al. (2023) highlight several sustainability assessment methods for regenerative agriculture that adopt a holistic approach in terms of considering economic, environmental, and social factors, such as multiple-criteria decision analysis (MCDA). The potential of MCDA as a decision-making methodology that goes beyond monetary values and integrate a plurality of dimensions of values when evaluating alternative courses of action is also stressed by Baveye et al. (2016). One main reason is that this tool allows the participation of multiple stakeholders and while it can integrate costs and benefits, not all criteria have to be in monetary units (ibid.).

A key framework for an integrative assessment of eco-agri-food systems is the TEEBAgrifood (TEEB, 2018), emphasizing value plurality and the integration of diverse assessment approaches. It highlights the positive and negative externalities of farming and the often-overlooked reliance on natural capital. While primarily supporting economic analysis, TEEB stresses the importance of moving beyond monetary valuation to incorporate qualitative, physical, and non-monetary measures, recognizing that some dimensions cannot or should not be quantified in monetary terms. In some contexts, monetary valuation may be impractical or even ethically inappropriate. Therefore, TEEB advocates for a variety of assessment approaches to capture a fuller range of impacts. This pluralistic approach enables the integration and use of diverse techniques, such as MCDA, to account for the complex values associated with ecosystems and biodiversity (ibid.). By aligning with initiatives such as the Natural Capital Protocol, the WBCSD Guide to Corporate Ecosystem Valuation (Spurgeon et al., 2011), and the Global Reporting Initiative, TEEB advocates for inclusive frameworks that enhance the measurement and disclosure of environmental and social impacts (TEEB, 2018).

Another holistic framework to assess the impacts of RA is the Global Farm Metric (GFM), an initiative that is supported by over 130 organizations from farmers, environmental groups, food companies, financial services, and government agencies (GFM, n.d.). The aim of this initiative is to respond to the lack of a common framework for farm assessment that reflects the interconnectedness of the system and enables multiple stakeholders "to speak the same language" (GFM, 2023, p. 3). It is the goal to create a shared understanding of what must be monitored and measured to ultimately inform decision-making. This is done by providing 12 categories with sub-categories that should define a farm system by encompassing all aspects of farm sustainability. Associated indicators for each category enable the evaluation of farm sustainability in assessments, can be adjusted to different contexts and integrated in management tools (ibid,).

5.2.6. Natural capital and ecosystem accounting

This last subsection turns to natural capital and ecosystem accounting frameworks as standardized tools to integrate the economic contributions of ecosystem services into decision-making processes (TEEB, 2018). A prominent example is the System of Environmental-Economic Accounting Ecosystem Accounting (SEEA EA) of the United Nations. The SEEA EA offers a spatially explicit framework to systematically measure ecosystem assets and services, supporting policymakers in tracking critical functions like carbon storage, water regulation, and biodiversity preservation (UN, 2021). The framework is composed of five core accounts: ecosystem extent, ecosystem condition, ecosystem services flow (physical and monetary), and monetary ecosystem asset accounts (UN SEEA, n.d.-a). These accounts quantify the size, health, and economic value of ecosystems, revealing the roles they play. The SEEA EA adopts the accounting principles of the System of National Accounts (SNA) to enable the direct integration of ecosystem accounting and allow for comparison with national accounts data (UN, 2021). It facilitates assessments from local to national levels and addresses diverse ecosystems such as forests, marine environments, and agricultural soils. Not only does the SEEA EA inform national policy decision-making (UN, 2021), reflecting the development of the wealth of nations in terms of its natural capital (UN SEEA, n.d.-b), but also does it generally give information on which ecosystem services are generated where and who is benefiting (ibid.).
Monetary valuation, while not mandatory, is emphasized to enhance the comparability of ecosystem services with traditional economic metrics. However, the SEEA also integrates physical measures and acknowledges ethical concerns about monetization, such as the exclusion of non-use values or the limits of economic proxies in capturing ecosystems' holistic significance (UN, 2021). These features make it a pluralistic framework that balances the need for monetary assessment with broader ecological and social considerations.

“*More generally, monetary values will not fully reflect the importance of ecosystems for people and the economy. Assessing the importance of ecosystems will therefore require consideration of a wide range of information beyond data on the monetary value of ecosystems and their services.*” (UN, 2021, p.1)

The conceptual framework, the outlined physical accounts of ecosystem extent, condition and services, and the guidance on monetary accounts are considered internationally recognized principles and recommendations that are increasingly being adopted as a standard (Edens et al., 2022). UN SEEA EA has already been used by policymakers in countries like Indonesia, South Africa, and Uganda to inform decisions on carbon storage, water management, and biodiversity (UN SEEA, n.d.-a).

Complementing the SEEA, the Natural Capital Protocol supports businesses in identifying, measuring, and valuing their dependencies and impacts on natural capital (Capitals Coalition, 2021). It offers context-specific guidance, enabling businesses to select appropriate valuation methods and integrate natural capital considerations into decision-making processes. Its Food and Beverage Sector Supplement highlights the relevance of applications to agri-food systems (NCC, 2016). By applying standardized accounting principles, these frameworks encourage a systemic perspective on the value of natural capital and therefore represent an important step toward integrating the value of ecosystem services into economic decision-making. Nevertheless, Azad & Ancev (2020) note that literature so far has been limited on translating the SEEA framework to approach natural capital accounting at farm level.

5.3. Exploration of stakeholder payments for ecosystem services of regenerative agriculture

It has already been presented in section 3.4. that some of the barriers to adoption of regenerative agriculture could potentially be overcome through stakeholder collaboration, specifically payments from stakeholders based on the quantified and valued benefits from RA. The goal of this section is now to examine practical examples of such payments. The Sustainable Markets Initiative (SMI, 2023) summarizes the big five issues related to how farmers could be paid for adopting RA. These include that farmers’ income should be built from environmental outcomes, mechanisms should be created to share farmers' cost of transition, government policies should reward farmers for adoption and sourcing should share costs across value chains (ibid.). All of this has to be based on common metrics for environmental outcomes (ibid.), which was the focus of the previous section 5.2. This section will look at what such approaches of stakeholder payments and cost sharing could look like, in how far they already exist and what mechanisms or actors coordinate stakeholder collaboration and payments. Thus, the goal is now to leverage the ecosystem services concept to make the value of the benefits generated by regenerative agriculture compensable.

5.3.1. Payment for ecosystem services schemes

Payment for Ecosystem Services (PES) schemes have been in use for several years, facilitating payments from those who benefit from ecosystem services to those who provide them (Fripp, 2014). These market-based instruments finance nature conservation by translating ecosystem services into financial incentives for preservation and have gained global traction (IPBES, n.d.). PES transactions are typically voluntary, based on well-defined and secured provisions of ecosystem services, and can involve public, private, or hybrid models (Fripp, 2014). Public PES schemes are thus a means for governmental stakeholders to support the transition to regenerative agriculture by compensating farmers for the ecosystem services they provide. Given the societal benefits of these outcomes, governments have a vested interest in investing public funds to incentivize farmers and promote sustainable practices (SMI, 2023).

A prominent example of this is Costa Rica's National PES Program. As one of the longest-running PES schemes, this program pays landowners to conserve forests and restore degraded land. The PES is funded through taxes on fuel, water charges, and contributions from both public and private sectors (UNCC, 2020). Under this program, landowners sign contracts and receive payments for providing four key ecosystem services: carbon sequestration, biodiversity conservation, water regulation, and scenic beauty. It is managed by the National Forestry Financing Fund, provides special access for indigenous communities, and incentivizes women landowners, ensuring broad social and economic

benefits (ibid.). Another example is a scheme implemented in Portugal that remunerates landowners and managers to adopt measures to protect, enhance and restore ecosystem services in two pilot areas (European Commission, 2021). This remuneration model is funded by the Environmental Fund of the Portuguese Government and covers payments from costs for the implementation and maintenance of projects, but also for ecosystem services themselves (ibid.).
More specifically, watershed programs like the New York City Watershed Program demonstrate the application of PES for water services. To safeguard drinking water quality, New York City compensates landowners in Southeastern New York State for adopting sustainable land-use practices that prevent pollution and protect the city's water supply, ensuring access to clean, high-quality drinking water for residents (*New York City Water Supply*, n.d.). This illustrates how a stakeholder, such as the government, compensates landowners for delivering environmental outcomes that align with its priorities and hold significant value.

5.3.2. Cost-sharing programs

Stakeholder payments further already exist in pay-by-practice programs, where stakeholders make an agreement to cover a share of the costs of transitioning to regenerative agriculture or just of the implementation of certain practices that are associated with RA (Petry et al., 2023). Characteristic for this approach is that stakeholders pay for realizing RA practices, and not necessarily for the outcomes in terms of measured and priced ecosystem services. To share the costs and therefore the risk with other stakeholders who benefit from the transition, such as businesses in the value chain, the government, or investors, is an essential step for farmer support (SMI, 2023).

There are a few existing examples of this happening already, mostly realized through the stakeholder of businesses in the value chain. For instance, PepsiCo and Unilever partnered with Practical Farmers of Iowa to launch the Iowa Regenerative Agriculture Cover Crop Program in 2018 (McKoy, 2022). This cost-sharing initiative encourages Iowa farmers to adopt cover crops and other regenerative practices, such as reduced tillage and advanced nutrient management, by offering financial incentives and technical support. Farmers in

PepsiCo and Unilever's supply chains receive payments to help offset the cost of implementing cover crops, which improve soil health and reduce erosion. The program also includes educational support and training to increase adoption rates (ibid.). Another example is that in 2022, McDonald's Canada and McCain Foods launched a one million dollar Future of Potato Farming Fund to support Canadian potato farmers in adopting regenerative farming practices that improve soil health and resilience (McCain, 2022). This fund provides cost-sharing grants and educational resources to help farmers implement sustainable techniques such as cover cropping, reduced tillage, and crop rotation. The program aims to mitigate the impacts of climate change on crop yield and quality by enhancing soil health and farm resilience (ibid.).

5.3.3. The soil carbon market

The most prominent way in which the monetization of ecosystem services as a means for financing RA is already happening is through the market for soil carbon removals. From all ecosystem services, it is only the monetization of carbon outcomes that is more developed (WEF & Bain & Company, 2024). Therefore, it is often said that the most likely way to quickly realize the call for monetization of ecosystem services as financing stream for RA is through carbon in the near term (McMahon, 2024). Farmers can register their fields with commercial certificate providers to certify increases in soil organic carbon to compensate the costs associated with their new practices that facilitate increasing SOC levels (Paul et al., 2023). Schemes for MRV for soil carbon removals are developed by governments, non-profits, and start-ups worldwide (McMahon, 2024), concerned with governance challenges such as to guarantee permanence and avoid leakage (Paul et al., 2023). In Australia, landowners can even generate and sell soil carbon credits within the regulated compliance carbon market (McMahon, 2024). In other countries, where agriculture is still excluded from regulated markets, voluntary carbon markets enable the exchange of soil carbon credits, often via soil carbon trading platforms (ibid., Keenor et al., 2021). This exemplifies the development of governance structures by the private sector in the absence of a global policy framework for MRV standardization (Phelan et al., 2023).

Soil carbon removal credits can be traded for offsetting and insetting. While offsetting refers to emission compensation of companies through claiming carbon benefits of projects unrelated to their own value chain, insetting is when companies act within their own value chain (Brandt & Silber, 2022). Insetting refers to „interventions by a company in or along their value chain that are designed to generate GHG emissions reductions or carbon removals, and at the same time create positive impacts for communities, landscapes and ecosystems” (ibid., p. 5). Agribusinesses can therefore invest in RA projects within their own value chain to generate and claim carbon removals along with certain co-benefits, the role of which will be further discussed in the coming sections.

Specifically for RA, this is often facilitated by AgTech companies. An example of this is Klim, a German start-up that supports farmers in transitioning to RA practices. Klim also serves as an MRV provider, using its technology to quantify sequestered soil carbon. The company generates carbon credits, which are sold to businesses for offsetting emissions or to food and beverage companies, such as Nestlé and Kaufland, for insetting projects aimed at transforming their supply chains (Klim, n.d.-a). These businesses pay farmers for implementing RA practices and delivering measurable environmental outcomes, with one carbon certificate from Klim currently priced at €50 (Klim, n.d.-b). AgTech companies like Klim act as intermediaries, connecting farmers with corporate stakeholders, creating markets for environmental outcomes, and coordinating payments (WEF & Bain & Company, 2024).

5.3.4. Nature credit markets

Markets for ecosystem services beyond carbon sequestration are less developed but are gaining attention. These emerging markets enable sellers, such as farmers, to receive compensation for delivering ecosystem services, with buyers obtaining certified credits in return (SMI, 2023). This concept mirrors carbon markets but applies more broadly to services like biodiversity conservation, improved nutrient density, or enhanced farmland resilience. However, many of these benefits, especially farmland resilience, remain rarely monetized (WEF & Bain & Company, 2024). Biodiversity credits, in particular, face challenges due to the complexity of measurement and the lack of clear drivers of demand compared to carbon markets (McMahon, 2024). Despite these challenges, biodiversity credits are often highlighted as a promising new type of environmental payment that could gain significant value in the future (ibid.).

The American company General Mills has co-founded the Ecosystem Services Market Consortium (ESMC), which aims to promote market-based incentive mechanisms for farmers in the United States to implement sustainable practices. ESMC has set up a protocol that associates monetary values with the environmental outcomes of increasing soil carbon and reducing GHG emissions, increasing water quality, and improving water use conservation. Acknowledging that practices associated with RA can deliver multiple additional benefits, ESMC is not solely focused on carbon, but aims to engage in multiple markets, (ESMC, n.d.). Another frequently mentioned example is the soil and water outcomes fund, that monetizes multiple environmental outcomes besides carbon sequestration, such as water quality (WEF & Bain & Company, 2024). For instance, the fund paid farmers $31 on average for the reduction in nutrient run-off per acre, achieved through RA practices (McMahon, 2024). The fund offers financial support and upfront initial payments for farmers and provides varied buyers, mainly value chain companies such as PepsiCo, with the environmental outcomes (WEF & Bain & Company, 2024). This fund acts as a mechanism that creates a market for ecosystem services on the one hand and aggregates and matches demand with supply on the other, connecting farmers with companies and government agencies (ibid.).

While there are a number of schemes emerging for selling measured outcomes, it is still far from a coordinated and unified market, but rather a range of different approaches (SMI, 2023). The perceived complexity is increased by the number of stakeholders involved, while a lack of transparency fosters confusion among landowners and stakeholders alike, undermining trust and ultimately reducing engagement (Cotton & Witt, 2024). As there is currently no unified environmental policy framework, governance initiatives have emerged from the private sector and civil society organizations (Phelan et al., 2023). A number of recent initiatives and taskforces have focused on creating more unified and coordinated markets with strong underlying principles and quality criteria. The Initiative of Nature Finance has established the Taskforce on Nature Markets, with nature credit markets as a core focus (Zadek et al., 2023a). Nature Finance has also published a report on the current state of and recommendations for the development of biodiversity credits specifically (Zadek et al., 2023b). Moreover, the Biodiversity Credit Alliance (BCA) has been formed as a voluntary alliance supported by organizations such as the UN Environment Programme. BCA aims to encourage the private sector to invest in biodiversity by providing “guidance for the formulation of a credible and scalable biodiversity credit market” (BCA, 2024, p. 2). The alliance is working on strong foundations and science-based principles for all actors entering the market, functioning as market governance (ibid.). The World Economic Forum has also published a guidance on Nature Finance and Biodiversity Credits, further putting it on the agenda of private businesses (WEF & McKinsey, 2024). In October 2024, the WEF and BCA have co-published a first working paper on high-level principles for guidance in biodiversity markets (BCA et al., 2024). The focus here is on verified positive outcomes for nature, equity and fairness for people, and good governance for high integrity markets (ibid.).

Nature credit markets are rapidly developed and will play a crucial role in the next years. Meanwhile, instead of focusing on creating tradable credits for each individual ecosystem service, more pragmatic approaches have suggested simply to add price premiums for carbon credits that also include co-benefits such as biodiversity enhancement or water quality (WEF & Bain & Company, 2024). In Europe, carbon credits from projects that also deliver positive biodiversity impacts often command a premium in the market (McMahon, 2024). In the general narrative on voluntary carbon markets, high-quality credits are those that also include co-benefits, meaning impacting other ecosystem services besides carbon sequestration (WEF & Bain & Company, 2023). As such, carbon removal credits from RA have a higher value, as they also lead to an array of other benefits, which is reflected in their price. As the WEF report (WEF & Bain & Company, 2024) summarizes: “In the short term, expanding existing carbon credits to include specific co- benefits may most easily capture the value from complex environmental outcomes such as water and biodiversity, adding a premium to the credits generated from a given farm" (p. 30).

5.3.5. Brief summary and stakeholder overview

It has been shown that there are already many existing schemes and approaches for stakeholder payments for ecosystem services. For the stakeholders of RA, several possibilities have been presented.

Private companies and agribusinesses within the value chain can contribute through cost sharing programs, paying directly for the adoption of RA. They can also purchase nature credits, currently mainly carbon credits, from RA projects or directly engage in insetting within their own value chain. Credits from RA projects can attract price premiums for co-benefits, which reflect other ecosystem services from RA. Government and policymaking stakeholders can establish PES schemes, setting up governmental funds that compensate farmers and landowners for environmental outcomes from RA implementation. Furthermore, a supportive policy environment should be created, for instance through tax incentives that place value on ecosystem services (WEF & Bain & Company, 2024). There are also several paths for financial actors that have not been discussed yet. For instance, lending products could be created that offer specialized terms for financing farmers who adopt agreed-upon regenerative practices (Petry et al., 2023). Financial actors can also contribute to coordination and governance through establishing platforms for nature credit markets. Rabobank, according to WEF and Bain & Company (2024), is working with MRV providers as well as environmental outcome buyers such as agri-food companies to coordinate these transactions. Public and private (international) organizations most likely play a larger role in facilitating collaboration and establishing governance mechanisms, such as the BCA setting up guiding principles for emerging markets.

Lastly, the consumer as a stakeholder has not been mentioned yet. It is sometimes suggested that additional payments could be realized for more nutritious products (Havemann et al., 2022). This would eventually be levied on the consumer, who would pay higher prices. Consequently, consumers could pay for benefits resulting from RA through paying a price premium for regeneratively sourced products, similar to the organic market. However, it is highly questionable whether this is realistic in the near term, as consumer awareness and visibility of regenerative brands might still be low.

In general, mostly carbon sequestration, water quality and regulation, and biodiversity are covered in existing schemes. Enhanced food security linked to increased climate resilience is not directly mentioned, but is probably a key reason for agribusinesses to engage in insetting with RA projects. The benefit of enhanced nutritional value is also not yet translated into a price or paid for in any form. Improvements in local livelihoods are also not paid for, however many schemes mention engagement with, and education of local communities. It can thus be concluded so far that the valuation of ecosystem services from RA predominantly emphasizes environmental outcomes, particularly regulating ecosystem services, while social outcomes, such as cultural ecosystem services, receive comparatively less attention.

6. Case study: Followfood and The Landbanking Group

This thesis has so far established the concept of ecosystem services to explore the necessity and benefits of transitioning towards regenerative agriculture, identified the key stakeholders in this transition, and examined frameworks for valuing ecosystem services and facilitating stakeholder contributions. To illustrate the practical application of these concepts, the following case study focuses on the role of a specific stakeholder: a food business operating within an agricultural value chain. As discussed in Section 5.3, private companies have shown particular interest in advancing RA in existing initiatives. This case study highlights this stakeholder group by examining Followfood, a company actively promoting RA through innovative projects and partnerships, including its collaboration with The Landbanking Group (TLG).

6.1. Summary of underlying theses

First, a summary of the central theses established so far in this thesis will be given based on the previous sections of this paper. These are the starting point for the explorations of this case study, which is meant to exemplify some of the points already made.

(1) The concept of natural capital and ecosystem services as a construct can contribute to environmental conservation through translating nature into a term that can be integrated into the economic sphere. Natural capital is viewed as a stock generating flows, or ecosystem services, which provide benefits to humans, making both concepts inherently anthropocentric.
(2) Regenerative agriculture is an approach to farming, that is predominantly defined based on its outcomes. This is because different practices can lead to the same outcomes and need to be adapted to different contexts.
(3) The benefits commonly attributed to regenerative agriculture include its role in improving farmer livelihoods and economic profitability, as well as delivering significant environmental advantages, such as carbon sequestration, water conservation, and enhanced resilience through improved soil health and biodiversity. Additionally, RA contributes to food security, increases nutrient density, and supports local communities. These benefits are often referred to as ecosystem services generated by RA.
(4) Farmers face technical, social, and economic barriers to adopting RA. Additional financing streams are needed, and one approach is that farmers could be compensated by different stakeholders for the ecosystem services they realize through transitioning to regenerative agriculture.
(5) Various stakeholders have a vested interest in the ecosystem services provided. Food and agricultural businesses, in particular, rely on and benefit from these services. For them, promoting regenerative agriculture addresses societal demands for sustainability and decarbonization while ensuring long-term supply chain resilience amid climate shocks affecting yields.
(6) A key prerequisite for stakeholder contributions to advancing RA is the ability to measure outcomes reliably. Measurable outcomes form the foundation for valuation, enabling their integration into economic assessments and decision-making processes. Valuation is based on farm-level biophysical measurements, with various indicators available to evaluate specific outcomes of RA. Innovations like remote sensing technologies have further

enhanced the precision and feasibility of these measurements. There are certain methods to assign monetary value to the ecosystem services generated by RA. These approaches estimate the worth of environmental outcomes to stakeholders, using data from existing, surrogate, or hypothetical markets.

(7) The monetization of ecosystem services sparks debate over assigning economic value to nature within a neoclassical market framework. Critics argue that prices cannot capture nature's complexity, while proponents see monetary metrics as essential for making its value visible to decision-makers. Ultimately, valuation should be context-specific, integrating monetary, qualitative, and other metrics through holistic frameworks.

(8) One approach to integrate resulting ecosystem services in economic decision-making is natural capital or ecosystem services accounting, where environmental stocks and flows are measured and documented in accounts, as exemplified by the UN SEEA for the public sector.

(9) Several approaches already exist for different stakeholders to contribute financially to the transition towards RA. Specifically for food and agricultural businesses, this includes programs or funds to finance the implementation of certain practices. Other approaches focus on the environmental outcomes generated and compensate farmers based on these. A prominent example is the soil carbon market, with other nature credit markets emerging.

(10) Other stakeholders included in this thesis so far occupy a less prominent role in financing the transition towards regenerative agriculture compared to food and agricultural businesses within the value chain.

6.2. Methodology

The case study method was chosen because the objective is not to validate the central claims of this paper through a broad, generalized sample, but rather to explore these themes in depth within the context of a specific, illustrative example. This case study adopts a qualitative methodology, beginning with an overview of the organizations based on information from their official websites, outlining the company's initiatives and exemplifying key partnerships with regard to RA. This will be followed by insights from three expert interviews that delve deeper into motives, trends, and innovations shaping their engagement and The Landbanking Group’s approach.

6.2.1. Expert interviews

This case study employs a semi-structured, guideline-based expert interview method, chosen for its flexibility in eliciting valuable information that may extend beyond predefined questions. This approach allows for in-depth exploration of expert insights while maintaining a structured framework to address the key themes of the study. Particular attention is paid to neutral and open questions that give the expert plenty of scope to contribute their own thoughts and know-how (Diekmann, 2007). The interviews are designed to complement insights from the literature and provide context to the case study of Followfood. The aim of the results of the qualitative interviews is not to claim generalizability, but rather to present a practical example that underlines the relevance of the topic in practice and provides anecdotal evidence of central arguments.

Findings from the interviews will be systematically analyzed, translated and paraphrased, and presented in section 6.5.

6.2.2. Interview partner selection

Three interview partners were chosen for this case study to provide diverse perspectives on Followfood's regenerative agriculture efforts. Each interview partner represents a key actor relevant to this context, including insights from the partnering farm Gut&Bösel and the project with The Landbanking Group The interviewees have consented to being mentioned by name in this thesis.

The first interview partner is Julius Palm, deputy CEO and head of marketing and strategy at Followfood. He has been selected because of his pivotal role in the strategic development of the company and his long-standing advocacy for regenerative agriculture through partnerships and initiatives. Palm provides valuable insights into Followfood’s engagement and future strategic plans. In addition to his role at Followfood, he serves on the board of the Federal Association for Sustainable Economy in Germany.

The second interview partner is Max Küsters, representing Gut&Bösel, a regenerative farm that partnered with Followfood early on. With a background in

business and economics, he is head of data and science at Gut&Bösel, where he oversees ecological and economic data collection and coordinates research projects with universities and institutions. His expertise in measuring ecosystem services resulting from the farm's regenerative practices makes him an ideal contributor to this case study.
The third interview partner is Tobias Bandel, co-founder, and head of biome at The Landbanking Group, where he is responsible for business development. As Followfood's key contact at TLG, he offers expertise in explaining TLG's concept of Nature Equity and how companies or stakeholders can invest in RA based on measured ecosystem service outcomes.

6.2.3. Development of semi-structured interview guidelines

In preparation for the interviews, semi-structured guidelines were created to outline key themes to be addressed. Since each interview partner represents a distinct organization and perspective, three tailored guidelines were developed. These guides generally covered the following core themes:

(1) Understanding of regenerative agriculture, its benefits, adoption barriers, and resulting ecosystem services
(2) Followfood's engagement with RA through partnerships with Gut&Bösel and The Landbanking Group and resulting benefits
(3) Exact form of stakeholder engagement in promoting RA, including the transaction between stakeholders and farmers
(4) Measurement, valuation, and monetization of ecosystem services resulting from RA
(5) Natural capital and its significance as a financial asset
(6) Engagement of other stakeholders
(7) Future outlook, market development, challenges and gaps

The guidelines, included in Appendix 1, were shared with the interview partners a day before the interviews to provide an overview of the topics to be discussed. However, the participants noted that they spent little or no time preparing, resulting in spontaneous answers and organically evolving conversations. All interviews were conducted in German to ensure a natural flow, as all participants were native speakers. The interviews were recorded, and transcripts were created with only minor edits to enhance clarity and readability, included in Appendix 2. Key findings have been translated into English for analysis. Table 1 summarizes the interview partners and assigns codes for citations.

Table 1: *Interview partners of the case study.*

Code / Appendix for citations	Name	Organization	Role	Interview Date and time	Interview Duration
A	Julius Palm	Followfood	Deputy CEO, Head of Strategy & Brand	14.11.2024, 10:30	35 min
B	Max Küsters	Gut & Bösel	Head of Data & Science	12.11.2024, 15:00	45 min
C	Tobias Bandel	The Landbanking Group	Co-founder, Business Development	15.11.2024, 9:00	42 min

6.3. Background information on Followfood and The Landbanking Group

This section provides relevant background information on Followfood, its engagement with regenerative agriculture, the Gut&Bösel farm, and The Landbanking Group to contextualize the interview findings.

6.3.1. Followfood and its engagement for regenerative agriculture

Followfood is a German company founded in 2007 by Jürg Knoll and Harri Butsch, who recognized the need for a shift away from industrial food production toward sustainable, transparent practices (Followfood, n.d.-a). Starting with Followfish to promote sustainable fishing, it quickly became a leading frozen fish brand. Building on this success, they launched Followfood, expanding their mission to include soil conservation (ibid.). They have particularly promoted regenerative agriculture, developing products in partnerships with different farms implementing RA (Followfood, n.d.-b). To source potatoes for their products, they have collaborated with a farm in the Black Forest on a project aimed at restoring soil health through improved soil coverage (ibid.). Followfood has also launched coffee from regenerative agriculture using agroforestry in Mexico (ibid.)

Followfood's "Bodenretter Initiative" (Soil Saver Initiative) exemplifies how agribusinesses can engage in promoting regenerative agriculture. Through the initiative, Followfood contributes 1% of the retail price from each agricultural product sold to a dedicated "Bodenretter Fund" (Followfood, n.d.-c). This fund provides financial support to farmers committed to RA, aiming to rebuild soil health and reduce dependence on harmful practices like monocultures, synthetic fertilizers, and pesticides. The goal is to promote an enhanced version of organic agriculture focused on ecosystem services such as climate regulation through soil carbon, water purification, regulation, and storage, biodiversity enhancement, and protection against climate and weather shocks (ibid.). By helping farmers to adopt regenerative practices, Followfood's initiative seeks to ensure sustainable, healthy food production while preserving soil as a vital resource for future generations.

A flagship project is Followfood's partnership with the farm Gut&Bösel, bringing regeneratively farmed flour to the market. Gut&Bösel is a 3,000-hectare regenerative organic farm and forestry operation in Brandenburg in Germany (Gut&Bösel, n.d.). The farm is widely recognized as a "lighthouse" project for regenerative agriculture in Germany. It employs innovative methods of multifunctional agriculture to build resilient and healthy ecosystems. Key practices include holistic grazing management, advanced composting techniques, syntropic agroforestry, forest conversion, and the development of new technologies and software (ibid.). By integrating these approaches, the farm aims to enhance soil carbon sequestration, biodiversity, water infiltration and storage capacity, and other critical ecosystem services (ibid.). To better understand and analyze the economic and ecological impacts of multifunctional agriculture, Gut&Bösel founded the Finck Foundation (ibid.). Collaborating with universities and research institutions, the foundation collects data on these impacts and makes it available to other farmers to promote broader adoption of regenerative practices by sharing insights with the wider agricultural community.

6.3.2. The Landbanking Group and Nature Equity

Followfood is further collaborating with the Landbanking Group (TLG) to track the impact of regenerative practices across its supplier network and provide financial support for these transitions (TLG, n.d.-a). TLG's innovative concept, Nature Equity, introduces a new asset class that integrates nature into corporate accounting. It focuses on non-extractive natural capital, valuing ecosystems for their inherent contributions to sustainability rather than their extractable resources (TLG, 2024). Nature Equity, as a legal and accounting construct, represents the net regenerative asset after deducting extractive liabilities (ibid.). Through TLG's Natural Capital platform, businesses and landowners can measure and invest in nature-positive outcomes (TLG, n.d.-b). Landowners can use TLG's Landler tool to assess natural capital on their land, enhancing property value and enabling compensation for practices that improve ecosystem services. For businesses like Followfood, this creates a mechanism to invest in regenerative farming practices that protect supply chains and provide reliable data to guide decision-making. The platform uses geospatial and ground data to track biophysical metrics like carbon, water, and biodiversity over time (ibid.). TLG's infrastructure facilitates outcome-based financing by buyers (e.g., agribusinesses) to purchase rights to Nature Equity Assets – legal agreements tied to measurable improvements in natural capital (TLG, 2024). This approach incentivizes regenerative practices, connecting farmers and other stakeholders through a coordinating entity. Followfood's use of these tools exemplifies how such partnerships can enable ecosystem service valuation and lead to outcome-based payments for the benefits derived from regenerative agriculture.

6.4. Key findings

This section will present the relevant findings from the expert interviews, sorted in different sub-sections according to the central themes.

6.4.1. Regenerative agriculture and its ecosystem services

The interviews generally supported an outcome-based definition of regenerative agriculture. Julius Palm and Max Küsters (A, B) emphasized the core idea of leaving land and ecosystems better than they were, with Palm describing RA as a productive use of ecosystems aimed at enhancing biodiversity, soil fertility, and humus formation (A). Küsters highlighted the centrality of soil health, calling it the foundation of life (B). He further outlined key principles of RA, including minimal soil disturbance, year-round soil cover, living roots, crop diversity, and livestock integration (B). Both Max Küsters and Tobias Bandel (B, C) stressed that RA should be defined by principles and outcomes rather than specific practices, as agricultural measures must be tailored to the ecological, social, and economic context of each farm. Bandel identified this context-specificity as the most critical aspect of defining regenerative land use (C). Küsters echoed this, noting that RA encompasses multiple approaches and doesn’t require a singular rigid definition (B). However, Palm viewed the lack of a clear definition as problematic, particularly in the context of competition. He expressed concern that large companies might adopt only superficial regenerative practices to use the term "regenerative" as a marketing tool (A). Both Palm and Küsters argued that truly regenerative farming should, at a minimum, adhere to organic principles (A, B).

The interviews highlight several key ecosystem services resulting from regenerative agriculture, with soil health as the foundation. Küsters emphasized that the starting point is always the state of the soil and its biological health (B). A primary ecosystem service associated with soil is carbon sequestration, which was mentioned by all interview partners. This is also a significant reason why stakeholders engage with regenerative practices (A, C). Küsters further explained that the focus is not only on increasing soil carbon storage but also on preventing further depletion that could release stored carbon back into the atmosphere (B). In addition to soil health and carbon sequestration, biodiversity was universally recognized as a critical service of RA. Palm described biodiversity as the most important indicator of ecosystem health, as it naturally supports other ecosystem services (A). Küsters elaborated that biodiversity spans both above and below the soil, including soil microbiology and the diversity of plants and crops. This biological diversity contributes significantly to farm resilience, a recurring theme throughout the interviews. Resilience is closely linked to the soil's water-holding capacity, which Küsters noted as one of the most valuable ecosystem services. Humus can retain up to five times its weight in water, making soil regeneration crucial for improving water storage and regulation (B). This not only helps prevent flooding but also improves drought resilience by storing water longer (C). Other ecosystem services mentioned by Küsters include air and water purification, resulting in cleaner freshwater (B). Additionally, when asked about the impact on the local community, Küsters highlighted the aesthetic and cultural benefits of regenerative agriculture, such as beauty of landscape and scenery (B).

The interview with Max Küsters also gave further insights into the perspective of farmers and landowners on RA. The goal of RA here is to enhance farmers' independence and resilience in their core operations (B). This is achieved by introducing diversified revenue streams and reduced reliance on external inputs. Additional streams from crop diversification, timber from agroforestry systems, or integrated livestock provide a safety net when primary crops underperform, ensuring greater financial stability (B). Reduced reliance on external inputs like fertilizers, diesel, and herbicides, shields farmers from price shocks and fosters self-sufficiency (B). However, transitioning to RA comes with significant challenges. Küsters emphasized that adopting RA increases complexity, particularly in work processes. Modern farming has prioritized efficiency and simplicity to maximize yields. In contrast, RA requires a more complex approach, such as integrating cover crops, under sowing, and rotational grazing. These practices demand new skills, investments, and often larger teams, which can be discouraging for farmers accustomed to conventional systems (B). Financial insecurity poses another major barrier. Transitioning to RA often involves upfront costs and uncertain returns. To address this, the Finck Foundation seeks to provide practical data and guidance on implementing regenerative practices, offering farmers a clearer path, and reducing the risks of the transition (B).

6.4.2. Followfood's initiatives and interest in promoting regenerative agriculture

The expert interviews underscored the value of regenerative agriculture for companies like Followfood, which Julius Palm describes in terms of two key themes: social responsibility and business relevance.

From a social responsibility standpoint, Palm emphasizes that Followfood, as a company, has a duty to contribute to solutions for pressing global challenges, such as climate change and biodiversity loss. Regenerative agriculture, in his view, provides a meaningful way to address these critical issues (A).

On the business side, several factors highlight the importance of RA. Most prominent among these is supply chain resilience, which Palm and Bandel emphasize as a crucial aspect (A, C). As supply chains grow ever more complex and only resilient agricultural systems can secure long term food security, investing in RA is nothing less than a form of risk management (A). Bandel highlights that this is not a philanthropic gesture, but a strategic decision to safeguard operational capacity (C). Without these investments, companies face significant risks, such as yield losses, rising raw material costs, and disruptions to supply chains (A, C). Thus, financing RA is a strategic investment in long-term resilience (C), ensuring operational stability and preventing competitive disadvantages in an evolving market (A). Furthermore, RA serves as an important tool for marketing and positioning, especially in the well-established organic sector. Palm points out that "regenerative" is becoming a unique selling proposition, which allows Followfood to differentiate itself from competitors (A). Beyond marketing, RA enables companies to improve their life-cycle assessments and better comply with reporting requirements, making it a valuable tool for both business growth and regulatory compliance (A, C). This is especially relevant considering increasing regulatory pressures, such as the Corporate Sustainability Reporting Directive (CSRD) (A, C).

Followfood's commitment to promoting RA is evident through its financial support and strategic partnerships. Since 2019, the company has allocated 1% of its revenue from selected products to the "Bodenretter" fund, financing farmers' investments in regenerative practices (A). This fund has supported various initiatives, such as purchasing seeds for agroforestry trees, and implementing keyline designs (A). Küsters underscores the significance of this financial support, noting that the fund allowed their farm to acquire the resources necessary for transitioning to regenerative agriculture, including trees, livestock, and equipment (B). Without Followfood's assistance, Gut&Bösel would not have been able to make these investments and implement regenerative farming (B).
Followfood's engagement in RA also extends to product development in partnership with farms transitioning to regenerative practices. Palm outlines two main approaches within this initiative. First, they test individual regenerative measures with farms, such as the project with a farm in the Black Forest to implement mulching techniques for potato cultivation, which are then used in Followfood's potato products (A). These projects serve as pilot programs for testing specific regenerative practices and supporting farms in their transition (A).

Second, Followfood also works with model farms, like Gut&Bösel, to design comprehensive farm systems that integrate regenerative practices across the entire operation. This collaboration led to the creation of Followfood's first regenerative product: organic flour sourced from Gut&Bösel (A, B). These partnerships primarily involve farms that were not previously part of Followfood's supply network (A), demonstrating a commitment to building new value chains and pursuing long-term, shared goals with transitioning farmers (B).

So far, Followfood has supported regenerative practices through these partnerships, but payments have not been tied to specific measurable outcomes in terms of ecosystem services (A). Palm explains that this is mainly due to the lack of structured, cost-effective measurement methods. Traditional soil sampling techniques, for example, were too expensive to scale and didn't provide the necessary data for linking payments to ecosystem service outcomes (A). However, Followfood plans to address this issue through its new partnership with The Landbanking Group, which will enable them to link payments directly to measurable ecosystem services (A).

6.4.3. The Landbanking Group and Followfood: concept, approach, and project goals

Followfood's project with The Landbanking Group (TLG) is still in its early stages, currently collecting data (A). The ultimate goal is to onboard all farmers within Followfood's supply chain to monitor and assess the impacts of regenerative agriculture on their operations (A). According to Tobias Bandel, Followfood has been an instrumental sparring partner for TLG from the beginning, helping to shape and refine their approach (C).

One of TLG's major innovations lies in its cost-effective measurement methods. The company has developed a new approach to monitor ecosystem health that relies on remote sensing satellite data (A). This method enables tracking environmental changes over time by measuring key parameters without requiring intensive on-the-ground data collection. The only data needed from farmers is their GPS and polygon information, which they are already required to possess to qualify for EU agricultural subsidies (C). This minimizes the burden on farmers by eliminating the need for additional data input (C). Another key advantage of the remote sensing method is that it can provide more accurate and comprehensive measurements across entire land areas, whereas common approaches of testing soil samples are merely precise for the one specific spot they were taken (A). Furthermore, remote sensing allows TLG to leverage historical data, tracing back as far as 2016 or 2017 (C). It can thus track changes over time and continuously monitor how land and natural capital are evolving (C). TLG's Landler tool enables the monitoring of three broad categories of ecosystem services: carbon, biodiversity, and water (A, C). For carbon, the amount of carbon stored in the soil and plant biomass is measured, providing real-time data on carbon sequestration efforts. This also eliminates the need for permanence guarantees typically required in carbon credit purchases, as TLG continuously monitors carbon levels in real time rather than relying on estimates derived from risk-adjusted assumptions (C). For biodiversity, the percentage of land designated as biodiversity areas is tracked. Water-related metrics focus on the water holding capacity of the soil and soil moisture levels, crucial factors in assessing how well regenerative practices are improving the farm's resilience to droughts and floods (C).

In its transactions with landowners or farmers, Followfood would essentially acquire the rights to utilize measurement data related to natural capital, including metrics on carbon sequestration, biodiversity, and water retention (C). This contract is linked to the continuous measurement of what happens on the ground (C). Currently, the transaction is primarily a direct agreement between buyers and individual landowners, facilitated through contract templates provided by TLG, who offer both the platform and the expertise necessary to structure these agreements and properly define the assets involved (C). Palm highlights that, in the long term, Followfood aims to move away from managing direct transactions with individual farmers, but to invest in ecosystem services directly through TLG's platform, with TLG handling the distribution of funds to farmers based on the agreed-upon contract terms (A). Although TLG does not yet act as a broker, there are instances where they have purchased ecosystem services from landowners and resold them to other parties (C). Payments could be made upfront or over time, depending on the agreement between the purchaser and landowners (C). However, upfront payments involve certain risks related to the potential underperformance of the ecosystem services (C). Compared to compensation-based models such as carbon credits or emerging nature-based credits, which offset damage by financing benefits elsewhere, TLG's approach focuses on actively building natural capital as a direct investment (C). Besides, remote sensing technology and real-time tracking allow for the adjustment of payments based on actual outcomes (C).

Followfood has three main strategic goals for its project with The Landbanking Group (TLG), which can be categorized into communication and reporting, incentive structure, and long-term competitive advantage.

A key goal is to improve communication and transparency in reporting. Instead of merely claiming investments in biodiversity enhancement, Followfood can now back this up with concrete data and a measurable value (A). This data is easier, faster, and more cost-effective to obtain, making it highly tangible and transparent. For marketing purposes, Followfood can highlight success stories within its supply chain where investments have visibly led to significant improvements in natural capital (A). Additionally, the data can be integrated into life cycle assessments and regulatory reporting frameworks such as CSRD, which will become increasingly important as these reporting requirements become mandatory (A). Another strategic goal is to create a long-term incentive for suppliers within Followfood's supply chain. By providing evidence-based results, the platform can demonstrate how specific actions will lead to desired outcomes (A). Finally, the long-term goal is to position Followfood's investments in RA as an asset. Over time, as the economic system evolves, these investments will no longer be viewed solely as expenses, but treated as depreciable assets (A, C). This is particularly relevant in relation to natural capital as a financial asset, which could positively impact Followfood's credit ratings (A, C) and provide additional financial benefits, as will be discussed in subsequent sections.

6.4.4. Valuation and monetization

According to Küsters (B), the exact methodology for monetization is less critical than ensuring that the approach is credible and well-founded in terms of calculating price values. Concerns of monetization should not focus on the methodology itself, but on realizing tangible payment flows for farmers (B). Bandel (C) explained that TLG does not directly set prices but instead provides recommendations and guidance. Price determination, according to accounting standards, must take place between buyers and sellers, as the valuation of intangible assets requires negotiated agreements that result in context-specific pricing. TLG recommends preventive-cost approaches, as acquisition costs can easily be taken for orientation (C). Bandel explains that the value is ultimately based on a calculation of resilience. This involves assessing the risks of inaction, such as operational failures or the need for expensive spot-market purchases, and then using these risks to substantiate monetary valuation (C). Küsters (B) noted that at Gut&Bösel they find it very difficult to translate ecological value directly into economic terms and precise euro amounts in their research projects. From his perspective, there is no perfect method to bridge the gap between measurement and valuation. The closest existing approximation is the price on CO_2, although questions about the accuracy of such valuations persist (B).

A key aspect was the ethical question regarding the monetization of nature. Palm (A) highlighted significant ethical concerns within the discourse on sustainability regarding assigning monetary value to nature. He described this as a controversial practice, often criticized as highly problematic, given that placing nature within a market context historically rather contributed to environmental degradation (A). Bandel echoed this concern. Despite these criticisms, all three experts recognized the necessity and utility of monetization under the current system. Küsters sees monetization as very important as it is vital for creating financial incentives for adopting ecologically positive practices (B). Palm emphasized that such approaches could encourage investments in positive actions through clear incentive structures (A). Bandel explained that the goal is to demonstrate that efforts to build resilient supply chains through RA can also enhance asset values and therefore create an incentive to do so (C). Ultimately, it is about speaking the language of the dominating current system.

> *„Finde ich das wichtig? Also ich finde es falsch. Also wer sind wir, um Natur ein Preisschild umzuhängen? Gleichzeitig geben wir ihr heute auch schon einen Preis, nämlich Null.*“ (Tobias Bandel (C), Appendix 2.3)

There already implicitly is a price of zero for nature (C). Thus, explicitly attaching monetary value to nature can only accelerate transformation by framing conservation as a business-relevant activity rather than mere philanthropy (C). While the ultimate aim may be to protect nature without having to assign a price, the current system requires adaptation to its existing structures and language (C). Palm added that working within this system involves embracing its language, acknowledging that nature can only be protected in this framework by translating its value into monetary terms (A).

6.4.5. Natural capital, Nature Equity, and a new asset class

One innovative aspect of The Landbanking Group's concept is their pioneering approach to conceptualizing and operationalizing natural capital as an asset class. According to Bandel, investing in natural capital should be seen as an investment in critical infrastructure, similar to preventive maintenance (C). TLG has collaborated with auditors to ensure that their methodologies for measuring and accounting for natural capital can be recognized as legitimate investments in business sustainability and operational capacity (C). Essentially, the asset is not the land itself but rather the right to access measurable results linked to the land's ecological performance (C). This usage right, tied to continuous measurement of natural capital, forms the basis of a tradable intangible asset. By tracking the "stocks" of natural capital over time and documenting changes, companies can treat these improvements as tangible investments (C). From an accounting perspective, investments in regenerative practices could be recorded as investments in operational resilience rather than as costs (C). The resilience here forms the justification for the value of natural capital as an asset (C).

Palm highlighted the tangible benefits of this approach for Followfood. By integrating natural capital into their accounting, the company can document and present investments in soil fertility as concrete, measurable contributions to their business (A). This shift not only enhances the company's profitability by reducing costs over the long term, but also underscores the core relevance of Followfood's business model as more than just altruism (A). Moreover, the recognition of natural capital as an intangible asset could substantially enhance Followfood's enterprise value, affecting its ability to secure loans or negotiate better credit terms, if banks recognize these values in the long-term (A, C). Over time, investments in soil fertility and ecosystem services could directly translate into higher perceived business value (A). He described this vision as both an inspiring idea for now and a critical future pathway to achieving sustainable profitability (A).

The Landbanking Group aims to take natural capital valuation one step further by creating a marketplace for Nature Equity, an upgrade to existing compensation markets (A). This would allow individuals and organizations to invest directly in ecological metrics such as soil fertility, biodiversity, or water retention capacity. Investors could monitor how their investments in natural capital perform over time. Similar to an ETF dashboard (C), the platform provides a portfolio view where investments are not shares in companies, but usage rights tied to the measurable outcomes of natural capital stocks. The goal is to establish a system where investments in RA are not only accounted for as assets but also traded and valued like traditional financial instruments (C). This could fundamentally transform the way natural capital is integrated into economic decision-making.

6.4.6. Integration of other stakeholder groups and stakeholder partnerships

A few other stakeholder groups have been mentioned in different contexts within the interviews. Consumers are only indirectly involved in supporting regenerative agriculture. According to Palm, financing regenerative practices is not a topic that involves the end consumers, only as an audience to showcase the company as an innovator and a responsible system-shaper. While the responsibility aspect is important to consumers, most are unaware of what "regenerative" entails (A).

Followfood's brief communication on product labels merely serves as a loyalty marker rather than an in-depth explanation (A). Küsters also mentions the lack of consumer awareness regarding the environmental impact of their purchasing decisions (B). Palm notes that the costs of RA are absorbed entirely by Followfood's margins, not by raising consumer prices, as the products are already in the premium price segment (A).
On the political stage, there are increasing discussions at both the European and national levels about RA, yet the concrete development of frameworks, such as unified definitions or standards, is often deferred to private enterprises (A). Gut&Bösel, as Küsters mentions, collaborates with Germany's Federal Ministry of Food and Agriculture. The Landbanking Group actively participates in policy discussions at various levels, including the EU (C). TLG's efforts with political actors encompass land-use projects in critical regions such as Africa. Their approach aligns with the political goal to create an outcome-based system to tie EU subsidies and access to financial instruments to tangible results in land stewardship (C).
The financial sector is rather an enabler in this context. Bandel emphasizes that a primary focus of TLG's is to engage with banks, insurers, and rating agencies as key multipliers to integrate natural capital metrics into their systems (C). Despite its importance, the financial sector is still in the early stages of understanding natural capital and related asset classes (C). Progress is underway, with some early adopters incorporating these concepts into fund structures and sustainability-linked financial instruments.
Other stakeholder groups mentioned are research institutes such as the Julius Kühn Institute (B) or even beyond value chain companies that want to use their sustainability budgets to invest in natural capital via the Landler platform.

The Landbanking Group provides a mechanism for advancing RA in so far as they provide a platform that connects diverse stakeholders, including banks, farmers, producers, and researchers. By integrating with partners, including competitors, and working with a Science Board to align expertise, the group fosters collaboration while avoiding redundant efforts (C). Their focus is on practical implementation, and they emphasize private-sector engagement while maintaining dialogue with policymakers. This enables TLG to bridge gaps and drive tangible outcomes for regenerative agriculture (C).

6.4.7. Future outlook

The future of stakeholder investments in regenerative agriculture appears promising as ecological pressures and resource scarcity increase (B, C). So far, payments to Gut&Bösel have mainly been based on financing the implementation of certain practices, rather than based on measured outcomes (B). However, in the future, they might potentially create carbon certificates and start selling ecosystem services based on outcomes (B). Demand is expected to grow as stakeholders recognize regenerative land use as a critical tool for addressing global challenges (B). However, a shift away from traditional compensation models toward forward-looking investments for resilience is essential (C).
The legal and accounting frameworks (such as German HGB standards) already allow for natural capital to be recognized as an intangible asset, provided investments are tied to measurable outcomes on specific land and structured with clear contractual ownership (C, A). This creates a strong foundation for scaling investments. To realize The Landbanking Group's vision, practical steps include rolling out a marketplace platform, executing pilot projects to establish best practices, and foster a general recognition of these concepts among stakeholder groups (A). These efforts are crucial to transitioning regenerative agriculture from concept to widespread implementation. This will also require developing expertise and know-how regarding the implementation of RA practices (B).

7. Discussion

The overall goal of this thesis has been to examine the extent to which the valuation of regenerative agriculture based on its ecosystem services can advance its transition through engagement of stakeholders benefiting from RA outcomes. To address this, the concepts of natural capital and ecosystem services were introduced, the benefits of RA were identified and categorized as ecosystem services, and a stakeholder model was developed to map these benefits to relevant stakeholders and their interests. Furthermore, the valuation of ecosystem services—and the broader question of nature's value to humans—was discussed, followed by an exploration of valuation and monetization methods. The central inquiry focused on identifying mechanisms to involve diverse stakeholders in the transition to RA. The case study with Followfood, The Landbanking Group, and Gut&Bösel provided practical insights to contextualize the theoretical arguments presented in this thesis. Most importantly, it served as a concrete example of what a stakeholder contribution to promoting RA could look like. As anecdotal evidence from a specific stakeholder's perspective, it offered a tangible illustration of how theory can be applied in practice. The key findings from the expert interviews will now be discussed and integrated into the broader theoretical framework of this thesis.

A central concept underpinning this thesis is natural capital and how this term can be understood. Natural capital has often been viewed as a stock of resources that can be depleted, treating it primarily as a material input for production. However, there is a paradigm shift towards recognizing natural capital not merely as a physical stock, but as something that holds value in its capability to generate flows—ecosystem services—that benefit humans in ways beyond the mere provision of goods and materials. In this sense, it can be viewed as an asset that generates dividends rather than a resource to be consumed. Natural capital is then not something to be extracted and used, but to be conserved and restored in order to ensure long-term resilience and the continuation of life-supporting systems. This shift is mirrored in The Landbanking Group's vision of natural capital and Nature Equity. The view of natural capital as something that creates benefits if it is invested in and preserved, rather than used as a production input, is fundamentally rooted in the interview partners' understanding of investments in RA. The interviews reinforced this emphasis on resilience and the imperative to safeguard nature's integrity for the long term. This thesis has further argued that the frameworks of natural capital and ecosystem services serve as essential constructs for quantifying and accounting for nature's contributions, making humanity's dependence on these services visible. The argument of creating a shared language that bridges the domains of economy and ecology has been a recurring theme throughout the theoretical discussion and expert interviews alike.

It has also been a defining argument in the ethical debate surrounding the valuation and monetization of nature, a central theme throughout this thesis. The formulation of the ecosystem services concept as such has frequently been criticized as it has often been directly associated with the commodification of nature under a neoclassical understanding of markets and the economy. This critique was reflected in the expert interviews, where concerns were raised about the morality of assigning monetary values to nature’s services, particularly given the historical failure of markets to achieve conservation goals. However, the interviews also underscored a key conclusion from the theoretical discourse: the necessity of aligning with the language of the prevailing economic system. In a world where monetary metrics dominate the recognition of value, nature conservation must translate its worth into financial terms to be effective. This pragmatic approach acknowledges that valuation—whether explicit or implicit—is intrinsic to human decision-making. Without explicit valuation, nature is implicitly assigned a value of zero, as highlighted in the interviews, or even a cost associated with inaction. Interestingly, while academic literature advocates for holistic frameworks of value pluralism that integrate diverse valuation metrics, this perspective did not emerge as a priority in the interviews. Instead, there was a clear emphasis on adopting the economic language of price as a pragmatic tool to drive near-term change. Similarly, the specific methods of monetization discussed in the theoretical sections of this thesis were less relevant in practice. As a basis for valuation, biophysical indicators were measured employing innovative remote sensing technologies. Yet, the translation of these indicators into a price is not grounded in standardized economic models but rather in negotiations between buyers and sellers. The focus, instead, lies on establishing tangible payment streams for farmers, justified through practical assumptions rather than rigorous adherence to valuation methodologies. Concluding from both the theoretical arguments and the case study, monetization plays a critical role in explicitly valuing nature to catalyze its preservation and restoration.

A promising pathway to restore and preserve natural landscapes, and the central focus of this thesis, is regenerative agriculture. All interview partners have supported an outcome-based approach to defining regenerative agriculture focusing on key principles that can be adapted context-specifically, as argued in the literature. The ecosystem services identified as central to RA in this thesis were supported in the interviews, with soil health and biodiversity consistently underscored as core benefits, alongside carbon sequestration and water management. Notably, resilience was a recurring theme and emerged as one of the most significant advantages of RA. It was framed as the foundational argument for why investing in RA holds value, particularly for businesses. Interestingly, social benefits of RA, or cultural services, played a less significant role in the interviews, except for the aspect of improving farmer livelihoods.

In general, the interest of various stakeholders in RA has been echoed in the interviews. While other stakeholder groups undoubtedly benefit from RA outcomes, agribusinesses face unique pressures tied to the continuity of their operations, which is why a particular focus was placed on this group in the case study. Key themes for private businesses supported in the case study with Followfood include supply chain resilience, societal responsibility, and leveraging RA in external communication, marketing, and reporting efforts. The challenges farmers face in adopting RA practices—particularly the uncertainty and financial risks associated with the transition—were also mentioned in the interviews. In the literature-based part of this thesis, this has resulted in the argument that stakeholder contributions are essential to overcoming farmers' barriers by compensating them for the ecosystem services they provide to a range of beneficiaries. This was exemplified in the interviews through the partnership between Followfood and Gut&Bösel, where Followfood’s financial support played a pivotal role in enabling the farm’s adoption of regenerative practices. For Followfood, the value proposition of engaging with RA was evidently sufficiently compelling to motivate their investment and commitment.

Several existing schemes for stakeholder contributions to promoting and financing RA have been discussed in the literature-based part of this thesis and can be supplemented by insights from the case study. Primarily, Followfood has already implemented initiatives that finance the adoption of specific regenerative practices in farmer partnerships, as outlined in the section on cost-sharing programs. However, these payments are not yet based on concrete outcomes generated by RA, which will be the focus of Followfood's collaboration with The Landbanking Group. Through the Landler platform, outcome-based payments for ecosystem services such as carbon, water, and biodiversity can be realized, forming the foundation for greater resilience. This shift from practice-based to outcome-based partnerships emerged as a key theme in the interviews, with the ultimate goal being to make payments for ecosystem services more effective in accelerating the transition. In the literature-based section, carbon credits were highlighted as the most common already existing mechanism of outcome-based payments for RA. While carbon credits were also mentioned in the interviews, concerns were raised about the underlying logic of compensation. Instead of compensating for environmental damage by financing projects elsewhere, The Landbanking Group advocates a more profound shift in how nature conservation efforts are perceived. Rather than creating the next compensation market, widening from carbon to nature credits, TLG aims to foster actively building natural capital for the value it has for humans, away from traditional compensation models toward forward-looking investments for resilience. This also underlines the fundamental understanding of natural capital as outlined above.

It is also the prerequisite for establishing a new asset class based on natural capital, an innovative approach proposed by TLG. This is a crucial step to move away from nature investments as philanthropical efforts, to integrate them into established accounting frameworks, aligning with economic principles. Anchoring this concept within the broader context of business value creation is essential to validate its economic viability and to fully incorporate natural capital into economic decision-making. In that sense, expenses for investing in RA within the supply chain would not be accounted for within profit and loss, but as investments in the long-term existence of the core operation, in the company's operational capability and social legitimacy. According to the interviews, this approach of integrating natural capital as an intangible asset on the balance sheet is already legally possible according to German HGB standards. It is therefore merely a question of widespread acceptance to fully put this concept into practice.

While businesses in the agricultural value chain play a pivotal role in driving the transition to RA through financial contributions, the roles of other stakeholders within the proposed framework were also explored. Interestingly, the idea that consumers might indirectly support RA outcomes through price premiums was not supported in the interviews. This is attributed to the limited consumer awareness and understanding of regenerative products and their implications. Moreover, such products are currently confined to the premium market, raising affordability and equity concerns similar to those faced by organic products. Other actors potentially making direct payments for the adoption of RA could be government or policymaking actors, for instance through payment for ecosystem services schemes or supporting tax environments. Practical evidence for direct monetary support apart from private companies could not be derived from the case study, due to its limited scope in terms of interviewed stakeholder groups.

Although other stakeholder groups may not directly contribute financial resources to RA, they can provide critical (non-monetary) support to facilitate the transition. Insights from the expert interviews highlight the financial sector as a crucial enabler, with the potential to act as a multiplier by integrating natural capital metrics into financial systems and setting new standards that promote widespread adoption. Drawing from both the literature and emerging developments in nature credit markets, international organizations are also key players, acting as agenda setters and developing governance mechanisms to support RA. This aligns with Ostrom's (2003) assertion that addressing the tragedy of the commons requires robust governance structures. In the absence of a unified policy framework, private-sector initiatives and civil society organizations are stepping in to fill the gap (Phelan et al., 2023). The interviews have underscored this emphasis on private-sector engagement, while maintaining dialogue with policymakers and public sector organizations.

The Landbanking Group and its platform could further be considered to fulfil the criteria of a cooperation facilitating mechanism as outlined in section 4.3, as they are capable of accurately projecting economic costs and benefits of RA through their innovative technology and use expertise to develop a new market with certain rules for these outcomes, pooling demand and supply. Given the criticism of the neoclassical framework and the commodification of nature, a key question remains whether markets are the appropriate structures for governing ecosystem services. Nevertheless, The Landbanking Group's approach is a promising initiative to develop a new kind of market that operates under certain rules, addressing many of these concerns.

Referring to the ecosystem services and stakeholder matrix (see Figure 4), the interests of various stakeholders in these individual services were reflected in the interviews. However, considering that private companies are likely to be the primary financiers of the RA transition, certain ecosystem services—and consequently, a portion of the total value generated by RA—may remain uncompensated if they are not aligned with the core interests of these companies. The main focus will continue to be on biodiversity, carbon, water, soil health, and resilience. Social aspects such as nutrient density, food security, or local livelihoods are unlikely to be directly paid for, as they are not the primary concerns of agribusinesses. However, in many multi-stakeholder partnerships, education and dialogue with local communities have been key agenda items. Ultimately, the goal is not to establish payment streams for every intersection of the ecosystem services and stakeholder matrix, but to foster partnerships that promote the regenerative transition through bundled ecosystem services and targeted stakeholder collaborations.

Returning to the central research question of this thesis, an effort can now be made to address to what extent the valuation of ecosystem services resulting from regenerative agriculture, based on a stakeholder model, can contribute to its promotion. The valuation of RA in terms of its ecosystem services undeniably supports the transition toward RA. By explicitly recognizing and assigning value to the benefits of RA, stakeholders who derive advantages from these outcomes are more likely to integrate them into their decision-making processes. In this way, valuation makes these benefits visible, particularly if translated into economic language through monetization. After all, understanding and quantifying the outcomes are prerequisites for meaningful engagement and investment. Thus, valuation plays a pivotal role in facilitating the regenerative transition. However, it is important to recognize that valuing ecosystem services, particularly within a market framework, presents both methodological challenges and ethical concerns. The inherent complexity and interconnectedness of ecosystem services mean that fully capturing their value in monetary terms is likely unfeasible. Despite these limitations, efforts must continue, with the ultimate aim to place value on nature.

8. Insights from relational economics: Shared value creation and cooperation rent

To contextualize the findings at a more abstract level, the here presented concept of stakeholder collaboration for the regenerative transition will be placed within the framework of relational economics (Wieland, 2020), particularly focusing on shared value creation and cooperation rent. This can be approached from two perspectives: one focusing on the company as a nexus of stakeholder interests and resources, and the other emphasizing the broader network as a whole.

This thesis has explored the valuation of natural capital and ecosystem services, focusing on what holds value, how this is valued, and how stakeholders allocate resources for these values. Building on the case study focusing on a company, these questions of valuation must be situated within a framework of corporate value creation to achieve economic plausibility and move beyond gestures of goodwill or philanthropic aspirations (Wieland, 2024). Such considerations are not merely technical issues of measurement, valuation, or accounting methods but are fundamentally tied to the nature of the firm itself and its societal legitimacy (ibid.).

Companies play a vital role in fostering cooperation among diverse actors, contributing not only to economic value creation but also to the societal legitimacy for their existence (Wieland, 2020). As articulated in Josef Wieland's relational theory of the firm, the company operates as a nexus of stakeholders, resources, and interests within a shared value creation process (Wieland, 2024). Here, exchanges are not isolated, transactional events but are embedded within the firm's broader network of interdependent relationships and resources (ibid.). In this context, the firm becomes a "multi-stakeholder agent for the productive, value-creating proportioning of available and invested resources" (Wieland, 2020, p. 4). When considering a company's investment in regenerative agriculture within its supply chain, such efforts should not be confined to the domains of impact or business ethics (Wieland, 2024). Instead, they represent essential investments in the company's legitimacy and, ultimately, the continuity of its existence. This legitimacy—its societal license to operate—is linked to the process of shared value creation (Wieland, 2024). Shared value creation (SVC) is a broader governance approach that integrates stakeholder resources and interests into the company's value creation activities (ibid.), to ensure continued legitimacy. Shared value addresses "the relationship between the private and social value creation functions" (ibid., p. 115), going beyond peripheral aspects such as impact or ethical behavior but concerning the core of the business model. This involves rethinking and transforming practices that are no longer perceived as contributing positively to society, while actively incorporating those elements that align with societal priorities (ibid.). In essence, it challenges firms to constantly rethink their entire business model to balance private and social value, ensuring they remain accepted institutions within society. In this context, companies are themselves stakeholders in society and "part of a social discourse on 'valuing what counts' and 'the future we want'" (ibid., p. 117).

In this sense, the firm as a focal organization and other stakeholders presented in this thesis contribute resources to realize the transition towards regenerative agriculture, which then results in the creation of value that goes beyond economic outcomes but realizes wider benefits for the firm and society alike. From this perspective, the generation of ecosystem services through RA, creating positive outcomes for all stakeholders, could be understood as nothing else than shared value creation. In the process of SVC, tangible or intangible rent is realized as a result of cooperation. SVC is thus the generation and distribution of cooperation rent, based on the resources devoted by different stakeholders (ibid.).

From the perspective of the firm, this is an investment in the continuation of its existence, creating economic and social value. In accounting terms, this is often referred to as a going concern, a continuing independent form of organization

(Wieland, 2024). Investments in regenerative agriculture within the supply chain could further be understood as relational costs, as they are costs the organization must pay to safeguard its continuing existence and to engage in interactions with stakeholders and their resources (Wieland, 2020). In other words, "they are the costs incurred by generating and maintaining the willingness and ability to cooperate" (Wieland, 2020, p.149).

The willingness and ability to cooperate represents an essential relational asset, particularly when the focus is now not on the perspective of the individual firm but the broader context of the network. In chapter 4, the term regio-global value network has already been introduced, as used by Wieland and Hellpap (2024), referring to multisectoral networks of various stakeholders of the private and public sector and civil society. Transactions within such networks, such as in this thesis the transition towards regenerative agriculture, become relational transactions within a specific atmosphere of cooperation (ibid.). To go into detail on the economics of atmospheres is beyond the scope of this chapter. It is merely important to understand that the regenerative transition could in this sense be viewed as a relational event that is produced by a network of stakeholders and consequently is dependent on the effectiveness of the relational assets available (ibid.). Such relational assets, crucial for creating an atmosphere of willingness and ability to cooperate, can be the willingness and ability to build long-term relationships of trust based on mutual benefit, or devoting assets that are highly specific to the network and the transaction (ibid.).

In this context, again, the costs incurred for this cooperation are referred to as relational costs, resulting in relational rent as a form of income (ibid.). It becomes evident that the resources devoted are not merely financial or technological, but essentially resources aimed at fostering this atmosphere of cooperation. In other words, this is the willingness and ability to cooperate in order to generate shared value (ibid.). In the context of this thesis, this has become evident when leaving the focus point of the company as focal stakeholder and considering the wider stakeholder map. Here, not all stakeholders will contribute to the regenerative transition by devoting financial means, but in general through maintaining their ability and willingness to cooperate and foster a corresponding atmosphere. Even if they are not realizing direct payment streams to support RA, all actors have to develop the capabilities to effectively engage in stakeholder partnerships (WEF & Bain & Company, 2024). In other words, stakeholders must develop the relational abilities to create material and immaterial value in cooperation (Wieland & Hellpap, 2024). As discussed in this thesis, this capability for cooperation is more important than linear relationships facilitating production and trade of material economic goods and services (ibid.) and is crucial for shared value creation. Effective stakeholder cooperation for promoting regenerative agriculture is characterized my multi-stakeholder partnerships and agreements, that are fundamentally based on trust, on the understanding that RA will ultimately create benefits for all sides, and on specific resources devoted context-specifically, as exemplified in the case study by Followfood's partnerships.

Relying on a cooperative atmosphere becomes essential when markets and formal organizations fall short in governing relational transactions—an idea that aligns closely with many arguments advanced in this thesis (ibid.). In such contexts, the creation of joint conventions, shared languages, and unified value concepts becomes imperative (ibid.). The absence of economic or social standards is frequently addressed through strategic alliances, innovation platforms, or multi-stakeholder forums (Wieland, 2020). Ultimately, these partnerships serve as a foundation for establishing the shared standards critical to driving the regenerative transition.

The company's investment in regenerative agriculture represents an investment in the continuity of its operation and its continued societal legitimacy to operate, engaging with a nexus of stakeholders and their interests. The stakeholders of the regenerative transition as a network have to devote resources to maintain and build relational capabilities, in order to position themselves as receptive for cooperation. Only through this cooperation can regenerative agriculture effectively be promoted, and shared value created in the form of resulting benefits for all stakeholders. Each stakeholder can then, according to their individual interest regarding the transition, derive tangible or intangible cooperation rent.

9. Limitations and further research

This thesis has several limitations, particularly in its approach and methodology regarding the case study. First, the sample size of three interview participants is quite small, offering only a narrow range of insights on the subject. This limited scope stems from the intent to provide solely an illustrative example based on the perspectives of these three experts. However, it is important to acknowledge that conclusions drawn from such a small sample are not generalizable. To further support the findings and validate the claims made, future research should include larger sample sizes. Specifically, additional interviews could have been conducted with other employees within the three organizations studied, such as the Head of Impact and Sustainability at Followfood, to enrich the understanding of the case. Furthermore, the case study focuses on only three organizations, representing a very limited set of stakeholders. It does not include perspectives from other relevant stakeholders, such as policymakers or financial institutions, who could provide valuable insights into the broader context of RA. Another limitation relates to the specific farm involved, Gut&Bösel. While they certainly are an operating farm that economically depends on farm revenue streams, they are also a lighthouse project for regenerative farming and a research institution for the cause. This dual role makes it an atypical example of a farming operation. To gain a more representative understanding of farmers' perspectives, future studies should include smaller farms and landowners who consider transitioning to regenerative farming. In general, frameworks for practical recommendations for multi-stakeholder partnerships in the regenerative transition could be developed by gathering and analyzing additional best-practice examples from existing models and collaborations, extending beyond the single case study presented in this thesis. Key findings from the interviews also highlight other areas for further research. One promising avenue is the integration of natural capital as an intangible asset in accounting frameworks. Future studies could investigate the barriers preventing widespread adoption of this approach by companies, including organizational, regulatory, and practical challenges.

From a theoretical standpoint, further research could explore the empirical application of the relational economics framework to the agriculture and food sector—an idea only briefly addressed in this thesis's final chapter. This could also lead to efforts of aligning the idea of accounting for natural capital, as exemplified by The Landbanking Group, with the development of new accounting frameworks for shared value creation. Moreover, it could inform studies on adequate governance of stakeholder cooperation for ecosystem services in the nexus of agriculture and food system stakeholders. This could then also investigate the specific financial or non-financial resources each stakeholder devotes and validate which and how cooperation rent is received and distributed.

10. Conclusion

The central question of this thesis was to determine to what extent the valuation of ecosystem services resulting from regenerative agriculture can drive its transition through payments or contributions from stakeholders. Based on a comprehensive theoretical analysis and insights from a case study, it has become clear that many stakeholders have a vested interest in advancing the regenerative transition and particularly companies within agricultural value chains have the potential to contribute by allocating financial resources. Other stakeholders might also support the transition with direct payments, or by facilitating partnerships and shaping agendas. If benefits are valued and put into practical contributions, this can effectively help to overcome the barriers and challenges farmers are facing. Conceptualizing the benefits of RA as ecosystem services provides a framework to make outcomes tangible for economic decision-makers, enabling the development of outcome-based payment mechanisms. Valuation plays a crucial role in this process, though it must be approached with sensitivity to ethical concerns. A vital argument here remains that monetization can be understood as the translation of into the economic language of price and is thus essential to promote the transition under the current economic system. While not all ecosystem services may be directly or individually monetized, they are often supported as co-benefits alongside key services like carbon sequestration, soil health, and water management, which already attract direct payments. These environmental benefits have been more frequently emphasized than the social benefits, a trend also evident in the case study.

Serving as a practical example, the case study illustrates how a company invests in the implementation of RA and fosters meaningful partnerships with farmers, underscoring the tangible value RA outcomes hold for the business. The case study has revealed a particular approach to realize outcome-based payments for farmers, which is based on a new understanding of natural capital as a financial asset class that can be integrated as such into corporate accounting frameworks. Here, the value of investing in regenerative supply chains is fundamentally rooted in long term resilience and the safeguarding of operational capability. Investing in the continuity of operation and societal legitimacy as well as creating an atmosphere of cooperation for transforming agricultural systems can be further informed by the relational economics framework. In this sense, the cooperation of stakeholders for promoting the regenerative transition could be understood as a process of shared value creation, leading to tangible and intangible cooperation rent for stakeholders.

The ultimate goal remains to enhance decision-makers' understanding of the diverse and interconnected benefits that regenerative agriculture offers—benefits that are worth to be valued.

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