Sociocultural Barriers and Enablers to Paludiculture Adoption

A Case Study from the Gnarrenburger Moor, Germany

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Abstract

In Germany, 71% of drained peatlands are used for agriculture, primarily grassland, a land-use change that has turned these ecosystems from carbon sinks into major carbon sources. Paludiculture, the productive use of wet and rewetted peatlands, offers a potential to substantially reduce these emissions while maintaining an economically viable alternative for farmers. Yet how farmers themselves perceive this transition has rarely been studied, and adoption of paludiculture among farmers remains low. This thesis explores sociocultural values and meanings farmers attach to the peat landscapes and how these shape barriers and enablers to rewetting for paludiculture. Drawing on the Nature's Contributions to People (NCP) framework, semi-structured interviews were conducted with farmers in the Gnarrenburger Moor, Germany. Findings show that cultural perceptions of 'valuable' land, still favouring the dry, actively managed grassland, together with place attachment and aesthetic ties to this landscape act as barriers. While older farmers remain more sceptical, shaped by the historical hardship of drainage, younger farmers show greater willingness to change if their livelihood is secured, policies provide planning certainty, and their voices are heard in the process. Continuous land management emerged as a key source of meaning for what is perceived as landscape care – one that paludiculture could build on, offering an entry point for its adoption and acting as a possible future for farming in the Gnarrenburger Moor. Scaling paludiculture, therefore, requires turning its economic potential into functioning value chains, alongside policies that offer a clear and locally adapted pathway. Ultimately, this transition will only succeed if it takes farmers' sociocultural values, meanings, and everyday realities into account.

Keywords: Paludiculture, Peatlands, Rewetting, Sociocultural values, Nature's Contributions to People, Farmer's perceptions

Zusammenfassung (Deutsch)

In Deutschland werden 71% der der entwässerten Moore landwirtschaftlich genutzt, überwiegend als Grünland und sind bedeutende Treibhausgasquellen. Paludikultur bietet das Potenzial diese Emissionen drastisch zu reduzieren, durch die Nutzung nasser und wiedervernässter Moore und bietet zugleich eine wirtschaftlich tragfähige Alternative für Landwirt:innen. Wie Landwirt:innen diesen Landnutzungswandel selbst wahrnehmen, wurde bislang kaum untersucht, und die Akzeptanz von Paludikultur bleibt bisher gering. Diese Arbeit untersucht, welche soziokulturellen Werte und Bedeutungen Landwirt:innen mit Moorlandschaften verbinden und wie diese als Barrieren und Enabler für die Wiedervernässung zur Umsetzung von Paludikultur wirken. Auf Basis des Nature's Contributions to People (NCP) Frameworks wurden semi-strukturierte Interviews mit Landwirt:innen im Gnarrenburger Moor durchgeführt. Die Ergebnisse zeigen, dass trockenes, aktiv bewirtschaftetes Land weiterhin als „wertvolles" Land betrachtet wird, was Skepsis gegenüber Wiedervernässung begünstigt. Zudem zeigt sich, dass Landwirt:innen eine starke Verbindung zu der landwirtschaftlich geprägten Landschaft haben und diese als ästhetisch empfinden. Ältere Landwirt:innen, die durch die historischen Mühen der Entwässerung geprägt sind, sind grundsätzlich skeptischer, während jüngere Landwirt:innen teilweise eine größere Veränderungsbereitschaft zeigen, sofern ihre Existenzgrundlage gesichert ist, die Politik Planungssicherheit bietet und ihre Stimme im Prozess gehört wird. Eine kontinuierliche Landbewirtschaftung erwies sich als zentralen Faktor, um die Landschaft bewohnbar zu erhalten. Die Skalierung von Paludikultur erfordert daher zum einen, ihr wirtschaftliches Potenzial in funktionierende Wertschöpfungsketten zu überführen, und zum anderen eine Politik, die einen klaren und lokal angepassten Weg aufzeigt. Darüber hinaus ist es notwendig auch die soziokulturellen Faktoren zu berücksichtigen, sowie die Realitäten von Landwirt:innen, welche eine großflächige Umsetzung erschweren.

Schlagwörter: Paludikultur, Moore, Wiedervernässung, soziokulturelle Werte, Nature's Contributions to People, Wahrnehmungen, Landwirt:innen

Foreword

I always felt drawn to the natural environment and therefore wanted to study something where I could potentially make a positive impact in protecting it. Agriculture might not be the first thing that comes to mind when thinking about protecting nature. Indeed, our current agricultural system is largely responsible for the depletion of our natural ecosystems, exacerbating the interlinked crises of climate change and biodiversity loss. These issues basically followed me through my entire bachelor's degree at the University of Göttingen in Germany.

During one lecture I specifically learned how agriculture also bears much of the responsibility for peatland degradation. Peatlands, at that time were something I did not fully understand nor had really seen one. However, I remember when we first learned about their superpowers in climate mitigation and their ability to store twice as much carbon as all the world's forests combined. This led me to wonder why everyone talks about forests, but no one really talks about peatlands as natural carbon sinks.

The next thing I learned was that more than 90% of peatlands in Germany are drained and used for agricultural production. Instead of vast, *sphagnum*-dominated bog landscapes, peatlands are now hidden behind maize fields and meadows with grazing cows. Landscapes that I also grew up with myself, but which I began to see in a different light once I became aware of their greenhouse gas emissions. Paludiculture was then introduced to us as a possible solution for reviving these peatlands as natural carbon sinks while maintaining a productive use to generate income for farmers. So, I decided to write my bachelor's thesis on *sphagnum* farming, as it combined both of my interests in farming and peatlands while also contributing to climate mitigation.

Throughout my master's in Agroecology, I specifically strengthened my interdisciplinary thinking because Agroecology is much more than the ecology of sustainable farming systems. It also takes economic, sociocultural and political dimensions into account to ultimately transform the whole food system. The challenge of this thesis was to combine paludiculture with what I have learned throughout this two-year master's programme. Paludiculture does not directly contribute to food production, nor can it be compared with Agroecology, but it can be understood as part of the process towards a just and sustainable food system more broadly. Indeed, paludiculture follows a similar ecological logic to design farming systems that work with nature rather than against it. It also faces similar interlinked challenges on the economic, political and sociocultural level.

This thesis focuses on the last aspect and tries to understand the relationship between farmers and peatlands. It explores sociocultural values and meanings that hinder or possibly enable broader adoption of paludiculture among farmers. I am happy to say that I am writing the final words now. The process took longer than expected, but I am deeply grateful for the support and understanding of both of my supervisors, Hassan and Harry who guided me throughout this process.

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1. Introduction

Peatlands cover only about 3% of the Earth's surface yet store around one-third of global soil carbon – roughly twice as much as all the world's forests combined (UNEP 2022). Despite this significance, forests are far more widely recognized in public discourse as a key climate mitigation solution (Psistaki et al. 2024) than peatlands and are commonly associated with beauty and restorativeness (Simkin et al. 2021). Peatlands, on the other hand, are still often perceived merely as mysterious and inaccessible places (Byg et al. 2017, p.187; Tannert 2023, p.44f.). Even though their climate mitigation potential is increasingly recognized in political discourse, negative public perceptions persist. Such negative perceptions may partly trace back to their history (Byg et al. 2017, p.181). For centuries, peatlands were drained and regarded not as valuable ecosystems worth protecting, but as wasteland to be drained and made arable (Bruisch 2023, p.21). This view shaped land use across large parts of Northern Europe and has left most of the region's peatlands drained and degraded today (Byg et al. 2017; Bruisch 2023, p.21).

Germany illustrates this well: the country began draining peatlands in the early 18th century for agricultural production, as well as for peat extraction and to enable settlement (Bruisch 2023, p.20). A well-known saying from peatland regions during that time reflects the hardship of life there: "the first generation faced death, the second hardship, and only the third earned the bread". Over just a few hundred years, peatland landscapes have transformed from wild, inaccessible areas into cultural landscapes dominated by drained grassland (Succow & Jeschke 2022), becoming home, identity, and livelihood for the people (Ziegler et al. 2021, p.10). Today, more than 95% of Germany's peatlands are drained, with the majority used for agricultural production (GMC 2026).

Yet, it is well known that drained peatlands release large amounts of CO_2, significantly accelerating the climate crisis (van Giersbergen et al. 2025). The Paris Agreement commits signatory countries to limiting global warming to well below 2°C, and ideally to 1.5°C, above pre-industrial levels (IPCC 2018). Achieving this target will require action across all major emitting sectors, including agriculture, forestry and other land use (AFOLU) (Nabuurs et al. 2022). In Germany, drained peatlands released approximately 52.2 million tonnes of CO2 equivalents in 2024, accounting for about 8% of the country's total greenhouse gas emissions (UBA 2026). Agricultural land use, primarily cropland and grassland on organic soils, accounts for most of these emissions, at around 82% (UBA 2026), making these areas a critical target for climate mitigation. Among all emitting sectors, peatlands

1 thus hold particular significance – not only as part of the problem, but also as part of the solution.

Given the scale of emissions associated with drained peatlands, rewetting has emerged as a key climate mitigation strategy within Germany's national Climate Action Plan for achieving climate neutrality by 2050 (Abel et al. 2019; Tanneberger et al. 2021). Yet rewetting requires the opposite of what shaped these landscapes for centuries, and it conflicts with the continued agricultural use. This is why it requires solutions that are locally adapted to secure farmers' livelihoods. As Cottet et al. (2022, p.4) argue in the context of river restoration, returning ecosystems to a pristine state often fits neither social and economic reality nor scientific or technical feasibility. Instead, restoration should acknowledge these human realities and aim for the best possible ecological outcome within a given system (ibid.). In the context of peatlands, paludiculture acknowledges this need for compromise. It is defined as the productive use of wet or rewetted peatlands, allowing land to remain in agricultural use while significantly reducing emissions (Wichtmann, Schröder & Joosten 2016, p.1).

Despite growing policy recognition of paludiculture as a viable pathway to reconcile climate goals with continued agricultural livelihoods, adoption among farmers remains low (Wichmann & Nordt 2024). While research has expanded considerably over the past 25 years, particularly within in the natural sciences, demonstrating that technical implementation and cultivation are feasible on a small scale, studies on socioeconomic factors, utilization, planning and approval aspects remain scarce (Neudert et al. 2026). This imbalance may partly explain why technical feasibility has not yet translated into widespread farmer adoption.

Moreover, considering the historically negative perceptions of peatlands suggest that cultural values and identity also play an important role in paludiculture adoption (Deickert and Piegsa 2016, p.161). Recent research has shown that peatland landscapes carry diverse values and meanings (Heindorf, Plieninger and Schüler 2025; Ohlsson et al. 2025; Pop et al. 2025), resulting in different land-use interests that challenge restoration efforts (Hünnebeck-Wells et al. 2025; Merkelbach et al. 2026). According to Khosravi et al. (2025) farmers and other stakeholders' relationships with peatland landscapes are shaped by long histories of drainage across Europe (Ziegler et al. 2021). However, whether and how these perceptions shift in the context of paludiculture have rarely been studied qualitatively, particularly in the European context (Deickert and Piegsa 2016, p.161; Neudert et al. 2026, p.13). Consequently, it remains poorly understood how such values and meanings shape farmers' decision-making regarding paludiculture adoption beyond technical, ecological and economic aspects alone.

1.1 Aim and research questions

Building on this, the study aims to explore how farmers' sociocultural values and meanings attached to the current peatland landscapes may act as barriers or enablers to adoption of paludiculture. To examine these diverse values and meanings, this study draws on the Nature's Contribution to People (NCP) framework. This concept builds upon the Ecosystem Service Concept and captures material, regulating, and non-material benefits people derive from nature while explicitly designed for diverse cultural values and knowledge systems (IPBES 2019). The following research questions guide the analysis:

- *What sociocultural values and underlying meanings do stakeholders associate with peatland landscapes?*

- *How do these values and meanings act as barriers or potential enablers to rewetting for paludiculture?*

To address these questions, semi-structured interviews with farmers and other key stakeholders were conducted alongside field observations within the Gnarrenburger Moor in Germany.

1.2 Outline

The thesis begins by giving some background information on paludiculture in Chapter 2. Chapter 3 introduces NCP as a theoretical framework. Chapter 4 describes the methodological approach and reflects on ethics and positionality. Qualitative findings are presented in Chapter 5, followed by a brief visual summary of the key results in Chapter 6. Chapter 7 discusses these findings, including recommendations, methodological reflections, limitations and, a reflection on paludiculture through an agroecological lens. Finally, Chapter 8 concludes the thesis.

2. Background

2.1 Paludiculture - alternative land use for climate change mitigation

The term paludiculture is derived from the Latin palus ("swamp") and refers to a form of land management practiced on wet or rewetted peat soils (Neudert et al. 2026, p.6). By maintaining water levels close to or above the surface, this approach keeps the peat body saturated, preventing its decomposition and, in turn, substantially reducing greenhouse gas emissions (Wichtmann & Joosten 2007, p.24; Wichtmann, Schröder & Joosten 2016, p.1). While the practice of paludiculture has existed for more than 25 years, the term itself was coined by peatland scientist Hans Joosten in 1998 at the University of Greifswald (Neudert et al. 2026, p.5f.). Hans Joosten and Wendelin Wichtmann, among others, scientifically systematized the concept, against a backdrop of rising biomass demand, environmental damage from drained peatlands, and a lack of a viable alternative for the land (Wichtmann & Joosten 2007, p.24). Building on this recognition, they proposed a sustainable alternative form of land use that works with peatlands' natural waterlogged conditions (ibid.).

There are two different types of peatlands, distinguished mainly by their hydrology and characteristic plant species: bogs (Hochmoore) and fens (Niedermoore) (Joosten & Clarke 2002, p.25). Bogs are fed exclusively by rainwater and tend to be acidic and nutrient-poor (ibid.). Fens, by contrast, receive additional groundwater or surface water and are typically richer in nutrients and minerals (Joosten & Clarke 2002, p.25). For paludiculture, this distinction determines which plant species are suitable for cultivation. On fens, species such as reed (*Phragmites* spp.), cattail (*Typha* spp.), and sedges (*Carex* spp.) can be cultivated, whereas bogs are suited mainly for peat moss (*Sphagnum* sp.) or sundew (*Drosera rotundifolia*) (Abel, Couwenberg, & Joosten 2012, p.4). These plants can be harvested and turned into marketable products, opening economic potential for paludiculture (Temmink et al. 2026). Their use can take various forms, for example, as insulation and packaging material, bioenergy, animal fodder or as growing media in horticulture (Abel, Couwenberg, & Joosten 2012, p.3). While research into these different usages has expanded considerably in recent years, most paludiculture products are not yet established at a commercial scale, and their economic viability continues to be tested in pilot projects (Ziegler et al. 2021). Among these applications, *Sphagnum* spp. stands out for its potential to replace white peat as growing media in horticultural production (Müller & Glatzel 2021; Kumar 2017). *Sphagnum* farming is therefore a promising contributor to climate change mitigation, both by replacing a fossil resource and by means of rewetting it requires (Gaudig et al.

2018). This potential has been the subject of ongoing research in Germany for over two decades (Gaudig et al. 2014). The following sections describe *Sphagnum* farming in more detail, including its implementation process as well as its ecological and economic potential.

Paludiculture implementation: The case for *Sphagnum* farming

Sphagnum farming can be established on rewetted cutover bogs, peatlands from which peat has previously been industrially extracted, as well as on rewetted former bog grassland (Gaudig et al. 2014; Gaudig et al. 2018). Site preparation generally involves levelling the peat surface and installing an irrigation system to enable water-level control (Gaudig et al. 2018). Afterwards, *Sphagnum* fragments are spread across the field (Gaudig et al. 2018). Surface levelling and removal of the upper 30-50 centimetres of topsoil are considered crucial for achieving optimal nutrient conditions because it exposes the underlying, nutrient-poor peat layer that is more suitable for *Sphagnum* growth while the nutrient-enriched former agricultural topsoil gets removed (Temmink et al. 2017). Nutrient-rich water flow from the surrounding farmland is considered less problematic, as *Sphagnum* can also sequester nutrients such as nitrogen (N), potassium (K), and phosphorus (P) (Temmink et al. 2017, 2024). A consistently high and stable water level has been shown to be one of the most critical factors for successful establishment and growth (Brust et al. 2017; Gaudig et al. 2018, p.10; Gaudig, Krebs and Joosten 2020; Pouliot et al. 2015; Quadra et al. 2025, p.7). Findings from experimental sites also suggest that a high initial cover of *Sphagnum* fragments around 80-95% further supports successful establishment (Gaudig et al. 2014; Gaudig et al. 2018; Pouliot et al. 2015). To date, spreading of the moss fragments is largely done by hand, mechanised methods have only been applied on a small scale so far (Gaudig et al. 2018, p.9; Temmink et al. 2017). Under favourable conditions, moss carpets have been shown to establish within 1.5 to 3 years (Gaudig et al. 2014). However, removing competing vascular plants through regular mowing is considered beneficial (Gaudig et al. 2018, p.12; Pouliot et al. 2015; Temmink et al. 2017). Only the uppermost, living layer of peat moss carpet (2-5 cm) is harvested (Gaudig et al. 2018, p.15), while the rest remains in place to continue accumulating peat. *Sphagnum* regrows after cutting, allowing a repeated harvest cycle of potentially 2-3 years (Gaudig et al. 2018, p.15). Under favourable conditions, studies have shown that yields of up to 6.7 tonnes of dry matter per hectare and year can be achieved (Temmink et al. 2017). Currently, only small research sites around 900 m² to 16 hectares exist, predominantly in Germany and Canada as well as in the Netherlands and Latvia (Gaudig et al. 2018, p.2; Temmink et al. 2024, p.347).

Climate mitigation potential among other ecological benefits

Sphagnum growth comes along with several ecological benefits alongside climate mitigation. The plant, for instance, has the capacity to actively sequester nutrients, such as phosphorus and nitrogen, and studies have shown that it can act as an active nutrient sink, preventing eutrophication (Temmink et al. 2017, 2024). *Sphagnum* farming may also contribute to water storage and purification within the landscape (Temmink et al. 2024; Vroom et al. 2020) due to the plants ability to store up to 20 times its own weight in water (Campbell et al. 2009). Furthermore, it offers habitat for different wetland species such as various birds, dragonflies, spiders, bees and frogs among others (Gaudig & Krebs 2016; Muster et al. 2015; Muster, Krebs, & Joosten 2020; Mainda et al. 2025; Zoch, Budig, and Reich 2024). The study by Baranyai et al. (2021) has also found that *Drosera* species, which are threatened have spontaneously spread onto *Sphagnum* farming sites, contributing to their conservation. The most significant and well-studied ecological benefit is its potential to substantially lower greenhouse gas emissions (Daun et al. 2023; Beyer & Höper 2015; Günther et al. 2017; Quadra et al. 2025). While the *Sphagnum* farming production sites themselves function as net carbon sinks, ditches and causeways remain the most challenging emission sources (Daun et al. 2023). Nevertheless, compared to drainage-based agriculture, *Sphagnum* farming can lower emissions by up to 20 tonnes CO2-eq per hectare and year (Daun et al. 2023).

Economic potential of *Sphagnum* moss as horticultural growing media

Alongside its ecological value, *Sphagnum* farming holds economic potential as a renewable substitute for white peat (Wichmann et al. 2020; Müller & Glatzel 2021; Gaudig et al. 2018; Kumar 2017). Peat is widely used as horticultural growing media because of its favourable physical and chemical properties, particularly its high water-holding capacity and nutrient retention (Schmilewski 2008). In Europe, nearly 70,000 m³ of peat is extracted annually, of which 42.2% was used for horticultural growing media in 2005 (Schmilewski 2019, p.161). Germany plays a significant role in this market, both as a producer and a consumer. In 2025, Germany still produced 830,000 tonnes of peat, ranking among the world's most important peat extractors (StatsGeo 2026). However, domestic extraction is declining sharply (IVG 2024) because Lower Saxony, Germany's primary extraction region, has permanently banned the approval of new extraction sites since 2023. According to the German Horticultural Industry Association (IVG), extraction is currently permitted on around 8,000 hectares, though only about 2,000 hectares of peat is actively extracted (IVG 2024). Despite this decline, domestic demand for peat remains high, at approximately 8 million m³ annually (Schmilewski 2019, p.161) - roughly twice the volume that domestic extraction alone can supply. In 2019, only 4.7 million m³ were extracted and used in German horticulture (IVG 2025; BMLEH 2026). Roughly half of the remaining demand is

met through imports, primarily from the Baltic states (BMLEH 2026). However, this practice merely relocates the environmental impact of peatland drainage and extraction rather than resolving it, which strongly drives the demand for peat-free alternatives.

In Germany, this demand is largely driven by its national peat reduction strategy, which targets a near-complete phase-out of peat in hobby gardening by 2026 and a substantial reduction in commercial horticulture by 2030 (BMEL 2022, p.12). However, this strategy relies on voluntary industry commitments rather than binding regulation. Current research estimates that peat can already be substituted by up to 30-50% (BMEL 2022, p.13) in many horticultural applications using alternative substrates, including green compost, wood fibre, bark compost, and coir (BMLEH 2026). However, particularly in industrial horticulture, extremely high-quality substrate mixtures are required, which makes replacing peat entirely considerably more difficult (Schmilewski 2008).

Sphagnum moss has similar characteristics, making it a promising alternative to peat, particularly the less decomposed white peat (Kumar 2017; Müller & Glatzel 2021; Emmel 2008). It has already been tested with promising results across several studies for ornamentals, vegetables, herbs, as well as shrubs and trees (Emmel 2008; Gaudig et al. 2018, p.16). Nevertheless, further research remains necessary, and the limited availability of *Sphagnum* biomass continues to constrain its use, as most existing sites remain small-scale research plots (Gaudig et al. 2018). ZukunftMoor Gnarrenburg GmbH (hereafter referred to as ZukunftMoor), a company in Lower Saxony, is currently establishing a large pilot site to advance *Sphagnum* production and demonstrate that substantial quantities can be produced at scale (ZukunftMoor n.d.). Pilot projects such as this one may present an opportunity for peatland regions in northern Germany to work closely with farmers, advancing a transition of the peatland landscapes that is grounded in economic as well as ecological objectives.
Despite such initiatives, underdeveloped sales markets, high establishing costs, and insufficient political and regulatory frameworks continue to limit farmers' willingness to transition to paludiculture-based production. These barriers are addressed in the following sections.

2.2 Paludiculture within EU and national regulatory frameworks

Building on this ecological and economic potential, policy frameworks at both the EU and national level increasingly recognize paludiculture as a feasible alternative

to drainage-based agriculture and a crucial pathway towards climate mitigation goals.

The European Climate Law commits the EU to net-zero emissions by 2050 (European Commission 2026). Yet emissions and removals from peat soils fall under the LULUCF (Land Use, Land-Use Change and Forestry) sector, which, during the regulations' first period (2021-2025), only required maintaining the existing carbon sink at its present strength (the so-called "no-debit rule") (European Commission 2025). This was largely because forests have historically driven the sector's overall balance: their carbon storage capacity has been sufficient to offset emissions from drained peatlands, making the sector appear as a net sink in national climate reporting (Wichmann & Nordt 2024, p.3). As a result, peatland emissions have remained largely invisible in political and public debate, providing limited direct incentive to actively reduce them. Since the start of the regulation's second period in 2026, however, a considerably stricter regime has applied, making LULUCF emissions reporting mandatory across all managed land (European Commission 2025). Moreover, the EU has set a binding target to increase net carbon removals in the land-use sector by around 15% by 2030 (European Commission 2025). This shift, from merely offsetting emissions to actively expanding removals, is expected to make the climate cost of continued peatland drainage more visible in national accounts (European Commission 2025).

The EU Nature Restoration Law, adopted in 2024, goes further by setting binding targets for the restoration of drained agricultural peatlands: Member States must restore at least 30% of such areas by 2030, with at least a quarter rewetted, rising to 40% (2040) and 50% (2050), with paludiculture explicitly named as one eligible restoration pathway (Regulation (EU) 2024/1991; European Parliament and Council of the European Union 2024). Rewetting itself, however, remains voluntary for individual landowners and farmers (ibid.), making financial incentives central to translating this target into practice.

Among these financial instruments, the Common Agricultural Policy (CAP) is a crucial instrument due to its EU-wide effectiveness (Wichmann & Nordt 2024, p.4). Under the new CAP reform (2023-2027), rewetted peatland cultivated with non-agricultural products through paludiculture is, in principle, no longer excluded from direct payments (Regulation (EU) 2021/2115; European Parliament, and Council of the European Union 2021). However, eligibility remains limited to crops recognized as "agricultural products" meaning that high value paludiculture crops such as reed and cattail continue to be excluded in practice (Wichmann & Nordt 2024, p.6). This does not represent a real improvement and further discourages peatland farmers to transition (ibid.). Meanwhile, conventional drainage-based agriculture continues to receive full support in the CAP, effectively subsidizing the very practices driving peatland degradation (Wichmann & Nordt 2024, p.4).

At the national level, Germany has translated these EU frameworks into concrete domestic policy. The National Peatland Protection Strategy (Nationale Moorschutzstrategie), adopted by the federal cabinet on the 9th of November 2022, sets a quantified target of reducing annual greenhouse gas emissions from peatland soils by 5 million tonnes of CO2-eq by 2030, as part of Germany's broader goal of climate neutrality by 2045 (BMUV 2022, p.38). The strategy involves several different areas of action, including the rewetting of agricultural used peat soils and the promotion of paludiculture as a sustainable land-use alternative, on a voluntary basis for farmers (BMUV 2022, p.39). An estimated 1.3 million hectares of drained agricultural peatland would need to be rewetted by 2050 to meet Germany's climate targets (Wichmann & Nordt 2024, p.1).

To operationalize this strategy, the federal government introduced the Palu funding directive (Förderrichtlinie Palu) in 2026, providing 1.75 billion euros in funding until the end of 2029 to support the rewetting of drained agriculture and forestry peatland and the subsequent transition to paludiculture, including processing and marketing of paludiculture products (BMUKN 2026). The directive targets the rewetting of 90,000 hectares by 2030, with an expected reduction of approximately 2.25 million tonnes of CO2-eq annually (BMUKN 2026). This is an important step but still covers only around 7% of the 1.3 million hectares estimated to be necessary by 2050. Like the broader national strategy, participation remains entirely voluntary (BMUKN 2026).

3. Theoretical Framework

3.1 Nature's Contribution to People (NCP)

This study draws on the Nature's Contributions to People (NCP) framework developed by IPBES (see Fig. 1), which builds on the earlier Ecosystem Services (ES) concept (IPBES 2019). It was established to provide a more holistic approach for conceptualising a deeper understanding of the diverse values of nature (Christie et al. 2019). The framework describes all positive and negative contributions people obtain from nature and how these contribute to their well-being (IPBES 2019). Unlike the ES concept, which distinguished four clear categories (regulating, provisioning, supporting, cultural) (Millennium Ecosystem Assessment 2003, p.5), NCP differs between material, regulating, and non-material contributions (IPBES 2019, p.51). The categorisation of the ES concept has been critically discussed, as culture appears closely intertwined with both material and regulating contributions, rather than a separate, fixed category (Chan et al. 2012). NCP addresses this limitation by explicitly recognising that these dimensions are closely interlinked rather than clearly separable (Díaz et al. 2018; Kadykalo et al. 2019). It also acknowledges that people hold different perceptions, values, and beliefs that shape how NCP are valued and perceived, and that these values are themselves a product of sociocultural interactions (Zoeller & Cumming 2024). NCP therefore also considers a range of different cultural contexts, worldviews, and perspectives, including those of practitioners such as farmers (Kadykalo et al. 2019). In research, NCP is used to examine socioecological systems more broadly with a stronger focus on human-nature interactions (Moreira et al. 2025; Dean et al. 2021). The following section will describe the framework and its categories, specifically focusing on non-material contributions and their interaction with sociocultural values and meanings.

Regulating contributions include e.g. climate mitigation or water regulation, while material contributions provide tangible goods such as food, medicine or raw materials that support human well-being (IPBES 2019, p.51). Non-material contributions are referred to as "people's subjective or psychological quality of life" (IPBES 2019, p.51). Non-material nature´s contributions to people are further divided into three dimensions: 1. Learning and inspiration, 2. Physical and psychological experiences and 3. Supporting identities (IPBES 2019). These dimensions form the analytical core of this study to identify such non-material values, which are referred to as sociocultural values. Learning and inspiration refer to the ways nature shapes knowledge, skills, and creative expression or inspiration (IPBES 2019). Physical and Psychological experiences encompass the recreational and emotional benefits people derive from being in or interacting with nature

(ibid.). Supporting identities capture how nature contributes to people's sense of place, belonging, and cultural or personal identity (ibid.), which acknowledges that the way people value nature is closely linked to the benefits or costs they perceive (Díaz et al. 2018). Meaning that non-material values can shape how material or regulating contributions, such as paludiculture, are understood and evaluated (Díaz et al. 2018).

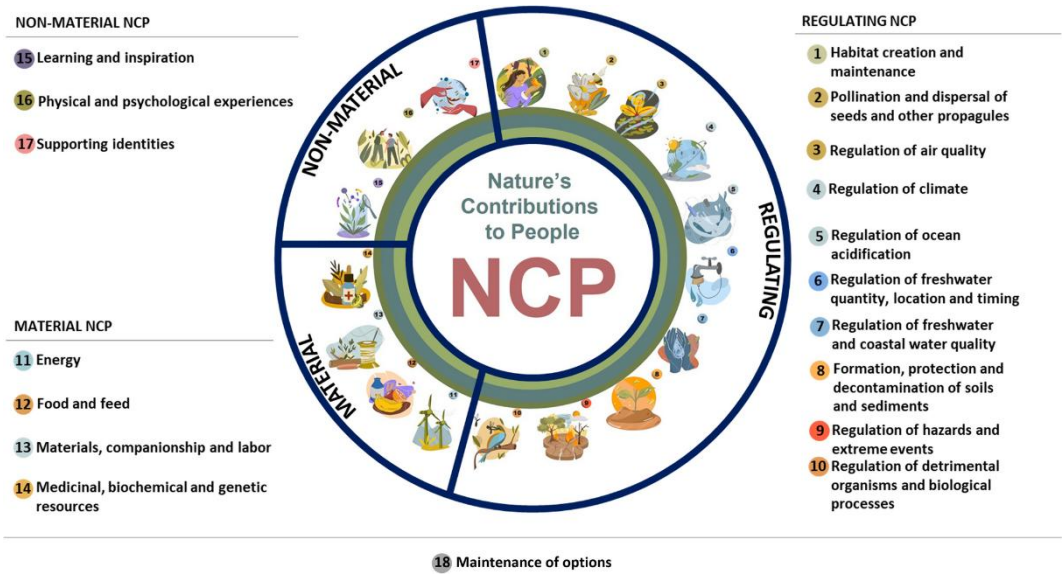


Figure 1*. Overview of the material, non-material, and regulating categories of the Nature's Contributions to People (NCP) framework. Source: Moreira et al. (2025).*

4. Methodology

4.1 Conceptual framework: Assessment of sociocultural values and meanings

A range of related studies and international reports were consulted for the value assessment and formulation of the interview questions. In particular, these included two reports by IPBES (2019, 2022), a study by Heindorf, Plieninger and Schüler (2025) on peatland-related relational values, a study by Adams et al. (2026, Tab.1) that assessed non-material values in the context of coastal change in Hawaii, and a paper by Gould et al. (2015, Tab.2). Those value categories formed the basis for the formulation of the prompt cards, which were used in the interviews for support. Detailed descriptions of the meanings of these non-material values, adopted to fit the context of peatlands, can be found in the table below. These descriptions align also with the wording of the prompt cards.

Table 1. *Description of prompt cards based on non-material NCP categories.*

NCP category	Values	Description
Supporting identities	Cultural heritage & tradition	This peatland landscape is important to me because of past events/ family businesses or other reasons.
	Identity	Peatland landscapes shape who I am. I feel that my sense of self is connected to peatlands.
	Attachment to Places and people	I value this peatland landscape because I feel attached to it. There are certain areas in the peatland landscape or people that contribute to my belonging here and play a role in strengthening ties in my family and/or community.
	Connection with non-living and living elements	I feel connected to this peatland landscape, people or certain species. I experience positive or negative emotions when I visit or think of peatlands.
Learning & inspiration	Ingenuity	This peatland landscape helps me think of how to approach problems or develop solutions to those problems.
	Inspiration	Peatland landscapes provide me with ideas/ images that inspire art or creative expression.
	Knowledge & learning	Peatland landscapes provide me with knowledge and is a source of learning for me.
	Perspective	Spending time in or thinking about peatlands help me to put things into perspective.
	Aesthetics	I derive satisfaction or meaning from visual characteristics of the peatland landscape.

Physical & psychological experiences	Existence & uniqueness of the landscape	This peatland landscape is important to me simply because it exists/ because of its uniqueness.
	Well-being	This peatland landscape contributes to my well-being.
	Spirituality	This peatland landscape inspires/ reminds me to be aware of forces or entities larger than myself.
	Ceremony	There are peatland areas that are important to me for ceremonial reasons.
	Non-physical value of activity	I experience cognitive experiences such as appreciation of silence; positive or negative memories and sensory experiences sounds and smells.
Responsibility	Intergenerational/ moral responsibility	Restoring this peatland landscape is important to me because of what it means for future generations/ because it is important for climate mitigation.
Blank card		Write down what feels important to you that has not been mentioned already.
Barriers		Sociocultural factors that could promote the implementation of paludiculture.
Enablers		Sociocultural factors that could hinder the implementation of paludiculture.

Note: Value categories and descriptions adapted from IPBES (2019, 2022), Heindorf, Plieninger & Schüler (2025), Adams et al. (2026, Tab. 1) and Gould et al. (2015, Tab. 2) and modified for the context of peatland landscapes.

4.2 Research design

Grounded in a constructivist paradigm, which assumes that reality is socially constructed through meanings that are dynamic and context-dependent (Bryman 2008, p.19f.; Guba and Lincoln 1994, p.110 f.), this qualitative study seeks to understand how farmers construct social and cultural values and meanings around the topic of rewetting for paludiculture through their lived experiences. In line with this, the study adopted a qualitative research approach, using semi-structured interviews as the primary method. The NCP framework provided a thematic orientation for the data preparation and analysis.

Because the theoretical framework was chosen before the data analysis, the study follows primarily a deductive approach but remained open to emerging themes relevant to the research questions, which is more common for abductive approaches (Creswell 2014, p. 75; Timmermans and Tavory 2012, p.168). The data collection naturally remained open and flexible due to the semi-structured interview design, which acknowledges the relational nature of knowledge production between interviewer and interviewee (Bryman 2008, p. 438). However, the NCP framework

was used to help formulate research questions and the prompt cards, which served as supportive prompts introduced at the end of the interviews to help participants reflect on additional aspects. Besides this, it helped structuring codes during the data analysis.

This method approach was chosen to address the limited availability of empirical studies (Khosravi et al. 2025, Pop et al. 2025, Ziegler et al. 2021), while at the same time making use of established concepts to increase comparability with existing research on similar topics. An increasing number of studies use the NCP framework across the world, and it has shown several benefits within socioecological research in highlighting relational values that are shaped by people's relationship with nature (Moreira et. 2025), including for example meanings, identities and responsibilities that shape how landscapes are understood and managed. The NCP framework builds upon the ES concept and was developed to include sociocultural aspects more holistically (IPBES 2019, Diaz et al. 2018), which contributes to its strong applicability and communicability across scales and contexts (Moreira et. 2025).

The same concept was chosen in my bachelor thesis from 2023, which explored non-material contributions to people of paludiculture using the example of *Sphagnum* sp. and *Drosera* sp. on rewetted bogs. A large literature review was conducted, and non-material contributions were found to be limited further highlighting the need for empirical studies. Therefore, this master thesis aims to extend upon those previous findings and explore underlying non-material, here referred to as sociocultural values grounded in the relationship between humans and peatland landscapes. In order to understand the current state of research and explore further knowledge gaps, another literature review was conducted for this study (see section 2.3) using the databases Web of Science and Google Scholar. Search items included: "paludiculture" AND "non-material values" OR "social and cultural values". For an extended research round, the keywords: "peatlands" AND "non-material values" OR "social and cultural values" were used.

Furthermore, building on a light ethnographic orientation (Bryman 2008, p.436), field observations were conducted which provided additional contextual information about the environments in which participants live and work. Combining semi-structured interviews with observations is a widely used practice in qualitative research (Akinyode & Khan 2018, p.164f.; Bryman 2008, p. 436). The study was conducted in the Gnarrenburger Moor in Germany, a representative peatland region with active agricultural use and an ongoing large-scale paludiculture implementation project. Data collection took place between the 11th and 15th of April 2026 and involved in-person semi-structured interviews with local farmers, complemented by field observations of the different farms and the surrounding landscape. One additional interview with a representative of the peat

industry in the study area was conducted online. Further details on sampling, data collection procedure, and analytical steps are provided in the following sections. Figure 1 below gives an overview of the study's methodological approach.

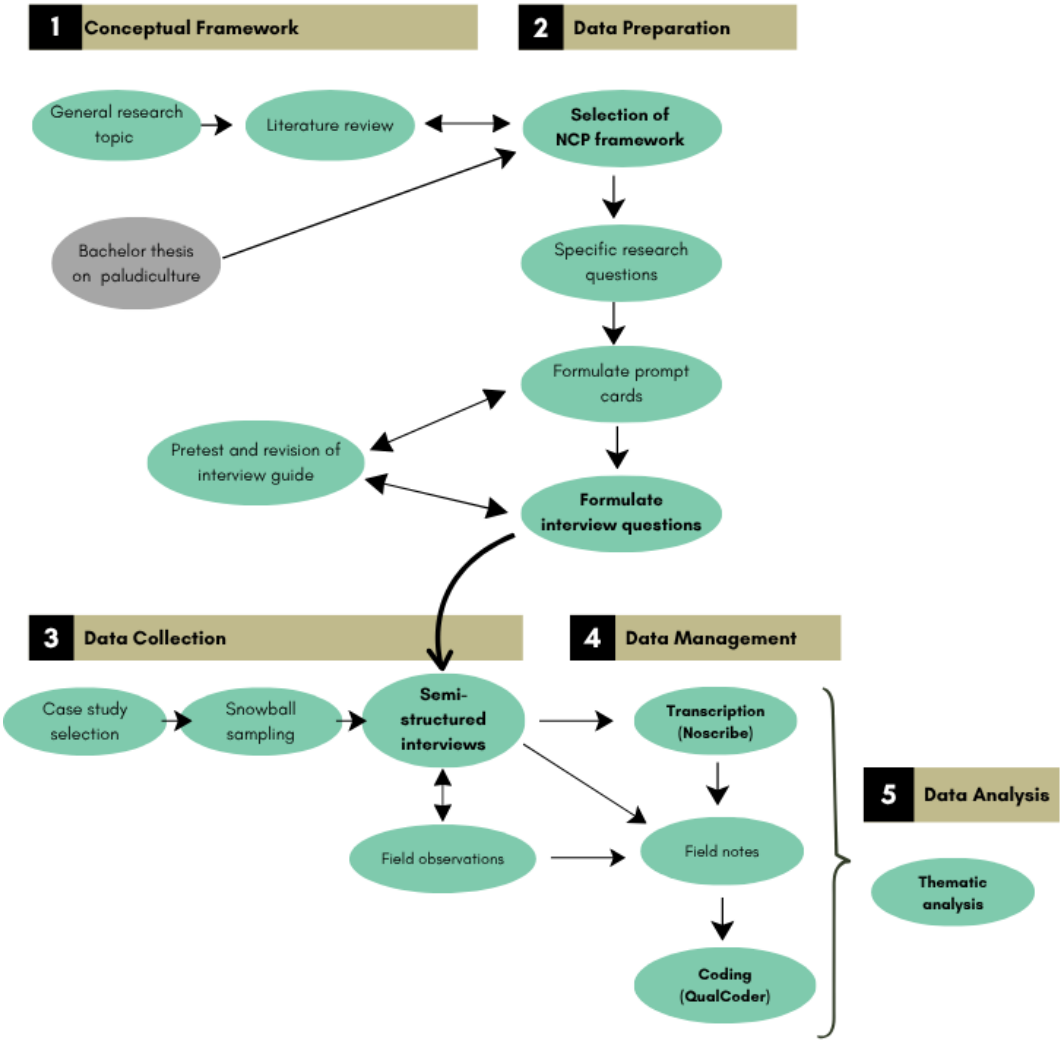


***Figure 2**. Schematic overview of the study's methodological approach (own illustration).*

4.3 Study area – Gnarrenburger Moor

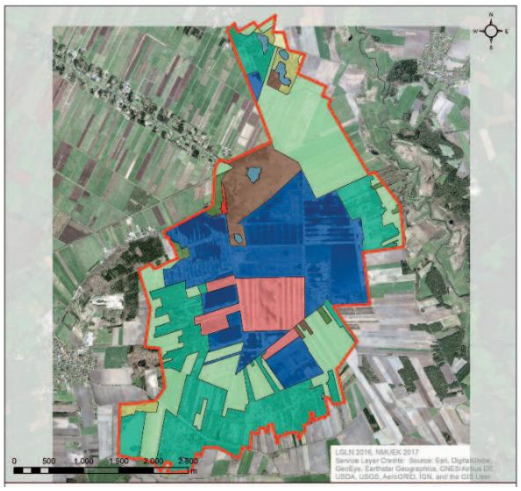


***Figure 3**. Aerial distribution in the peatland nature reserve (Huvenhoopsmoor) in 2015, and its surrounding agricultural landscape. Adapted from Sieber and Bauerochse (2018).*

Note: blue (rewetted peat extraction sites), red (peat extraction), brown (nature reserve), light green (pastures), dark green (succession)

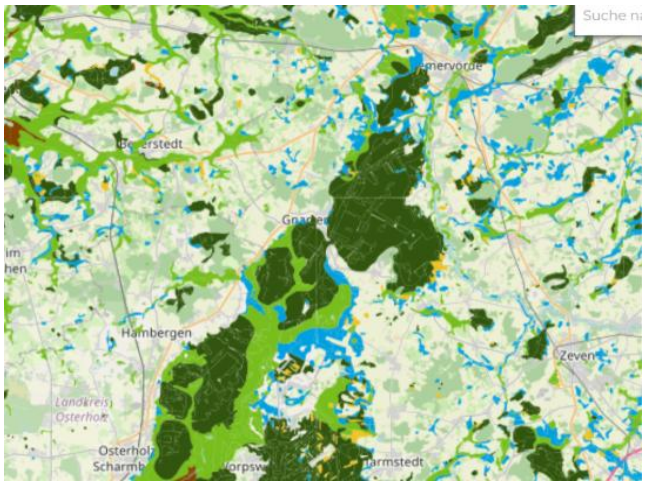


***Figure 4**. Distribution of organic soils in the Gnarrenburger Moor. Extract from the digital peat map by the Thünen Institute (2023).*

Note: dark green (bog), light green (fen)

The Gnarrenburger Moor is in the North German Plain between Hamburg and Bremen and is part of the larger Teufelsmoor complex (Sieber & Bauerochse 2018). It covers an area of approximately 6,120 ha. Raised bog soils dominate the region, with some fens along the edges. Peat layers can reach 2-4 metres on the areas that have not been extracted. The average annual precipitation in this region is 804 mm, with an average annual temperature of 9.3°C (Sieber & Bauerochse 2018). More than half of the study area is used for agriculture, dominated by grassland (78%) and some small-scale potato fields (Kalinski et al. 2021). Most of the farmers in the region are dairy farmers operating on peat soils, with only a small proportion of mineral soils for cereal production. As a result, grassland management is the predominant land-use practice. Only few areas are still used for peat extraction, most of the peat extraction sites have been rewetted and put under protection or are currently undergoing restoration after peat extraction (Sieber & Bauerochse 2018).

These areas are part of the Huvenhoopsmoor complex, which covers an area of approximately 1,373 ha, including the 80-hectare Huvenhoops Lake (NABU n.d.). Part of the Huvenhoopsmoor was already placed under protection in 1958 (Sieber & Bauerochse 2018). About 1.5 km² remains in a near-natural state, while the rest

is undergoing restoration after peat extraction (ibid.). In the center of the protected peatland site, typical peatland vegetation can be found, including *Eriophorum* sp. (cotton grass), *Rhynchospora* sp. *(brown beaksedge) with* up to 5 metres deep peat layers and rich biological diversity (NABU n.d.).
The Gnarrenburger Moor has changed significantly over the past 250 years, shaped by shifting sociocultural demands on the peatland landscape. The area was drained and developed for settlement in the late 18th and early 19th centuries under the moor colonizer Jürgen Christian Findorff and still bears the layout of those typical strip fields and drainage ditches in the landscape. Following settlement, small-scale manual peat extraction was initially practiced, replaced in the 1970s by industrial peat extraction. Furthermore, the landscape was characterized by birch forests and extensive grasslands, most of which still exist today. Until the 1980s, bog areas were generally used for agriculture after peat extraction. This practice was replaced by the implementation of various national and regional programs, such as the Lower Saxony Peatland Conservation Program or the Natura 2000 Directive. Since the early 2000s, the proportion of rewetted areas within previous peat extraction sites or nature reserves has been increasing. (Sieber & Bauerochse 2018)
In 2016, a first model project for rewetting was launched in the region: the Modellprojekt Gnarrenburger Moor. The aim of this project was to establish a water management concept on a landscape scale to raise the water table while maintaining extensive use of grassland. (Kalinski et al. 2021) Several farmers that were interviewed were part of this research project.
Since 2025, the start-up ZukunftMoor introduced paludiculture to the region and has been cultivating peat moss (*Sphagnum palustre*) on 50 hectares of rewetted, formerly drained grassland. These areas currently represent the largest *Sphagnum* paludiculture sites in Germany. The company aims to expand production to 100 hectares in the coming years, scientifically supported by universities and other research institutes. The pilot fields, located in Langenhausen and Barkhausen, combine peatland restoration with the cultivation of *Sphagnum palustre* as a sustainable alternative to horticultural peat. (ZukunftMoor n.d.)

4.4 Data collection

4.4.1 Sampling & interview process

Participants' characteristics:
The Gnarrenburg region is traditionally characterised by dairy farming. However, structural changes in the agricultural sector have led many farmers to discontinue their farming activities in recent years. As a result, only a few larger dairy farms remain in each village, while many former or retired farmers either kept a small number of cattle as a secondary activity or have stopped livestock farming entirely. Therefore, this study focused on local farmers and land managers of organic soils,

both those currently farming either full- or part-time and former or retired farmers. All participants are also landowners, while those who are still actively farming sometimes also lease additional parcels of land.
In total, eleven farmers were recruited for semi-structured interviews. However, one interview was conducted with both the senior and the junior farmer present, although the senior farmer served as the primary respondent. This interview was therefore counted as a single case. Participants ranged in age from 31 to 80 years, and except for one woman, all interviewees were men. Five participants were full-time conventional dairy farmers, one of them was part-time livestock farmer and four of them were retired farmers, with one of them still partially involved in hobby livestock farming, while the others had already discontinued farming entirely. One additional interview was conducted with an actor from the local peat industry sector. The decision to include this perspective emerged naturally during the research process, as it became clear throughout the farmer interviews that the local peat industry plays a significant role in the region, particularly in the light of the ongoing *Sphagnum*-paludiculture production in the region. Several participants also mentioned having worked in the local peat factory after discontinuing farming, which further underscored the relevance of the peat industry as an important source of employment in the area.

Participants selection and outreach:
Participants were recruited through several complementary pathways. Prior to the field visits, a few active farmers were identified via Google Maps and contacted directly. Other participants were approached through local networks and personal contacts using a snowball sampling approach, commonly employed in qualitative research (Bryman 2008, p.184f.). In some cases, additional contacts were obtained through the interviews themselves, as participants suggested further individuals who might be interested in participating and able to provide relevant insights. Some contacts were also established through a previous connection with the company ZukunftMoor (see section 4.7, Ethical considerations, for details).
Most farmers were then reached by phone in advance, and interview appointments were arranged within the fieldwork period. However, reaching farmers, particularly those still actively farming was challenging. For this reason, several farms were visited spontaneously and asked directly whether they would be willing to participate in the study. With most of them interview appointments were then scheduled for the next day.

Interview questionnaire development:
An interview questionnaire (see Appendix) was prepared to guide the data collection process. The questions were organized into four thematic blocks: introductory questions, values associated with peatlands (identity, learning and inspiration, physical and psychological experiences, responsibility and social

relations), values and meanings related to paludiculture, and closing questions. One ice-breaker question was always asked at the beginning of each conversation. All questions were open-ended and formulated to maintain openness and avoid shaping participants' interpretations - a key principle of grounded theory (Bryman 2008, p. 442). Sometimes in addition to the questions from the interview guide, additional follow-up or probing questions were asked based on the answers from participants, when appropriate (Bryman et al. 2008, p. 446). Several questions were inspired by recent studies on peatlands farming and land-use decision making in Germany (Heindorf, Schüler and Plieninger 2024; Merkelbach et al. 2026).

Interview procedure:
All interviews were conducted in person within the participants' everyday living and working environments, either indoors in a quiet setting or outdoors in their gardens. In-person interviews were chosen because it allowed for more in-depth contact with the participants and increased the likelihood of their availability, as visits could be arranged flexibly and required minimal time commitment on their part.

As a common consequence of the interactive nature of semi-structured interviews (Knott et al. 2022; see also Bryman 2008, p.438), participants responded with varying levels of detail and occasionally addressed multiple topics simultaneously; not all questions were asked in the same order or with the same depth. While this introduces certain analytical challenges (Knott et al. 2022), care was taken to ensure that at least one question from each thematic category was covered. Additional questions were asked when they appeared appropriate for further elaboration, reflecting inherent flexibility of semi-structured interviews (Bryman 2008, p.438). Furthermore, as part of the interview procedure, prompt cards (see tab. in 4.1) were presented to the interviewees at the end of each conversation. Interviewees were then asked to read the cards and categorize them according to their individual preferences on the following scale: *very important, partly important, not important at all, neutral* or any other category they considered appropriate. In cases where participants found it difficult to rank the cards, some were instead invited to select those that stood out the most. The cards were not used for quantitative measurement but rather served as supportive prompts to invite further reflections and discussions. They also helped maintain the focus on the core research questions.
Before and after each interview, there was always time for more informal conversation, which helped to build trust with the participants. The interviews themselves lasted between 28 to 77 minutes, with an average of 45 minutes. Some participants had only limited time available, which required shortening certain parts of the questionnaire. In such cases, priority was given to questions concerning attitudes towards paludiculture, and the prompt cards were occasionally omitted.

Data processing:
Ten out of eleven interviews were audio-recorded and later transcribed (see section 4.7, Ethical considerations for consent, anonymisation and data protection). Although AI-assisted transcription substantially reduced the initial processing time, all transcripts were manually checked and revised by the researcher (approximately 3-4 hours per one-hour interview), as transcription errors can still occur. This time-consuming process also helped getting familiar with the data prior to the formal analysis.
Given that transcription is a sensitive and interpretative process that can introduce analytical challenges and research-driven biases, as highlighted by Point and Baruch (2023), this study followed the transcription rules proposed by Kuckartz and Rädiker (2024), which are based on established qualitative standards. Transcriptions were used as the primary basis for coding and data analysis. For the unrecorded interview, detailed notes were written down immediately after the conversation and used for the analysis.

4.4.2 Field observations

In addition to the semi-structured interviews, field observations were conducted both on the participant's farms and in the surrounding area during the designated study period. Combining in-depth interviews with field observations to better understand the study area you are researching is common for qualitative research (Akinyode & Khan 2018). Unlike classical participant observation, which typically involves immersing oneself in a social setting over an extended period (Bryman 2008, p.402), these field observations represent a light ethnographic approach, considering time constraints and a stronger focus on physical structures, land-use practices and contextual features.
Farm-level observations were often carried out together with the interviewees after the formal interview. Depending on each farmer's availability, farm tours varied between 15 to 30 minutes. Those observations proved highly valuable, especially for the researchers' understanding of physical aspects in the landscape, as participants were able to point out specific places they had talked about in the interview.
Additional observations of the surrounding area included visits to the nearby Huvenhoopsmoor, a party formerly extracted and now restored peatland site, as well as to the historical peatland farm ("Historischer Moorhof") in Augustendorf, which represents a typical farm structure from the early phases of peatland colonisation. Several publicly accessible sites with informational displays for visitors were also explored, such as the "Moorlehrpfad". These observations contributed to a deeper contextual understanding of the landscape, local land-use practices, and historically shaped peatland developments. They further provided complementary insights that supported the interpretation of the interview data.

During some of these visits, members of the local community were encountered, which occasionally led to brief conversations. Two participants also gifted the researcher books they had written about the region, which offered additional historical and personal insights.
All informal interactions were documented in field notes immediately after the encounters to document impressions, contextual details and emerging analytical reflections, which further enriched the data analysis.

4.5 Data analysis

The data were analysed following the codebook thematic analysis approach developed by Braun and Clarke (2006). QualCoder was used for coding and category management. This software was chosen for its accessibility and ease of use, as well as on the personal recommendation of other researchers.

As mentioned above, the Nature's Contributions to People (NCP) framework formed the basis for initial category as well as sub-category identification (Tab. 1), described as ‘theoretical thematic analysis’ (Braun and Clarke 2006). However, the subcategories were adopted dynamically throughout the coding process to better reflect the data. For example, ‘place attachment’ was extended to ‘attachment to places and people’ as social relations emerged as an important aspect throughout the interviews. In addition, two further categories were added (“neutral factors” and “ambivalent factors”) for the coding process itself to comprehensively capture the material, and especially for those aspects that were difficult to assign to a specific (sub-)category. These were later reorganized as the process progressed.

This category system, grounded in the NCP framework, provided the analytical starting point for the subsequent coding process, which followed 6 distinct steps: 1. Familiarizing yourself with your data, 2. Generating initial codes, 3. Reorganizing codes and categories, 4. Identification of barriers and enablers, 5. Searching for sub-themes, 6. Producing the report.

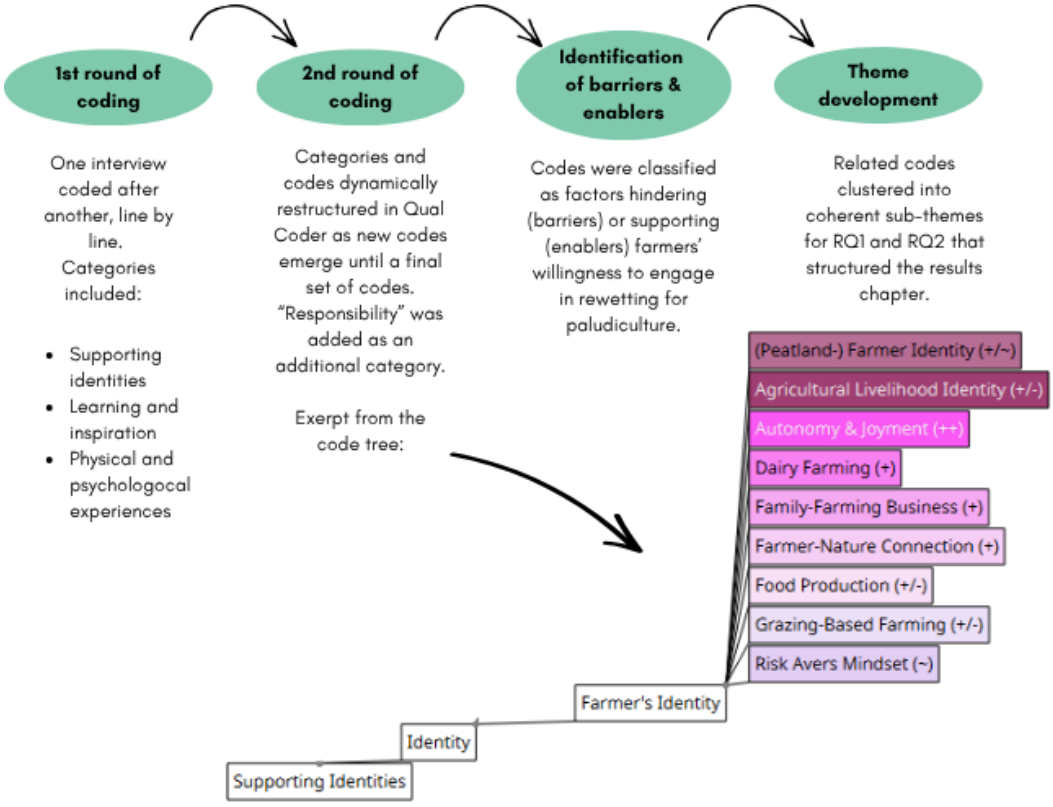


***Figure 5**. Overview and description of coding process. (own illustration)*

The transcription process itself was valuable to get familiar with the data. Codes were then generated dynamically rather than linear, using QualCoder software. With each new interview, additional codes emerged, and it became necessary to reorganize existing sub-categories to maintain a clear and manageable structure. Codes were revised throughout the analysis: existing codes could be renamed, merged, or reassigned, and new sub-categories could be formed when needed within the software. The aim was to use as few codes as necessary while still capturing the range of meanings present in the data. Regarding barriers and enablers, relevant to the second research question, the analysis moved from identifying general barriers and enablers to more specific ones. These were then examined more closely to trace their underlying roots, for example whether they were more linked to knowledge, identity, emotional experience or responsibility. This proved relatively feasible for barriers but difficult for enablers. It was therefore not pursued further for enablers. To document the development of the category system, the coding structure was saved as a screenshot after each interview (see appendix). This allowed the coding process to be traced retrospectively. However, for two interviews, this step was inadvertently omitted.

Once all interviews were coded, codes were grouped into broader themes in relation to the research questions. This step was most time consuming and involved hand-drawn mind maps to organize themes and explore links between them. At this stage, it became apparent that several codes were closely interlinked and appeared across multiple categories and could therefore not always be clearly separated.
In the next step, themes were reviewed and revised. Here, the researcher moved away from individual codes and instead reflected more broadly on which major themes emerged across the interviews as most prominent. Overlapping codes were narrowed down to the category that fit best, to avoid excessive repetition and overlapping themes; additional themes emerged or were discarded during this process. Finally, themes were refined and renamed to capture their content clearly and comprehensively. Supporting quotes were selected to illustrate and highlight specific aspects of each theme.
My own translation of the quotes was supported by using DeepLPro and DeepL-Write (see section 4.7, Ethical considerations, for data protection details). The findings were then written up comprehensively to capture and interpret the data meaningfully.

4.6 Ethical considerations

This study followed standard ethical procedures for qualitative social research. All participants were orally informed about the aim of the study, how their data would be used and analysed, and that their involvement was entirely voluntary and could be withdrawn at any time without providing a reason. This oral approach was chosen to keep the interview setting more casual and approachable. All data were anonymised, and participants were assigned pseudonyms prior to analysis. Specific details, for example exact farm size or location were kept vague where possible, given the small community within the study area. In terms of data analysis, all AI-assisted tools used during data processing (noScribe for transcription and DeepL Pro/DeepL-Write for translation) were DSGVO-conform. Recordings and transcripts were stored securely and accessible only to the researcher.
Regarding potential conflicts of interest, some contacts were established through the company ZukunftMoor, which has a commercial interest in peatland-related developments in the area. The researcher had been professionally involved in the establishment of *Sphagnum*-paludiculture sites for one week each in February 2025 and March 2026, shortly before data collection for this study in April 2026. The company had no influence on this study and this connection served only to facilitate access to some participants and is mentioned here for transparency. Potential implications for participants' recruitment and for the researcher's own perspective on the topic are further reflected upon in the Positionality section.

4.7 Positionality

As outlined in previous sections, I had already explored *Sphagnum* paludiculture and its Nature's Contributions to People in my bachelor's thesis, based on a literature review. This is where I first identified a gap in the literature on non-material contributions, which partly motivated the focus of this study. Apart from my academic engagement with the topic, I was also involved in the establishment of *Sphagnum* paludiculture sites in Gnarrenburg. Towards the end of my bachelor's thesis, I discovered ZukunftMoor and became curious to learn more about its practical implementation. This prior engagement, academically and practically, gave me some familiarity with both the topic and the region before starting this study, which likely shaped the questions I asked and the direction the research took. Despite my own background in agriculture and previous internships on different kinds of farms, I do not fully share participants lived experiences of depending on the land for a livelihood. I tried to stay aware of this distance throughout the interviews and analysis, but it likely still shaped which aspects of the data stood out to me as significant.

Finally, translating the interviews from German to English involved further interpretive choices on my part (see section 4.6, Limitations, for translation-related challenges). Some meanings, particularly around terms like "Heimat" or "Moorlandschaft", do not translate directly, and my own understanding of these terms may not match how participants intended them.

5. Results

This chapter will present the findings of the study, drawing on elven semi-structured interviews conducted with farmers and one interview with a representative of the peat-processing industry. Table 2 provides an overview of participants' socio-demographic and (farm-related) characteristics to offer some context for the findings and quotes presented throughout this chapter.

***Table 2**. Socio-demographic and (farm-related) characteristics of the participants.*

Farmer	Age	G.	Occupation	Farm type
Mareike[1]	31	f.	full-time farmer	dairy[2]
Rainer[1]	58	m.	full-time farmer	dairy[2]
Timo[1]	~35	m.	full-time farmer	dairy[2]
Holger[1]	~60	m.	part-time hobby farmer	small-scale cattle farm
Jörg[1]	74	m.	retired farmer	no agriculture any more
Uwe[1]	63	m.	retired farmer[3]	small-scale potato farm
Klaus[1]	77	m.	retired farmer[3]	small-scale cattle farm
Matthias[1]	~35	m.	full-time farmer	Grazing-based cattle
Heinz[1]	~80	m.	retired farmer	no agriculture any more
Dieter[1]	~50	m.	full-time farmer	dairy[2]
Frank[1]	~40	m.	full-time farmer	dairy[2]
Michael[1]	~60	m.	peat-processing facility employee	not relevant

[1]pseudonyms, [2]dairy = conventional dairy farming, [3]retired farmer but still partly involved in hobby farming

5.1 Sociocultural values & meanings of peatland landscapes

The table below presents a summary of the findings, which are described in detail in the following section.

***Table 3**. Summary of the sociocultural values and meanings associated with the peatland landscape in the Gnarrenburger Moor, structured according to the non-material NCP category (own illustration).*

NCP category	Theme	Core meaning
Supporting identities	Local rootedness	Sense of belonging through place-and community-based attachment.
	Sense of community	Mutual support and solidarity among 'moor farmers' and the broader community.
	Farmer-nature connection	Close, every-day contact to wildlife and the natural environment.
	Farming as livelihood	Economic existence tied to personal fulfilment and family continuity.
Learning and inspiration	Embodied peatland-farmer knowledge	Generational, experience-based expertise in managing peat soils.
	Peatland-inspired storytelling	The moor as a source of local history and creative reflection.
Physical and psychological experiences	Aesthetic appreciation of moor-pastures	Open, green landscape are valued for its visual character.
	Experience of silence and calm	Landscape supporting mental well-being.
	Future anxiety and fear of decline	Concern over long-term future of the region and farming existence.
	Experiences of nature's higher powers	A sense of humility towards uncontrollable natural forces.
Responsibility	Land stewardship and biodiversity conservation	Active management seen as a duty to keep the land 'alive' and habitable.

5.1.1 Supporting identities

Local rootedness

For most participants, a strong sense of 'home' (German: 'Heimat') was self-evident. This sense of belonging appeared to draw on two different sources: a place-based attachment and a community-based attachment, which, in some cases, seemed closely interlinked.

Place-based attachment predominantly referred to the farm, the surrounding land, or one's home village or place rather than the moor as an ecosystem specifically. This became especially clear when participants were presented with prompt cards describing an explicit connection to the moor landscape, such as: 'I value this peatland landscape because I feel attached to it'. Rather than confirming this connection, most participants attributed their attachment instead to the place more broadly. Only two participants explicitly framed their sense of belonging as tied to the 'moor' itself. Dieter, for instance, described his 'property' as central to what home meant to him, explaining that relocation would mean leaving his place of residence altogether, "with all its consequences: circle of friends, neighbourhood". Mareike similarly explained that this place meant 'home' to her but questioned whether it was the moor or the place itself: "I can`t say with 100% certainty that it comes from living here on the moor. It comes from this being home, this is where I live." For her the moor was simply part of the place she belonged to, and therefore acceptable: "the moor belongs here, to this place, and so that's acceptable to me." Several participants similarly reflected that the importance of the place itself outweighed practical drawbacks of living on peat soil: higher building and maintenance costs, uneven ground, subsiding infrastructure and other water-related challenges regardless of whether this attachment was tied to the place itself, or to the moor. Heinz was one of the few participants for whom this attachment was explicitly and repeatedly tied to the moor itself, as illustrated by his response to those questioning the appeal of the place:

> Some people might not understand: 'What's so special about this place? You're always dealing with water here. There are floods and night frosts that freeze the roses. What do you even find beautiful about it?' People say things like that. But for me, this is my home, my place. - Heinz

When asked by a local newspaper to name his favourite place, the participant chose a spot within the small peatland conservation area nearby, where he would go to look out over the moor and watch birds and wildlife. For two participants, this attachment to the moor was further tied to their working lives within the peat industry. Uwe, who worked in the peat industry for 43 years, described this as inseparable from who he was: "I have never done anything else in my life but work with peat [...] that is almost a self-image." Heinz, who went into peat work - "into the peat, into the moor" after giving up his farm, described this period similarly, as a lasting part of his life. As both participants belonged to an older generation, this may reflect how deeply peat-related work was culturally embedded in the region during their lifetimes, shaping their broader occupational lives. It may also reflect the more limited range of local employment available in the region at the time. Holger, for instance, noted that 'jobs are somewhat scarce here' and that farmers often turned to local peat work after leaving farming.

In addition to landscape characteristics and occupation, a similar explicit connection to the moor itself emerged in how some participants explained their inability to imagine living anywhere else, tying this directly to having grown up in the moor region. As Jörg put it: “It’s true — the moor is the moor. If you grew up here, you certainly don't move away. We live here all by ourselves anyway. It's quite isolated. [...] you have to have grown up here to be able to live here. That’s how you learn to live with the moorland”. This attachment to the moor extended into a deeper sense of self, when the participant described himself as a “person of the moor” and compared his attachment to the place with that of indigenous communities. This comparison was his own framing and was not further elaborated upon in the interview. This degree of identification was an exception and was not shared by other participants. One participant, Matthias, expressed a wish to farm elsewhere, away from the moor, so that he could let his cows graze outside without water difficulties. He had originally moved to the region because land prices were low and described the friendships he had built there as a key reason for staying: “I built a circle of friends here at the time, and I'd say that's also a reason why I want to stay.”

Sense of community

In additions to attachment to the place itself, several participants also described a strong sense of community as an important source of belonging. It was often described as rooted in mutual support and a general sense of ease and comfort among the people who lived there. In contrast to the feeling of local rootedness, this sense of community was more consistently tied to the moor itself. Several participants, for example, talked about ‘moor-farmers’ or ‘moor people’ as a distinct group. Mareike, for instance, summarised a common saying among moor farmers, contrasting them with farmers on sandy soils: "The Geest farmers can't handle it – you have to know how to work with moor." Dieter similarly described that at meetings among moor-farmers, “we don’t need anyone from the Geest there.” Furthermore, Mareike also linked the sense of community more directly to the practical conditions of moor farming: because larger machinery cannot be used on peat soil, moor farmers still rely on each other during harvest peaks for example, which she felt strengthened community ties compared to other regions. These small, family-based farm structures were something several participants valued in this context. Apart from farm-related tasks, others described supportive community structures more generally, whether in the form of neighbourly assistance or support during local events.

This sense of community was, at times, also framed as historically and culturally grounded. Several participants recounted the hardship endured by the earliest settlers of this moor region. Jörg, for instance, explained that the mutual reliance this hardship demanded had, over generations, formed a lasting solidarity: "that's

even shaped by the moor, that we stick together here a little [...] and that has remained the case to this day." For Holger this sense of community was closely tied to his contentment with life in the moor: “We have everything here: friends, sociability [...] you're somehow more easily content here in the moor.”

Farmer-nature connection

For several participants, a close connection to nature, independent from the moor, was described as an inherent part of being a farmer. Timo summarised this: “As farmers, we are generally very connected to home and nature.” Rainer similarly described this connection, alongside working with animals, as his primary motivation for farming: “My work with the animals, with nature itself, being out in nature and working within natural cycles.” He noted, however, that this connection was not specific to the moor: "Whether I'm here or on a different soil type elsewhere, I don't see a difference.” This connection was also frequently expressed through a close, daily familiarity with wildlife. Mareike, for example, described an attentiveness to partridges and roe deer that recurred on her pastures each year, expressing a sense of quiet pride in recognising them: "You also work a little for them, in a way.” Dieter, similarly, described the lapwing as a good example of this bond, noting how the bird returns to the same spot on his fields year after year, regardless of whether it is currently pasture or ploughed for potatoes:

> *The lapwing is a good example – it's site-loyal. It doesn't know there's no grass there anymore, that we're growing potatoes instead. What does it do? It builds its nest right there, because that's its spot. [...] When we come back to tend the potatoes, to hoe and so on, you just carefully steer around it, and it flies off again. That's the kind of thing that happens when you live with nature. [...] When the little hares are running around and you're rolling the field; you carefully steer the roller around them. That's all part of country life, because we're so close to nature.* - Dieter

Generally, as with local rootedness or place-based attachment, this connection to nature was thus largely described as a general feature of farming life rather than something specific to the moor. By contrast, one farmer expressed that he did not consider wildlife conservation particularly important. He illustrated this with an example involving an owl found on someone’s land, which was then subsequently placed under conservation status. A decision he could not understand. He further noted that only ‘the prices’ motivated him in his work as a farmer.

Farming as livelihood

For most participants, farming represented their economic existence. Yet its significance also reflected a broader way of life. Several of the active farmers emphasised that farming sustained their entire family, sometimes spanning multiple generations living from the same farm. A continuity some hoped might one day

extend to their own children. Dieter described this most directly, identifying the moor first and foremost as a source of “existence for many, many operations”, and situating his own farm within six generations of continuous family farming. His son who also joined the interview is already part of the business, and together they described actively considering how to make the farm viable for the future.

Other participants described how they continued farms previously run by their parents, sometimes extending or reinvesting in them over the years. Timo, for example, had just built a new stable a few years prior. Klaus recalled never taking holidays because of this continuous reinvestment: “We rarely - almost never - went on holidays. We never spent money on that. It always went straight back into the farm, and it kept growing. But it also gave you a certain standing. We were the biggest farm here.” He illustrated this with a small anecdote, explaining how being a farmer once carried a certain standing in society, which was no longer the case today according to him. Timo expressed a related frustration: that food production was increasingly taken for granted, with customers expecting prices to remain as low as possible regardless of the effort behind production. He describes this lack of recognition as one of the more negative aspects of farming, noting with an apology for his own choice of words that he “works his ass off every single day” without this being appreciated in return, whether through theft or through low prices. Despite this frustration, farming was, for Timo and others, still something they described enjoying. Something they valued for the independence it offered, the daily connection to nature, their animals and the yield gained from their own fields: “you see that you’ve achieved something,” as Timo put it. Rainer described this similarly in his own words:

> Well, independence for one thing. My work with the animals, with nature itself – being in nature and working within natural cycles. What you harvest in the fields, feeding the animals, getting a yield out there – these are all things you don't find in every job. - Rainer

Mareike expressed a similar sentiment, noting that she would not choose to keep working on a Sunday if she did not genuinely enjoy it. Another participant had put a sign next to his potato field reading: ‘Into Paradise’ and later referred to that, explaining that they work where other people spend their holidays. Two participants however, also mentioned that becoming a farmer had not been a free choice. Heinz had originally wanted to become a pastor, or a vet yet still found it hard to give up farming once it could no longer sustain his family. Klaus similarly recalled that his younger brother would have made a better farmer.

Another recurring theme throughout the interviews was the role of farmers as food producers, often described with a sense of pride. As Timo said, for instance: "But

I'm also proud that we produce some of the cleanest and safest food here, food you can eat without worry." Rainer similarly highlighted the scale of his family's dairy, which supplies a substantial share of the wider region directly: "We deliver to 500 kindergartens and schools, 1,000 private households, and several shops." This appeared closely tied with a strong, often personal connection to dairy cows specifically. Mareike summarized this simply, laughing: "My passion is the cows." Jörg similarly explained having "a different relationship with them than with other animals, because you milked them twice a day [...] and then you were content too, when the cattle were content."

Several dairy farmers also described actively choosing pasture-based grazing for their cows, despite the practical difficulties this posed on peat soil. Mareike, for instance, continued to graze her cows despite receiving no additional pay for pasture-based milk and the extra work required: "for me the cows simply belong there". Rainer similarly described choosing to offer seasonal grazing. Timo, by contrast, expressed a wish to let his cows graze again, but explained that this was currently not possible due to wolf predation risks and unfavourable soil conditions on his 'moor pastures'. Some participants additionally engaged in direct marketing alongside dairy farming, with two running small farm shops selling local products such as potatoes, ice cream, and other dairy products from their own production.

Taken together, these accounts suggest that farming's economic necessity, personal fulfilment, and close connection with dairy cows emerged as closely interwoven dimensions of what farming meant to the participants.

5.1.2 Learning and inspiration

Embodied peatland-farmer knowledge

Water regulation was widely described as a basic precondition for farming on 'moor soil'. Heinz, described this as a rule that was culturally embedded and passed down across generations:

> The rule, fifty years ago and before, and after that too, was simply: if you want to harvest anything on the moor, you first have to drain it [...] it was the guiding principle. It mattered for the farmers. Whoever neglected it just had wet soil and couldn't harvest anything. - Heinz

Jörg recalled this necessity from his own experience, describing how potatoes and grain had frequently been lost to flooding, requiring farmers to "drain, drain, drain, just so we could even get onto the fields at all". Dieter similarly explained that they had only started draining their fields more systematically in the 1990s, noting that this now allows them to drive and work almost anywhere on the moor. Across

several accounts, a dry well-drained moor was therefore often associated with agricultural productivity and profitability while wetter conditions were viewed as economically limiting. This is a distinction that becomes relevant when considering attitudes towards rewetting (see Barriers and Enablers).

Participants further described how as ‘moor farmers’, they had learned over time to manage the general challenges of moor soil, as well as the specific conditions of their own land. This included, for example, knowing how to drive on it properly, and being especially cautious during periods of rain. Rainer, for instance, noted that fields were “noticeably cooler in spring and dry out later” than sandy soils. Grazing, similarly, was only considered feasible during dry summer periods, as pastures could otherwise turn muddy quickly. Timo added that farms in the region had specialized accordingly, relying on lightweight machinery and twin wheels suited to the moor. This sense of specialised, hard-won expertise was expressed most clearly by Mareike, who noted that ‘moor farmers’ develop a keener sense for the soil than farmers elsewhere, because “it doesn’t forgive as quickly”; pointing to a common saying:

> The Geest farmers can’t handle it. You have to know how to work with moor. - Mareike

She illustrated this with a concrete example: after a hired contractor drove heavy machinery onto one of their potato fields, the resulting damage was still causing problems more than ten years later. When she reflected on the lack of recognition by outsiders, she explained: “There are reasons why we work the way we do. We're not backward – we work with the soil, in a way that’s sustainable.” Some participants, however, noted that while they were constantly learning, this was not necessarily tied to the moor specifically.

When discussing embodied practical knowledge, participants frequently used technical terms such as ‘soil’ (‘Boden’), ‘plots’ (‘Flächen’) or ‘ground’ (‘Untergrund’) alongside ‘moor’ (‘Moor’). One participant also called the layer below the first 10 centimetres of the topsoil ‘dead soil’ because once disturbed this part would no longer support plant growth. For this reason, she explained, moor farmers avoided disturbing the older, established soil structures of their pastures unless necessary. Timo similarly described a chemically precise form of soil management: while liming the moor was common practice, he explained that they deliberately kept this to a minimum to avoid raising the soil's pH level too far, which would cause it to decompose – supplying the plants only with the calcium oxide needed as a nutrient, 'because it's our land, our soil’. Across these accounts, this body of knowledge appeared to emerge less from formal instruction than from direct, often generational experience of working the land itself.

Peatland-inspired storytelling

For a few participants, the moor also served as a source of inspiration for storytelling and reflection. Klaus, for instance, described writing down local historical stories on his computer and describing this as something he simply enjoyed doing. Two participants also shared self-published books about local history with the researcher during the fieldwork.

Other participants that reflected on the prompt card about 'peatlands as a source of inspiration', often expressed ambivalent feelings about whether such inspiration was specific to the moor itself. One participant, for instance, noted that the 'Moor-Lehrpfad' (moor educational trail) likely creates 'a lot of images' and 'probably a lot of ideas' for visitors. He also questioned whether this source of inspiration was specific to the moor: "the artist from Worpswede who paints moor landscapes, he could just as easily be standing her on our mineral sites, watching the deer run across the field". But he immediately added: "Well, of course it's different here, like in the mornings with the fog and all that. That's definitely different." Matthias expressed a similar view, stating that nature inspired him in general, but not the peatland specifically.

When asked about specific stories or memories connected to the moor, most participants referred to everyday anecdotes from their farm life, recalling a particular wet year or getting stuck in the mud. A few participants, however, recounted single, distinct stories tied to the moor's own history. Heinz recounted the story of a Second World War aircraft that had crashed and remained buried in the moor, describing it as 'an incredibly fascinating story'. Klaus similarly described discovering an old, broken gravestone while restoring the local cemetery, which led him to uncover the forgotten history of a local family.

5.1.3 Physical and psychological experiences

Aesthetic appreciation of moor-pastures

Several participants associated the moor landscape with its green pastures and wide, open views, often describing this appearance as particularly beautiful. Timo, for instance, specifically described the region as 'green moors', explicitly distinguishing its largely green cultivated appearance from the exposed black peat still visible at some active extraction sites. Mareike explicitly rejected a common stereotype of moors as dark and gloomy, describing her own experience in striking different terms:

> What I definitely don't associate with the moor – I find that sometimes, when you talk to people, they connect the moor with something dark, like there's only birches standing there and it's

swampy and all that. And I think, no, that's not what we have here, that's not really it. [...] For me, [the moor] is bright, a lot of green landscape, wide views, and structured. – Mareike

At another point in the interview, Mareike additionally described that she liked the structuredness within the village due to systematic drainage. She referred to the fact that every farm plot was originally laid out the same size, with generally straight roads. In contrast, Matthias described missing structural variety in the moor compared to hillier regions with "small forests, winding paths, small fields and hedgerows".

Alongside this appreciation of the landscape's structure, the moor birch was frequently mentioned as a defining visual feature, though with mixed sentiment. Heinz, for instance, described it as something one had simply grown used to, yet still considered fitting: "The birch tree, the birch, the moor birch that belongs in the moor - it doesn't usually grow very straight, but it belongs there." For others, however, an overabundance of birches carried more negative associations, closely tied to concerns about land abandonment (see section 3.2 and 3.3. for Barriers and Enablers).

Grazing ruminants, cows in particular, were closely tied to this aesthetic appreciation of the moor landscape. As Rainer put it: "First and foremost, I see our cows as connected to the moor meadows here". Matthias similarly described enjoying the sight of his cows grazing, describing it as calming. Alongside cows, other wild species, such as skylarks, lapwings, storks, cranes and partridges were likewise mentioned as part of this positive landscape experience. One participant noted that there was not as much game left as there used to be: "It's a real shame. This used to be an area full of game—especially game birds. And I really do regret that we don't have partridges anymore, no more pheasants either." Mareike, by contrast described a quiet pride in observing the same partridges and roe deer returning to her land year after year.

Experience of silence and calm

Apart from this visual, outward appreciation of the landscape and its wildlife, several participants also described a quieter, more inward experience closely tied to their overall sense of well-being: a feeling of silence and calm. Some specifically attributed this with the moor landscape, while others stressed that you could experience this sense of quietness everywhere in nature or in rural settings more generally. Holger, for instance, expressed a strong appreciation for the sense of calm that the moor offered, describing how simply arriving home after a stressful day helped him unwind: "I'd say, you come down, you slow down. It's not too loud here. You can really unwind. [...] you come into your own four walls. This was

always your own patch of land. Then you arrive. That brings you back down. And then everything's okay again." He further explains that walking his dog out on the field would really calm him. For Heinz, this appreciation centred on a specific place within the moorlandscape: a raised lookout point within the Huvenhoopsmoor nature reserve, which he named as his favourite spot in the entire region.

> That's my favourite spot, where I can look out over the moor and watch the birds and the animals. And best of all, when there's no one else around – no tourists, no visitors – just sitting there alone on the hide, letting your soul wander. You don't need to travel the world for that. You can have that right here in the moor. - Heinz

Jörg, in contrast, did not describe this quietness as something unique to the moor, but simply as a matter of habit. When asked what he considered special about the moor landscape, he replied: "Actually, nothing. If you think about it. I'm here—yes, we live pretty quietly here, pretty secluded, we're hardly ever disturbed. But it's all just a matter of habit." Despite this, most participants named the area's silence and calm as a reason for not wanting to move to a city, or even to the nearby, somewhat larger town of Gnarrenburg, which they considered too noisy.

For a few participants, this sense of calm was less tied to the landscape as a place but rather to their daily farming activities within it. Dieter, for instance, associated it directly with the rhythm of farm work itself: "When you're out rolling the land, you can nicely take in the moorlandscape, look around, think about everything, find some peace. [...] But that doesn't necessarily have anything to do with the moor specifically." Jörg similarly recalled that milking cows had once been his own time for clear thinking. He now gets the same effect while cycling through the landscape with his wife, listening to the birds 'chirping'. In contrast, Matthias explained that he did not need the moor landscape to think clearly. He simply "needs some calmness". Klaus made a related point stating that for him, singing in the local choir worked better than time in the moor at clearing his mind: "The moor landscape can create problems; it can also inspire reflection, but the choir is better in that regard."

Regardless of its source, this sense of silence and calm was consistently described as an important part of participants' everyday well-being and source for mental clarity.

Future anxiety & fear of decline

As described in relation to 'Farming as Livelihood', farming represented, for many participants, the economic foundation of their family's livelihood. This dependency also frequently appeared closely tied to the overall well-being of the farmers. In this context, several participants expressed concern on multiple levels: about the

existence of their own farm, about the future of farming in the moor more generally, and about the broader decline of the region as a whole.

The decline in the number of active farms was widely recognised as a broader trend across German and global agriculture, but participants described this decline as particularly severe in the moor, due to shifting political conditions. Of the eleven interviewees, five had already stepped back from active full-time farming. They were either fully retired or continued part-time farming as a hobby.

Holger described how giving up dairy farming a few years back had ultimately been the right decision, though he acknowledged the strain the preceding years had caused: “It affected both our health. My side wasn’t doing well, my wife wasn’t doing well either, because money was always tight. [...] And in the end it was a good decision. Our souls are free again now, and financially it works out too. And the bull mast on the side, that's manageable, it’s fairly easy in terms of workload”. He recalled how quickly the actual decision had been carried out once made: “Then it went fast. We actually planned to sell the cows in autumn '19 [...] [but] the farm inspector asked when the cows should go. I said, October, autumn, sometime. ‘NO, NOW’. And then they were gone. We milked them one last time, sorted the cows, and the next day they were gone – without shedding a single tear. That's how fast it went back then.” Although Holger described the decision itself as quick and largely unemotional, a brief follow-up question revealed a different picture. The interviewee asked whether the decision had nonetheless affected him, and he responded simply: “It did. It did. It did.”

Rainer reflected on the future of his farm, particularly in relation to his daughter, who works alongside him: “With what feeling can you tell her, yes, it'll all be fine? Or do you have to say, better move to the city – there's no future here in 20 years?” However, he pointed out that he generally has a positive mindset, and that thinking about the future did not necessarily make him anxious. Mareike, for instance, described farming as generally uncertain due to politics: “but for the moor specifically, I find it extreme.” She further explained that this uncertainty was one reason why she avoided investing in a new stable, finding it “almost brave, in a way, when people build these huge new stables here, because we're 100% on the moor with our land, and I don't even know if I'll still be allowed to work here in 30 years”. Timo expressed a similar sense of uncertainty but, in contrast, ultimately decided to build a new stable, reasoning that the political situation and decisions regarding rewetting was unlikely to become any clearer over time: “this whole topic has already been going on for four or five years now, and it was already just as acute back then”.

For a few participants, this anxiety extended to the future of the whole region. Holger, who had given up farming a few years earlier, expressed a more severe sense of pessimism when reflecting on the political situation in recent decision-making processes, expressing farming as something 'simply not wanted' by political authorities. Later in the interview his concern extended into a more fundamental hope: "I just hope that we here in the moor aren't forgotten. That's really all you can hope for – that we're still here, that we have a right to be here." Klaus expressed this fear of decline particularly strongly:

> It's just... the fear, I guess, or seeing that maybe one day there's just nothing left anymore. That's the hardest part. [...] That no one lives here anymore. The houses fall apart, and we actually have too good a region for that. [...] Interviewer: Does that scare you sometimes? Response: Headaches! - Klaus

Experiences of nature's higher powers

Alongside this sense of powerlessness in the face of political change, several participants expressed a humbling experience of forces beyond their control. In that context several participants responded to the prompt card stating that 'peatland landscapes remind me of forces greater than myself'.

Mareike attributed this specifically to the soil itself, describing it as something that influences her daily work and its outcome: "that's the soil – if I don't look after it." Jörg framed this historically, linking it to the hardship earlier generations had faced simply to survive on the moor: "Nature, I mean – it's different now, but in the past it was quite remarkable just that people survived here at all." Heinz connected it to his religious faith, describing these forces as not necessarily divine in a traditional sense, but present "among us" nonetheless.

Holger related this idea to a broader sense of resilience, reflecting that "there's always some way forward". Matthias, by contrast, explicitly rejected any specific connection to the moor, stating that such forces "can be found everywhere in nature". Others spoke of extreme weather events and natural hazards, such as flooding, which farmers could not control but had to accept and work around. Dieter described this vividly in relation to a recent heavy rainfall event that ruined an entire potato harvest: "The power of nature can't be influenced [...] you're simply powerless. That's just how it is."

5.1.4 Responsibility

Land stewardship & biodiversity conservation

In terms of responsibility, two central themes emerged most clearly: stewardship of the land and biodiversity conservation.

This sense of responsibility for actively maintaining the land was for some tied to keeping the region habitable at all. Klaus expressed this most directly: “It's about the landscape – the landscape needs to be cared for and maintained somehow, if it's still supposed to be a living space for people.” Dieter expressed a similar view, illustrating the consequences of neglecting proper management:

> Well, someone has to manage it! Someone has to take care of the land and manage it, otherwise we'll end up with grassland that's all rotted. - Dieter

He further explained that such neglected land would eventually begin to smell, affecting neighbours as well. For Mareike this stewardship was explicitly linked to sustainable farming methods, framing her careful approach to the soil as an alternative to outside criticism: “We're not backward. We work with the soil, in a way that's sustainable.” Timo similarly explained that they deliberately limited liming to avoid raising the moor’s pH and causing the soil to decompose “because it’s our basis and our ground.”

This sense of stewardship extended, for some, into biodiversity conservation more specifically. Klaus linked the maintenance of the land directly to the survival of meadow birds, explaining that without regular management, bushes would gradually overtake the meadows: “if we want to protect meadow birds, we need meadows [...] if all we have is bushes and scrub, there are no meadow birds.” Other participants similarly named specific species whose continued presence they valued, including lapwings, partridges, and roe deer, reflecting a broader sense of care for wildlife sharing their land. Matthias, for instance, stressed that grazing his cattle was itself a form of active biodiversity promotion through their droppings. Other participants similarly viewed climate mitigation as comparatively less central, placing greater weight on maintaining their business itself. Uwe, for instance, acknowledged its relevance but prioritised the continuation of active farms: "That's something too – you could say that's perhaps important. But what's actually also important to me is that farming – the farming that still works 100% in the moor and lives off it – they also need to keep a future."

Timo, by contrast, named climate friendly dairy farming as a key motivation for his work apart from producing good quality food. He pointed out that they are part of a climate project called “Net Zero Farming”. He explained that the moor remained a comparatively ‘favourable location for milk production’ in terms of carbon footprint, when viewed globally: “We’re still in a favourable location, and we should continue farming in some way while trying to reduce our carbon footprint

through other means and methods that are climate friendly. It's simply the tension between farming wet moorland and producing climate friendly milk."

5.2 Barriers to rewetting for paludiculture

Building on the values and meanings described above, this section examines how these shaped participants' attitudes towards rewetting and paludiculture. Barriers emerged across several dimensions: practical and technical knowledge and experiences, identity, aesthetic and economic considerations, and a broader sense of responsibility as a farmer. These table below presents a summary of the key findings, followed by a detailed description of the barriers and enablers.

***Table 4**. Summary of the most prominent barriers and enablers to paludiculture adoption (own illustration).*

Barriers	Enablers
• Loss of agency and political planning uncertainty • Scepticism over technical and practical feasibility • Economic pressure and lack of a realistic viable perspective • Perceived loss of generational farming legacy • Aesthetic-related concerns and sense of responsibility as land-stewards	• Economic incentives and secure livelihoods • Political recognition of farmers realities • A clear pathway and planning certainty • Farmers' involvement in the planning process

5.2.1 Knowledge- and experience-based barriers

Fear of livelihood and existence: Loss of autonomy & planning insecurity

Most participants were aware of ongoing political discussions about rewetting and had already heard of paludiculture. Overall, they perceived Germany's rewetting proposals as unrealistic and disconnected from practical, on-the-ground realities. Klaus, for instance, expressed a general critique of policymaking, arguing that politicians often lacked farming experience, resulting in regulations that 'just don't fit reality'. Dieter described how the often-cited figure, that 7% of agricultural greenhouse gas emissions stem from moorland would likely shrink to closer to 2% in practice, stressing that a significant share of this land could not realistically be rewetted, since it was covered by residential buildings. While acknowledging that

peatland restoration for climate mitigation matters in principle, he trailed off: yes ‘restoration’ that’s a great word, but the recipe…’. Mareike offered a related critique of the national rewetting plans, arguing that they had not properly thought through. She pointed to lack of funding as well as insufficient consideration of existing social and agricultural structures within these moor regions: “You can't just throw something out there like 'we want to rewet 30% of the moors [...] we really don't have to think about it for long to say that's total bullshit, because they haven't thought it through yet.” As a particularly vivid illustration of this gap between policy and practice, she described how rewetting maps for the region appeared to have been drawn up arbitrarily, without any real verification of actual conditions on the ground: “Even the Fahrendorf cemetery was marked for rewetting on their maps.”

For several participants, rewetting alongside paludiculture was therefore not understood as one farming alternative among others, but as an external removal of control over their own land and livelihood. Mareike put this most directly:

> But this ‘rewetting’ is really more like a form of expropriation. They’re forbidding me from using my property to generate income. – Mareike

Another participant (not recorded) described the ongoing paludiculture project within the region as ‘a slap in the face’ (‘Ohrfeige’) for local agriculture. Dieter described the underlying logic of this loss of control as a more fundamental question of who gets to decide over someone else’s property when it comes to rewetting: “If you had a small house with a nice garden – your property – and I had to decide about that, as a politician or an outsider... it's much easier to decide over other people's assets when it doesn't affect you.”

Some participants also feared losing their homes. Holger, for instance, described how one local activist had once warned: “Watch out, we're losing our villages – they're falling apart, they're rotting away, and then it's over. And then we'll be resettled.” Dieter similarly expressed the fear of its consequences: “We would then be leaving our farm here – so I would be leaving my place of residence, with all its consequences: circle of friends, neighbourhood. Business-wise, that's one thing, but the personal side is another matter entirely.” Holger expressed this fear as a final, quiet hope rather than an outright demand, when asked what gave him hope for the future:

> I just hope that we here in the moor aren't forgotten [...] that we have a right to live here. Not just as some kind of statistic, but that there are people with families here. - Holger

Several of the active farmers stressed that they remained economically dependent on the moor and could not simply convert their farming systems in the short term. Some mentioned having debts that they would need to be paid off before retirement. Timo, for instance, had recently invested in a new stable. Rainer clearly stated that "a farm like ours, running conventional dairy farming, simply can't harvest feed from fields once they're rewetted. Farms like this need land that isn't affected by rewetting."

Nevertheless, for many participants, it was this lack of a coherent, technically informed plan, rather than the idea of rewetting itself, that made farmers dismissive of change. As Timo put it: When they're aware of that, they first need a clear plan – one that can work, because this 'everything has to be wet' thing just doesn't work like that. [...] Then you'd have a plan, and you could try to make the people affected aware of it. For Timo, this meant that policymakers first needed to develop a genuine awareness of the real situation on the ground. He added that this unresolved uncertainty had persisted for years without any real progress: "This whole topic has been around for four, five years now, and it was already just as acute back then, as if it was going to happen tomorrow." He explains that he would generally be open to it but notes: 'I can't just keep waiting another ten years until I find out'. Rainer described these concerns together in a single reflective statement:

> And once it's been restored – I mean, if you think back 200 years, there was simply nothing here. Not even roads or houses. Do we want that again? So, is that supposed to be the goal, in however many years? Or are there other goals? That's exactly where we're standing right now, on the threshold. Which areas can actually be restored? How can private individuals live with that? It's not just farmers here anymore; there are also a lot of people living in the villages. And if you're talking about the socioeconomic context, there's a lot of life going on here that wouldn't be possible if we actually rewetted and restored this whole area so that no one could live here anymore. And I see that as a critical issue if that's really what we want? But maybe the truth lies somewhere in between. That's what I'd hope for, let's say. And ultimately, of course, the question always pops into your head right away: what will happen to my farm? - Rainer

Scepticism specific to rewetting and paludiculture

Several participants also raised a more fundamental doubt about the practical feasibility of rewetting and paludiculture implementation. They pointed to a lack of practical evidence, expressing uncertainty about how water could realistically be retained in their specific raised-bog environment. Mareike put this bluntly: "We're a raised bog, though. What are you going to do, build walls around it?" Rainer articulated a similar concern drawing on basic hydrological reasoning:

> Anyone who paid attention in physics class knows this can't really work. You can't hold water on top of a hill. [...] I still see water as the biggest problem in this whole thing. - Rainer

Others pointed out that the entire landscape had been engineered for drainage over centuries, stressing the complexity of reversing these structures, and noted increasingly dry summers as a further reason to doubt whether sufficient water would even be available for rewetting. Several participants also questioned whether the land could still be worked at all once rewetted. Mareike described a neighbouring, already-rewetted plot where even tracked vehicles could no longer be used: “Right now, they can't even drive a tracked vehicle on it.” Timo's own experience with controlled water-level management showed a similarly narrow margin, with fields becoming impassable with a water table above roughly 30 to 40 centimetres below the surface. Several interviewees also stressed that rewetting would require large, contiguous areas, arguing that the small, fragmented land parcels typical of their region made this difficult. Mareike and Dieter, for instance, explained that coordinating access to both sides of drainage ditches was often complicated due to multiple landowners and leasing arrangements.
Taken together, these concerns suggested that, for several participants, the basic mechanics of rewetting and paludiculture implementation remained unresolved.

Scepticism rooted in prior rewetting experiences

Participants’ scepticism was further shaped by direct experience with an earlier, related rewetting project. Unlike paludiculture, this projects’ aim was to raise water levels within existing fields while maintaining current agricultural. Mareike, for instance, offered critique about its practical implementation, arguing that disturbing the site’s ‘hundred-year-old turf-structures’ had been a methodological flaw: “'If you re-seed on the moor, every farmer knows this – on sandy soil you can re-seed every five years, but on the moor, it takes five years just to get back to farming it the way you could before.” Timo similarly drew on his own experience with the model project explaining that this kind of rewetting simply did not work for him, because it not only produced lower yields but ‘poor quality grasses’, given that the conditions were ‘too wet’ for high-quality forage. Rainer expressed a related concern from the perspective of conventional dairy farming specifically: “A farm like ours [...] simply can't harvest feed from fields once they're rewetted. Farms like this need land that isn't affected by rewetting.”

Economic viability concerns

Alongside these practical and technical doubts, participants also questioned the economic viability of paludiculture itself, compared to drainage-based dairy farming - naming, for example, the absence of established markets, high upfront costs, limited access to credit, and the lack of any reliable price for the product.

Matthias, for instance, raised a more basic question: “What is this peat moss even needed for? For potting soil, or what's it used for? [...] I don't quite understand what it's supposed to achieve.” Dieter raised a more technical concern about supply reliability, contrasting the seasonal, weather-dependent harvest of paludiculture products with the consistency of dairy farming: “It’s not like the milk, where cows give milk two or three times a day, delivered constantly. But these products - we can’t harvest them in winter, and on re-wetted land with minimal accessibility, yet buyers want a constant supply, while it only grows in summer.” He further noted that dairy farming in contrast has a long-term future because prices are relatively stable and profitable. Holger questioned the scalability of the production: “Where would the quantities even come from? [...] whether it could really take off – that's difficult.” One participant explicitly referred to ZukunftMoor as a ‘project’ rather than a realistic long-term livelihood option, questioning whether it could ever replace dairy farming or grassland-based production economically. The economic uncertainty appeared, for some participants, closely related to a deeper attachment to their current way of farming, which will be described in more detail in the following section.

5.2.2 Identity-related barriers

As shown above, farming was for many participants not merely an occupation, but a central part of their identity (see Farming as a Way of Life). This section examines how this identity-based attachment translated into resistance to change, both through attachment to current farming practice and through a deeper generational legacy of moor-farming.

Attachment to current farming practice

For some of the still-actively farming participants, resistance to change appeared closely tied to how strongly their identity was bound to current farming practices. For Matthias and Mareike this reluctance was expressed most directly in relation to *Sphagnum* farming specifically. Mareike clearly stated that this could only ever be a solution for selected, marginal plots, not a replacement for dairy farming for the region: “Especially with the peat mosses – that's not something we can do across all our land here. We can't just all be growing peat mosses, regardless of whether there's a market for them or not. If we did that, I'd say, "I'd shut the farm down!" But I just think it's a good option for a few selected areas.” Matthias expressed a similar view, explaining: “I mean, if it works, that's great. But it wouldn’t be for me. I’m certainly not going to become a reed and peat farmer because of this. I can harvest the stuff that grows on the side. But if I were to do nothing but that and stop raising cattle, I don’t know. I think I’d end up moving somewhere where there is no moor.” Rainer similarly described that giving up his dairy farm, including over

thirty years of relationships with customers through direct marketing - would ‘break [his] heart’.

Generational legacy of moor-farming

For several participants, resistance to change was closely rooted in a deeper historical moor-legacy. Uwe traced this back to the region's founding history itself, describing how settlers had come to cultivate the moor roughly 300 years ago out of necessity, not choice: “That's why people came here 300 years ago – because there wasn't enough food [...] they didn't come here because it was beautiful; they came because there were farms all around here with three sons, but only enough land for two or even one of them. The others went out onto the moor and cultivated it.” Heinz described a related history of hardship, noting that only those who endured the difficulty of life in the moor had formed what he called an "elite" capable of living and working there.

This inherited legacy appeared to continue to shape attitudes towards change today, particularly among older generations. Mareike, for instance, recounted how older farmers in similar situations tended to react to change with more resistance, quoting a common sentiment: "I built all of this, I paid for it, and now he's tearing it all down again." She suggested that this dynamic was not necessarily tied to the moor itself but reflected a broader generational pattern she had observed repeatedly: certain farms, in her experience, remained so entrenched that "you don't even need to ask" whether they would be open to change – a resistance she did not expect to shift meaningfully in the next generation either. Dieter described a closely related dynamic, framing it explicitly as a ‘social factor’: farmers aged 70 and above, who had spent one or several generations making the land arable, could not imagine it being deliberately rewetted again. He contrasted this with the younger generation, whom he described as more pragmatically focused on whether a change would be financially worthwhile, rather than opposed to it on principle. Timo offered a deeper explanation for this generational resistance, suggesting that many older farmers experienced the push for rewetting as a personal attack on their life’s work:

> They still remember how much backbreaking work it took to cultivate this land [...] and now, suddenly, everything they did is supposed to be wrong – some take that as a personal attack, which I can well understand.
>
> - Timo

Heinz, himself part of this older generation, confirmed this perspective, acknowledging the emotional weight of watching land ‘made arable through blood, sweat, and hard work' now be deliberately rewetted. He described this as something that fundamentally contradicted a farmer's professional identity and intellect. Yet

he was careful to note that his own openness to the idea came from a position of relative safety, since he no longer depended on the land economically: “I can say that from a secure position – easy for me to say. My land, I've already leased it out.”

5.2.3 Aesthetic and physical barriers

Fear of landscape change, flooding, and abandonment

Alongside these practical and identity-related concerns, several participants expressed a more visual and sensory form of resistance: concern that rewetting would fundamentally alter the appearance and liveability of the landscape itself. Mareike articulated this most vividly, describing a stereotype of the moor she otherwise rejected – dark, overgrown, and swampy – as precisely what full-scale rewetting risked producing:

> We don't want everything we rewet here to end up as just birch forest and deep, swampy moor [...] then nobody would want to live here anymore. People are glad that we have wide views and structure here. - Mareike

Dieter expressed a similar concern in vivid, visual terms, unable to picture the resulting landscape as attractive: “walking through fallen birches standing in water – I just can't picture that as beautiful.” Jörg drew on a related distinction, separating land that was actively cultivated from land simply left to grow wild: "when it becomes overgrown [...] it's just trees growing everywhere. That's not so nice." Klaus raised a further aesthetic concern about monotony, arguing that a landscape consisting only of peat moss would lack the variety he associated with a healthy landscape: "if everything is just peat moss, that's boring [...] there needs to be some variety." One participant (not recorded) described it as a shame to see the beautiful moor pastures disappear while having observed construction work for the paludiculture plot in Barkhausen. Others expressed this concern less directly, instead pointing to the loss of the open landscape with its green pastures they otherwise highly valued.

Behind these aesthetic concerns lay a more practical argument: that peatland landscapes simply required active management to remain liveable at all. Dieter and his son made this point most concretely, warning that unmanaged, rewetted grassland would not flourish but rot: “Someone has to manage it! Someone has to take care of the land [...] otherwise we'll end up with grassland that's all rotted [...] and it really does stink. „Dieter compared unmanaged peatland to an unfed ‘concrete cow’ - a biogas plant that produces nothing without ongoing care: “That's not something that just waters itself, far from it [...] it also needs to be fed and looked after, otherwise you get nothing out of it.” Klaus drew on a similar

perspective, arguing that everyone knows that peatlands have to be managed to take care of them, otherwise they would ‘scrub over’.

For several participants, this concern about visible neglect, extended to a more concrete, physical fear of flooding in lower-lying parts of the village. Holger, for instance, reflecting on his role as a local community figure, described how residents feared being ‘drowned’ once water could no longer drain away as before. Rainer, though himself unaffected due to his elevated location, similarly described how many non-farming residents nearby had already experienced wet basements in spring and feared being 'flooded out' entirely if drainage were restricted. Klaus, by contrast, questioned whether this fear was justified, though he acknowledged a related risk: many local houses were built on wooden piles that could rot if groundwater levels dropped too far below them.

5.2.4 Responsibility-based conflicts

A final set of barriers emerged from participants’ sense of responsibility as farmers. These reflect conflicts between values they felt obligated to uphold, such as biodiversity conservation, food production, and doubts about the claimed climate benefit of rewetting.

Biodiversity trade-offs

A few participants named trade-offs between different species due to rewetting. Klaus had already articulated the underlying logic of this trade-off when discussing stewardship with the example of meadow birds (see above). Dieter argued that current agricultural species such as ground-nesting birds and hares “would be completely displaced if we move to rewetting” because they cannot cope with wet conditions. Like others, he further noted that, for example, other wet-tolerant species such as dragonflies might subsequently appear instead, suggesting that rewetting would not be bad for biodiversity in general, but would alter current species abundance. Others did not raise this trade-off explicitly but nonetheless emphasised the importance of local agricultural fauna and flora such as lapwings, roe deer, curlews and skylarks as part of their everyday relationship with the land.

Matthias argued that species diversity on paludiculture plots was generally low, since they were purely mechanically managed: “I do exactly the opposite. I try to develop land so that a diverse range of plants can grow there, which creates better conditions for insects, birds, reptiles, and other animals – through grazing.” He further states that the biodiversity aspect is way more important to him than the climate aspect.

Climate scepticism

This comparative reasoning was closely tied to a broader scepticism, expressed by Matthias and others, about whether rewetting would actually deliver the climate benefits it promised. Matthias expressed the strongest doubts, questioning the scientific basis of climate change itself: “I'm not entirely convinced that it's 100% down to human activity [...] I think it's being pushed too loudly.” Dieter raised a more specific, practice-based doubt about whether rewetting would reduce emissions, questioning both the CO2 and methane effects if the resulting land was left unmanaged. He argued that in mineralised soils, the loss of mineral content would prevent any further conversion process, and that decomposing, abandoned vegetation would continue to release methane regardless of rewetting:

> As for the CO_2 effect, I seriously doubt that rewetting would have any impact. Because with mineralised soils, like with peat moss, the mineral content gets washed away, then you’re back to theoretical white peat with no minerals, so there’s no more conversion. If we just make it wet now, the bacteria won’t stop. As Alex said, if we leave the area to its own devices, it could collapse and rot later, producing methane. In that case, we’d be no better off. We'll have done something just for political purposes, so politicians can say, 'We have a green thumb; we've rewetted so many thousand hectares.' It’s all wet, sure. But in terms of the carbon footprint, it hasn’t helped at all because it’s still rotting there, and nobody’s managing it. – Dieter

Others suggested that climate benefits were not taken seriously by many farmers simply because they could not be seen - even though, as Heinz put it, ‘it has been proven, yes indeed’. Rainer noted that ‘these CO2 stores’ [...] ‘it’s a great thing in principle’ but stressed the limited scientific and practical evidence currently available for its successful implementation: “It hasn't been scientifically established yet, and it hasn't been tested either.”

One participant had observed the peat moss paludiculture site in Barkhausen during its establishment phase, perceiving it as a form of destruction of soil and meadows and expressing doubts about whether such practices ultimately reduce emissions. He also felt this was unfair: farmers have to follow strict rules, for example on how to use manure, while this paludiculture approach was allowed to cause such large-scale destruction. Holger expressed an even more fundamental doubt, arguing that climate benefit now would come too late to matter:

> Now with all that CO_2 storage stuff, it’s all way too late anyway. The bog is already, I’d say, wrecked and gone and whatever. And you can’t just reset it, rewet it, and — poof! — it’s back again. That doesn’t happen here. - Holger

Food security concerns

Several participants also linked land withdrawal to broader concerns about food security, though with varying degrees of conviction. Uwe acknowledged the importance of climate protection but stressed that "farming, farming that still works 100% in the moor and lives off it, needs a future too." Heinz made a related point with reference to Germany's rewetting proposals, arguing that it would not be possible to rewet all the two million hectares: "What are we going to eat then? What are we going to live on in the end? Uwe raised a similar, though more understated concern: "We don't know if we'll still have enough to eat in the end – our food has to come from somewhere." Timo noted that it is important to think about where food comes from in times of crisis. He qualified this argument, adding that people would not 'starve' [...] 'I don't want to make that argument at all' but explaining that this was still worth keeping in mind when discussing rewetting proposals. Matthias made a related point, framing continued meat production in form of cattle grazing on marginal land as preferable to the environmental cost of alternatives: "The alternative is that we keep cutting down more rainforest in Brazil, which also emits huge amounts of CO2 – and then we breed our beef there and ship it across the ocean here, which puts even more CO2 into the atmosphere. I don't know if that's better."

5.3 Enablers to rewetting for paludiculture

Economic incentives & livelihood security

Economic incentives and a viable, realistic livelihood alternative were seen as the most important condition for enabling change. When asked about other values or beliefs beyond economic reasoning, most participants nonetheless returned to economic aspects. While some interviewees remained doubtful that paludiculture could become a realistic economic perspective in the near future, others expressed greater hope and optimism. Dieter, for instance said: "For us, it's just the purely economic effect." He drew a direct comparison to the earlier biogas boom, arguing that farmers would embrace wet moor management quickly, if a clear financial incentive existed:

> If someone could show me that you could make money with peat moss, we wouldn't need the company — all of us farmers could do it ourselves, the cows would be gone immediately, and we'd switch to peat moss right away. - Dieter

Dieter suggested that the younger generation was generally more pragmatic, less bound by the emotional weight of the past: "The next generation, they just say: somehow money has to come out of it, and then we'd be happy to do it." Timo expressed a similarly conditional stance, tying his openness to paludiculture

directly to the financial security of his existing investments: “If there's economic viability behind it — I mean, I am a farmer, and right now I'm still a dairy farmer, but our barn is ten years old and still needs to be paid off for at least another ten years [...] but ultimately, if I have an economic alternative where I can say, hey, we're doing paludiculture or peat moss farming now, and I can make a living from it, feed my family, keep running my farm, and be climate friendly on top of that — well, why not?”. Rainer expressed a related conditional openness that while giving up his dairy farm – including over thirty years of relationships with customers – would "break his heart," he was careful to isolate what exactly troubled him: without this particular relationship, he explained, he would happily consider growing peat moss instead: "without the direct marketing, I could say, fine, no more cows then, we'll just grow moss instead. That's great too, I'd definitely enjoy trying that out. [...] Otherwise, I'm certainly open to things like that. And I could imagine real opportunities there too." Klaus described how they “were supposed to collect signatures from farmers covering 1,000 hectares within three months [...] most said yes right away. Because if they can live off it and just have to work differently, why wouldn't they?”

A few participants also pointed to concrete, emerging opportunities that made such an economic incentive seem more attainable. Jörg, for instance, noted that the local peat industry could become a valuable partner. The peat works, he explained, had already signalled interest in eventually selling peat moss themselves, once traditional peat extraction came to an end: “The peat works, which still produces peat or garden soil, will eventually come to an end anyway. And they've already signalled that they'd want to sell the peat moss too. So, I hope, of course, that this economic development turns out to be a good thing for the whole community.” An additional interview with a representative of the local peat industry confirmed potential collaboration opportunities between peat moss farming and the growing-media industry: “There's already been an idea, at least, together with ZukunftMoor here locally, about whether this product could also be incorporated as a substitute material into the growing media. The future will show whether that's enough, and how much of it there will be.”

One participant, who actively supported the local paludiculture project, expressed optimism about its success and the 'really, really big role' it could play – but stressed that farmers' openness ultimately depended on being able to make a living from it: “If it functions [...] in the end, if they make money from it. That's what it always comes down to – doesn't matter what we do. Whatever we do, in the end you have to make money, right? But if the system works out – and I'm convinced it will, because you can clearly see how the mosses are growing now – then I believe they have a future.”

Recognition of local realities, planning certainty, local involvement a realistic roadmap

In addition to economic incentives, for several participants, openness to change also depended on a more fundamental condition that political decision-makers should genuinely recognised the human reality behind the moor, not merely its ecological potential. Timo, for instance, described inviting politicians to visit his farm specifically to make this visible: "we had quite a few politicians here, just to show them: look, there's a farm behind this that feeds four generations." Rainer expressed a similar concern for the wider region, arguing that decision-makers needed to grasp that "it's not just farmers here anymore; there are also a lot of people living in the villages [...] there's a lot of life going on here". Holger captured this wish for recognition most personally, hoping simply not to be forgotten: "not just as some kind of statistic, but that there are people with families here."

This wish for recognition translated, for several participants, into a concrete demand for a clear and workable roadmap. Timo articulated this two-step logic most directly:

> First of all, awareness. And secondly, once they're aware of that, they need a clear plan that actually works. This 'everything has to be wet' approach doesn't work just like that, because we've designed our entire irrigation system to drain water away rather than retain it. and that alone would already be very expensive, and it wouldn't be simple either. And even if we did that, the question is: what should actually happen on this land economically, and how do we want to do it? Then you could have a plan, and you could try to sensitise the people affected by it, and say: okay, here's our roadmap, this could work – it won't work for everyone, but it could work – and then you need a goal. - Timo

He illustrated the cost of this missing clarity through his own experience, having weighed the decision to expand his dairy operation for four years precisely because of this uncertainty. For Timo, planning certainty mattered as a basis for rational decision-making in general, whether that meant adapting or exiting: “Sure, that would be tough for me as a dairy farmer, but then I wouldn't have to worry about building a silage pad or calf barn anymore – instead I'd have to figure out how to exit sensibly and what to do afterwards.”

Rainer went further in translating this demand into a concrete roadmap. He outlined how partial rewetting could realistically be implemented: more distant plots could be rewetted through land consolidation (‘Flurbereinigung’), while land closer to the farmstead remained in active use for operations like his own, which still generated substantial living. Central to this vision was certainty – concrete figures that could reassure both farmers and their banks that remaining land was secure for the long

term: "that would be the dream, really [...] then you could also tell the bank, my land is secure." He linked this directly to voluntary participation and local decision-making as what made the approach worthwhile to him personally: "what pleases me about it, and what actually drives me to put time into it, is that it happens through voluntary participation and by involving people on the ground." Rainer tied this vision explicitly to schemes such as the PALU guideline and pilot "lighthouse projects," which he considered a reasonable starting point for exactly this kind of certainty and inclusion.

A few other participants expressed a similar conditional openness to engage with rewetting on marginal land or ‘abandoned land’ explicitly. Despite having some doubts about how representative the pilot site itself was of real farming conditions. Mareike, for instance, considered the overall approach a genuine "win-win situation" for such marginal land. Dieter even more concretely estimated that around 10% of his own land would realistically be suitable for rewetting, framing this as a societal responsibility to be collectively borne rather than an individual sacrifice: "I'd say around 10% of our land is probably suitable for some kind of rewetting somewhere.

Mareike described that openness in new approaches depend fundamentally on being able to test them on her own fields, rather than relying on external results or evaluations from elsewhere because ‘then you can actually judge for yourself, okay, I could work with that’. Matthias put it more plainly: “If you want to do it here, that's fine [...] you have to try it out somewhere, right?”

In this context some of the participants specifically mentioned having the pilot project within the region would be an advantage. Jörg put this most clearly, considering the region a potential pioneer, whose head start could benefit the wider area: 'we might even be a pioneer here in this area – or at least, we're definitely ahead with something new, which is good for the whole region.' Jörg additionally emphasised that trust depended not only on local presence but on how openly and personally the project team engaged with the community and the farmers in particular: what matters to me personally is also the approach that ZukunftMoor takes with its team [...] what's important to me is that people simply talk about it openly [...] they run tours, they try to be approachable.' He linked this partly to the team's own youth, noting their capacity to bridge generational divides: 'they're young people you can really talk to, who also understand older generations and old structures, and get along better with the moor community because of it.'

Securing a future for the village and continuity for future generations

When it came to the question of future, several participants expressed hope that this kind of change might help to maintain farming as a livelihood as well as providing a future for the villages themselves. Klaus, for instance, connected this directly to active land management, arguing that a cared-for landscape was a what allowed young people to stay and build a future locally:

> It matters to me because I want to preserve the landscape – I want it to be actively managed, so that people, and also other animals not yet here, can have a future here. [...] It's always this outlook towards the future of the villages – that people can live here, want to live here. – Klaus

This conviction had led him to help found a local citizens' initiative years earlier, with the explicit goal that 'the moors be preserved and the villages have a future.' His own vision for the region's future centred on expanding tourism, alongside new housing units and a landscape maintenance operation ('Pflegehof') that would also create new jobs. He acknowledged, however, that a related proposal for a nature park had already been rejected.

Jörg raised a related, more concrete hope: that the pioneering paludiculture site might attract visitors curious to see the peat moss growing, which could in turn benefit local restaurants, including his own. He expressed a broader hope for future generations along similar lines, though carefully limiting his judgment to social rather than ecological outcomes: "Peatland restoration' – let me put it this way: if this restoration is for the future benefit of the people living in the moor. We certainly don't want to wipe out or flood villages [...] Is that important? For future generations, too. [...] But it could benefit future generations." He drew a further parallel between past and present, noting that the peat works itself had long employed people who originally began as peat cutters – suggesting that new opportunities like ZukunftMoor could offer a similar kind of continuity: "just as the peat works here has many employees who at some point started out cutting peat in the moor, this new venture now being run here is much the same."

Building on the findings presented above, the table below summarises some of the most prominent barriers and enablers to paludiculture adoption identified in this study.

6. Discussion

Sociocultural values associated with peatland landscapes are prominent, but participants tied these less to the peatland as an ecosystem than to the agricultural landscape, its community, and the livelihood that farmers have built over generations. Willingness to rewet for paludiculture, in turn, cannot be explained through economic or value-based reasoning alone, but emerges as a layered set of conditions: livelihood security functions as a precondition, alongside political recognition of local realities, planning certainty, local participation, and compatibility with farmers' identities and stewardship ideals tied to active land management. For some, a strong sense of identity as a dairy or cattle farmer may outweigh economic incentives for paludiculture altogether, while others are willing to adopt paludiculture if it provides economic security, despite a stronger preference for dairy or cattle farming. Across the interviews, a deeper concern also emerged that the real issue at stake is not paludiculture adoption itself, but the future of the region. In that sense, paludiculture was, for many, discussed as a form of hope and opportunity for the region, but not yet as a realistic livelihood alternative.

6.1 Sociocultural values and meanings shaping farmer's engagement with paludiculture

Similar to findings from other studies (Byg et al. 2017, Heindorf et al. 2024, Lees et al. 2023) participants' perceptions of peatland landscapes were highly diverse, shaped by local, and historical context as well as by individual preferences. Nevertheless, local rootedness emerged as one of the most prominent values, tied to an aesthetic appreciation of the open green pastures and their characteristic species, such as skylarks, lapwings, and partridges. Wetter peatland conditions, by contrast, were associated with crop loss, restricted accessibility, and higher maintenance costs, and an overabundance of moor birch was linked to a perceived decline in visual appeal. This attachment and farmer's sense of stewardship reinforced broader concerns that full-scale rewetting could lead to land abandonment and a loss of the region's current biodiversity. The centrality of place attachment finds support in the findings by Reed et al. (2020), who similarly found that land managers' environmental priorities were shaped by a deep personal connection with, and lived experiences of, the landscape.

The protection of wildlife, for instance, appeared as a recurring concern, when it comes to rewetting. Participants described deep personal connections to certain species within the agricultural landscape, which implies that a shift towards different wetland-adapted species would not necessarily compensate for the

perceived loss of the current species composition despite ecological benefits overall.

Climate mitigation also played only a marginal role in participants' reasoning, which is consistent with broader patterns documented among European farmers (Kröner et al. 2025). Although the degree of its relevance varied considerably between individuals. This heterogeneity mirrors a wider, and partly contradictory pattern in the literature. The study by Hünnebeck-Wells et al. (2024), for instance, found that more sceptical farmers downplayed the climate benefits of rewetting, whereas Merkelbach et al. (2026) found that pioneer farmers view the climate crisis as one of the most pressing challenges motivating their transition to paludiculture. Another study from Khosravi et al. (2026) similarly found greenhouse gas reduction to be the most frequently cited benefit among their English stakeholders. In this study, however, some farmers even perceived the construction work involved in establishing paludiculture sites as destructive, making it difficult to imagine how such practices could ultimately benefit the environment. This observation reflects a well-established finding in landscape perception research (Nassauer 1995). Research has shown that ecological interventions tend to be perceived and evaluated not primarily by their ecological outcomes, but by the extent to which they display visible 'cues to care' (ibid.). In the absence of such cues, even ecologically beneficial interventions such as paludiculture risk being perceived as acts of neglect or destruction, particularly during the establishment phase.

Some participants also expressed a deeper fear that rewetting could put the future of the region at risk, including farmers' livelihoods and farming as a familiar feature of the region's identity. Although farm numbers had already been declining for years, driven by structural economic pressures affecting agriculture across Europe, farmers perceived the recent political push for rewetting as a particularly concerning threat. This fear, however, was often directed at the ending of drainage-based agriculture as such. Paludiculture was not always clearly understood as a pathway to continued agricultural use, suggesting a need for further clarification and consistent framing as, for example: rewetting for paludiculture. However, the term 'rewetting' should also be used with caution, as it also evoked associations with flooding, land abandonment and neglect. Paludiculture as a form of active land management was thus discussed in more positive terms. Active land management was seen as essential to keeping the landscape maintained and habitable overall. This is consistent with findings by Reed et al. (2020), who similarly show that land managers accept this transition more readily when framed as something they can identify with. Additionally, the study by Khosravi et al. (2026) found that soil enhancement was among the most frequently cited benefits of paludiculture for farmers in England. Instead of focusing on climate mitigation framing,

paludiculture could be framed as a form of land management that preserves the peat soil, the very foundation of all farmers.

Instead of promoting rewetting for paludiculture as an innovation, Sommer and Frank (2024) propose understanding rewetting as an 'exnovation' process, meaning a deliberate decision to end the long-established practice of drainage. According to the authors, this framing helps explain why the transition is so complicated, as it can be compared to other systemic phase-outs, such as the exit from fossil fuels. This stands in some contrast to statements made in this study, where participants compared the shift to paludiculture to the earlier biogas boom, suggesting that the transition would be straightforward as long as if provided economically viable. Relatedly, participants noted that the peatland landscape had already been changing over time from a natural peatland, through drainage and cultivation for agriculture, to industrial peat extraction in some parts and now to subsequent rewetting. This indicates that paludiculture was not necessarily perceived as a fundamental shift, but rather as a gradual transition and adaptation of existing practices. At the same time, this study also revealed that especially for older generations, who had experienced the hard ship it took to drain the peatlands, the shift towards paludiculture was far more difficult to accept.

Across studies, it becomes clear that farmers and other stakeholders cannot be separated into clear categories but are instead individuals with their own distinct preferences. Consistent with this study, other research has similarly shown that farmers' perspectives on paludiculture can be quite heterogeneous (Buschmann et al. 2020, Hünnebeck-Wells et al. 2024, Khosravi et al. 2026) and that engagement with paludiculture tends to be higher when it aligns with farmers' identities or values (Reed et al. 2020, Lees et al. 2023). This calls for a focus on finding compromises to support paludiculture adoption (Khosravi et al. 2026). One such compromise, identified both in this study and in Buschmann et al. (2020), was prioritising fields of lower productivity, where farmers showed greater willingness to shift practices.

The above discussed findings of this study illustrate broader interlinkages between NCP categories, widely recognised by other scholars: the different types of contributions are rarely valued in isolation but are instead shaped by individual values and preferences (Pascual et al. 2017). The perceived importance of regulating contributions such as climate mitigation and biodiversity conservation was shaped by participants' sociocultural values and meanings. Biodiversity conservation was, for instance, often closely tied to an aesthetic appreciation of the pastures and a personal attachment to familiar species within this type of landscape. Climate mitigation, by contrast, was perceived as less influential in farmers'

reasoning because its effect was not as visible. Farmers' perceived importance for such regulating contributions, in other words, does not necessarily follow from a political urgency, but from how closely they are woven into their everyday values and lived experience.

As this study shows, adopting paludiculture predominantly represent a practical, economically contingent transition. For a few, it also implied a greater change of a familiar landscape and touched a more fundamental question of their identity as farmers. This distinction between practical adjustment and deeper change at the level of personal values and identity has also been studied within the context of agroforestry systems (Klimke et al. 2026). According to O'Brien and Sygna (2013), meaningful change within practical spheres such as adopting a new land-use practice is considered easier to achieve than change within the personal sphere of values, beliefs, and identity.

6.2 Enabling conditions for local adoption of paludiculture

Paludiculture was generally perceived with scepticism, specifically in terms of its economic potential. This was partly because drainage-based agriculture, and dairy farming specifically, was still perceived as a more rational economic choice due to decades of established infrastructure, reliable markets, and predictable income streams. At the same time, participants recognized difficulties facing the dairy industry in the peatland region, for instance, that the peat soil is too wet for allow grazing in some areas, or that the ground becomes uneven due to peat subsidence. One participant had personally experienced the pain of having to give up farming from one day to another. The fear of losing the region and their home was prevalent throughout the interviews. That said, *Sphagnum* farming was, for some considered both a more realistic option and one that could help sustain the region's agricultural future. Some participants recognized the benefit of having ZukunftMoor and the local peat factory in the region. Given Germany's national peat reduction strategy, these factors may provide a basis for realistic local value chains. In that sense, focusing on establishing local markets might also increase farmer's willingness, but it must also address the underlying, historically shaped belief that wetland use cannot be economically viable. Besides this, it will require effective regulatory instruments that provide farmers with planning certainty and appropriate financial frameworks. The PALU guideline and its voluntary-based "lighthouse projects" discussed earlier may represent tangible conditions.

Some of the most important enabling factors identified in this study, such as economic incentives, political recognition, planning certainty and local

participation, are consistent with findings from several other studies (Reed et al. 2020, Schultz et al. 2022, Hünnebeck-Wells et al. 2024, Sommer and Frank 2024). Reed et al. (2020), for instance, similarly argue that finding compromises is more effective than attempting to change farmers' values and beliefs. Hünnebeck-Wells et al. (2024) likewise found that planning certainty was a central demand among their more pragmatic farmer types, while Schultz et al. (2022) emphasise that local participation is essential to prevent conflict and ensure long-term success of restoration efforts. Finally, Sommer and Frank (2024) highlight political recognition of farmers' realities as a precondition for a just transition. Moreover, findings from this study, as well as by Khosravi et al. (2026) suggest that the discourse should give greater weight to other environmental benefits, such as soil preservation that may receive greater acceptance by farmers than climate mitigation goals.

After all, scaling paludiculture requires engaging with sociocultural values and meanings presented in this study that continue to shape farmers' relationship to the land and to change itself. This echoes findings from a study by Schultz et al. (2022), who explore the importance of cultural values in ecological restoration more generally.

6.3 Methodological reflections

Conducting semi-structured interviews within participants' everyday personal environments proved a valuable method overall. This setting, together with the flexibility of scheduling visits around participants' availability, allowed the researcher to build trust and establish in-depth contact with the participants. The twelve in-depth interviews provided sufficient data to answer the research questions. It also provided insights beyond non-material dimensions, leading to a considerable wealth of information. According to Malterud et al. (2016), an adequate sample size in qualitative research does not depend on the size itself ("saturation") but on the information density ("information power") a sample provides. The more information power a sample hold, the smaller the sample size needs to be (Malterud et al. 2016, p.1753). Since this case study followed a specific aim, applied a theoretical framework, and recruited a highly specific sample of farmers, its interviews likely hold comparatively high information power, meaning that a smaller sample size was sufficient to generate meaningful insights (Malterud et al. 2016, p.1756). Considering this wealth of information, using QualCoder for the coding process offered a valuable tool for the data analysis.

Overall, the NCP framework was well suited as a conceptual foundation, guiding the analysis throughout this study. It produced meaningful findings while remaining

relatively flexible and avoiding overly fixed hypotheses (Bailey-Rodriguez 2025). As outlined, empirical farmer-focused research on non-material NCP remain scarce (Khosravi et al. 2025; Moreira et al. 2025). By applying the NCP framework directly to farmers, this study was able to provide an empirically grounded and farmer-centred perspective of how sociocultural factors shape both the perceived meaning of peatland landscapes and the practical barriers and enablers to rewetting for paludiculture. Methodologically, it is notable that sociocultural values surfaced more readily using the prompt cards than through direct questioning alone. This is consistent with previous research, which found prompt-based methods to be a valuable tool for examining sociocultural values and meanings (Adams et al. 2026; Gould et al. 2015).

6.4 Limitations

Some participants were partly recruited through snowball sampling, with initial contacts established via ZukunftMoor. This recruitment pathway may have introduced a degree of sampling bias, potentially over- or under-representing certain attitudes towards paludiculture. Prior experiences through the Gnarrenburger Moor Projekt may have further shaped participants' attitudes and perceptions towards paludiculture. This means that findings may not generalise to different regions without a comparable history of rewetting initiatives.

Further limitations concerned the translation process itself. Since interviews were conducted in German and subsequently translated into English for analysis and reporting, certain terms did not have a direct English equivalent. The German verb "bewirtschaften", for instance, can be translated as "to manage", "to farm", or "to cultivate", each of which carries slightly different connotations regarding the nature and intensity of land use. Similarly, "pflegen" can be rendered as "to take care of" or "to maintain. Additionally, "Moor" can variously be translated as "peatland", "moor", "moorland", or "peat soil", depending on context. Such translation decisions shape the research process, and its outcomes are rarely made explicit in qualitative research (Abfalter et al. 2021).

In addition to these translation issues, the term “peatland” or “moor” itself also proved biased within the original German because their meaning was not particularly defined. Participants also used the term “Moor”, for instance, when referring to the drained peatland landscape or the agricultural landscape. While this introduces a degree of interpretive uncertainty into the analysis, it is well documented that peatland terminology has long been described as inconsistent, varying across disciplines, languages, and regional contexts (Joosten & Clarke 2002, p.24; Lourenco, Fitchett and Woodborne 2022). For this study, this indicates

that participants' understanding of “Moor” is likely reflected in a historically and regionally shaped everyday meaning rooted in agriculture, soil, and home.

Another limitation concerning terminology was the use of the terms “rewetting” and “paludiculture”. Although the study aimed to examine attitudes towards paludiculture specifically, talking about rewetting at the same time was unavoidable. These terms were, however, at times used separately rather than as an already combined concept. Since rewetting can also refer to conservation-oriented approaches without continued agricultural use, this inconsistency may have influenced how participants understood and responded to the questions.

6.5 Paludiculture through an agroecological lens

Agroecology is not just an ecological approach to produce food sustainably without harming the environment, but it seeks to fundamentally redesign our current food system against a backdrop of ecological damage caused by industrial agriculture (Gliessman 2015, p.18). While ecological integrity is at its core (Altieri 1989, p.37), agroecology takes a holistic approach that also integrates economic, sociocultural, and political dimensions into account to address today’s crisis. This section examines paludiculture through an agroecological lens. It explores how paludiculture engages with some of 13 guiding principles of agroecology (Wezel et al. 2020) both conceptually and as examined empirically in this study. It is structured around agroecology’s three core dimensions of action: a science, a practice, and a movement (Gliessman 2015, p.18).

As a science, agroecology conceptualises farming through a landscape approach, which designs multifunctional farming systems within a broader agroecosystem (Gliessman 2015, p.21; Tittonell 2023, p.54). These systems should be able to sustain themselves without the need of external inputs (Tittonell 2014) and work in harmony with natural processes (Altieri et al. 2015). This basic understanding resonates with how paludiculture can be understood: as a form of land use that works with peatlands' natural wet conditions rather than against them. Peatlands thus form the ecosystem in which paludiculture, as a farming system is embedded. Building on this, the key principle of paludiculture is to keep the peat body saturated, supporting ongoing peat growth and thereby lowering greenhouse gas emissions compared to a drained state. Its design therefore directly contributes to climate mitigation and delivers other ecological co-benefits such as water filtration and storage and habitat for wetland-adapted species. In that sense, paludiculture can be considered as contributing to some of the principles, such as soil health, biodiversity, and input reduction, even if its original meaning differs (Wezel et al. 2020).

Agroecology as a practice is place-based and acknowledges different sources of knowledge, such as farmers or indigenous knowledge. It places farmers and other stakeholders at the centre of research to develop locally adapted solutions through co-creation of knowledge (Wezel et al. 2009, 2020). Although scientists developed paludiculture as a productive land-use alternative to generate income for farmers, adoption among farmers remains low. This is partly because farmers' realities are rarely considered and policies remain insufficient to adequately meet farmers' needs in this transition process. The limited consideration of farmers' perspectives is the gap this study aims to address. First, by using a participatory-oriented research approach - based on semi-structured interviews and field observations. Second, by applying the NCP framework, which was specifically developed to integrate various value- and knowledge systems (Díaz et al. 2018).

As a movement, agroecology also addresses the relationship between humans and food that shape how food is produced and consumed (Gliessman 2015, p.18). It therefore calls for a shift from perceiving food merely as a commodity, to valuing it for how, where, and by whom it is produced. Similarly, this study addresses the relationship between humans and peatlands and argues that the way people relate to these ecosystems influences how they are managed. Historically and culturally, peatlands were perceived as wasteland, which is why they were drained and made arable. This perception persists in people's mindsets today and continues to shape farmers scepticism towards alternatives to drainage-based agriculture. To scale paludiculture, people's relationship to peatlands need to change, including certain values such as the belief that wetlands are unproductive and not economically viable. Building on this, agroecology also calls for a greater political change.

The CAP, one of Europe's most important policy instruments still largely supports drainage-based agriculture despite increasing recognition of paludiculture (Wichmann & Nordt 2024). This study also illustrates another well-known issue regarding the CAP, which is described as the 'treadmill' effect. Farmers are forced to grow to remain economically viable or stop farming. Because growth is specifically limited in the peatland, the number of farms in the study region has already declined by more than 80%. In that sense, paludiculture could offer farmers a promising alternative to sustain farming both as a livelihood and as a cultural feature of the landscape. Germany's new Palu-Förderrichtlinie might address part of this problem, though its outcome remains to be seen. Nevertheless, this transition requires a holistic approach encompassing changes of rewetted farming systems, social considerations, economic development of new market chains and adequate policies and a broader shift in people's relation to peatlands.

7. Conclusion

Overall, farmers' values and meanings attached less on the peatland landscape itself than to the agricultural landscape, their farm, livelihood, and community. The landscape was accordingly often valued aesthetically for its green pastures rather than for specific peatland characteristics. Moreover, most farmers identified as food producers and stewards of the land, committed to conserving the current landscape and its species. While several participants already seemed to recognise that drainage-based agriculture on peat soil is reaching its limits, paludiculture as an alternative land-use was still regarded with scepticism.

Several of the values and meanings that were identified directly translated into barriers to change. These barriers appeared highly diverse, ranging from identity-related resistance among older farmers, to aesthetic concerns about the loss of the open pasture landscape, and a broader sense of responsibility towards agricultural species and food production that some felt conflicted with rewetting and paludiculture adoption. Climate mitigation considerations did not play a role across participants accounts. Enablers for change primarily focused on socioeconomic factors. In this sense, livelihood security, political recognition of farmers' realities, and a clear, realistic roadmap emerged not only as enablers but as preconditions for change. Nevertheless, findings were highly diverse and individual. Some farmers, for instance, did not consider as an alternative at all, as their preferences for dairy and cattle farming was stronger than economic incentives. These farmers noted that they would rather go elsewhere or stop farming entirely.

Even though this study aimed to focus on sociocultural aspects of paludiculture adoption, further ecological, socioeconomic, and political dimensions emerged. These findings illustrate more broadly how deeply entangled these dimensions are, and how they cannot always be clearly separated into one category. However, socioeconomic and policy considerations are still key drivers for paludiculture adoption, while sociocultural factors further shape farmers' individual preferences and openness towards change. That said, for paludiculture to become a realistic option for farmers, market chains need to be further developed, policies adapted to farmers' needs throughout the transition process, and local participation encouraged.

The insights of this study make a valuable contribution to knowledge in this field, and might support the development of locally adapted, socioculturally informed strategies for paludiculture adoption in the Gnarrenburger Moor. It could also inform peatland transitions more broadly in Germany and other European contexts facing similar challenges.

8. Recommendations

The following recommendations are addressed to multiple actors involved in advancing paludiculture adoption. Some recommendations require action at the level of regional and national policy (e.g. 1., 2., and 9.), while others call for practical adjustments by implementing and advisory bodies at a local level (e.g. 3., 4., 5., 6., 7., 8., 10.). Taken together, they reflect the understanding that successful implementation of paludiculture depends on economic and regulatory factors as well as on sociocultural values and concerns, and requires effective communication and collaboration between farmers, policymakers, and the institutions responsible for implementation.

1. Secure farmers' livelihoods as a precondition for engagement through policies that are adapted to fit farmers realities and needs throughout the transition process.
2. Provide clear, binding, and long-term planning pathways for farmers that are locally adapted.
3. Ensure genuine local participation rather than top-down implementation with respect for local knowledge.
4. Political authorities must listen to and genuinely validate farmers' realities, concerns, and fears.
5. Focus on finding compromises with farmers, e.g. on lower-productivity land.
6. Invest in regional market and processing infrastructure for paludiculture products such as the substitution of peat in horticulture and hobby gardening.
7. Shift communication away from climate framing toward tangible co-benefits (e.g. soil preservation and biodiversity).
8. Facilitate peer-to-peer exchange through locally organized, farmer-led discussion rounds.
9. Ensure voluntariness as a guiding principle for paludiculture adoption, while acknowledging that structural inequality it can otherwise obscure.
10. Expand existing technical advisory structures at a local level, including conflict mediation capacity, such as the Mooragentur MV in Mecklenburg-Vorpommern.

References

Abel, S., Barthelmes, A., Gaudig, G., Joosten, H., Nordt, A. and Peters, J. (2019) *Klimaschutz auf Moorböden: Lösungsansätze und Best-Practice-Beispiele*. Greifswald Moor Centrum-Schriftenreihe 03/2019. Greifswald: Greifswald Moor Centrum. Available at: https://greifswaldmoor.de/files/images/pdfs/201908_Broschuere_Klimaschutz%20auf%20Moorb%C3%B6den_2019.pdf

Abel, S., Couwenberg, J. and Joosten, H. (2012) 'Towards more diversity in paludiculture – a literature review of useful wetland plants', *Proceedings of the 14th International Peat Congress*. Stockholm: International Peat Society. Available at: https://peatlands.org/assets/uploads/2019/06/Abel-299.pdf

Abfalter, D., Mueller-Seeger, J. and Raich, M. (2021) 'Translation decisions in qualitative research: a systematic framework', *International Journal of Social Research Methodology*, 24(4), pp. 469–486. Available at: https://doi.org/10.1080/13645579.2020.1805549

Adams, A., Palacat-Nelsen, S.A. and Gould, R.K. (2026) 'Ecological decline degrades non-material values—but resistance and resilience complicate the story', *Sustainability Science*, 21(1), pp. 1–19. Available at: https://doi.org/10.1007/s11625-025-01728-1

Akinyode, B.F. and Khan, T.H. (2018) 'Step by step approach for qualitative data analysis', *International Journal of Built Environment and Sustainability*, 5(3), pp. 163–174. Available at: https://doi.org/10.11113/ijbes.v5.n3.267

Altieri, M.A. (1989) 'Agroecology: a new research and development paradigm for world agriculture', *Agriculture, Ecosystems and Environment*, 27(1), pp. 37–46. Available at: https://doi.org/10.1016/0167-8809(89)90070-4

Altieri, M.A., Nicholls, C.I., Henao, A. and Lana, M.A. (2015) 'Agroecology and the design of climate change-resilient farming systems', *Agronomy for Sustainable Development*, 35, pp. 869–890. Available at: https://doi.org/10.1007/s13593-015-0285-2

Bailey-Rodriguez, D. (2025) 'Deductive qualitative research: an integrative approach to designing studies', *Qualitative Research in Psychology*. Available at: https://doi.org/10.1080/14780887.2025.2604773

Baranyai, B., Krebs, M., Oehmke, C. and Joosten, H. (2021) 'Seed germination and seedling survival of Drosera rotundifolia (L.) cultivated on Sphagnum: influence of cultivation methods and conditions, seed density, Sphagnum species and vascular plants', *Mires and Peat*, 27(15), pp. 1–14. Available at: https://doi.org/10.19189/MaP.2020.APG.StA.1937

Beyer, C. and Höper, H. (2015) 'Greenhouse gas exchange of rewetted bog peat extraction sites and a Sphagnum cultivation site in northwest Germany',

Biogeosciences, 12(7), pp. 2101–2117. Available at: https://doi.org/10.5194/bg-12-2101-2015

Buschmann, C., Röder, N., Berglund, K., Berglund, Ö., Lærke, P.E., Maddison, M., Mander, Ü., Myllys, M., Osterburg, B. and van den Akker, J.J.H. (2020) 'Perspectives on agriculturally used drained peat soils: comparison of the socioeconomic and ecological business environments of six European regions', *Land Use Policy*, 90(104181), pp. 1-13. Available at: https://doi.org/10.1016/j.landusepol.2019.104181

BMEL – Bundesministerium für Ernährung und Landwirtschaft (2022) *Torffrei gärtnern, Klima schützen – Die Torfminderungsstrategie des BMEL*. Berlin: BMEL. Available at: https://www.bmleh.de/SharedDocs/Downloads/DE/Broschueren/torfminderungsstrategie.pdf (Accessed: 10 July 2026).

BMLEH – Bundesministerium für Landwirtschaft, Ernährung und Heimat (2026) *Gartenbau: Torfverwendung reduzieren – Klima schützen*. Available at: https://www.bmleh.de/DE/themen/landwirtschaft/pflanzenbau/gartenbau/torf.html (Accessed: 10 July 2026).

BMUKN – Bundesministerium für Umwelt, Klimaschutz, Naturschutz und nukleare Sicherheit (2026) *Förderrichtlinie "Maßnahmen zur dauerhaften und weitgehenden Wiedervernässung land- und forstwirtschaftlich genutzter Moorböden und zur Unterstützung der land- und forstwirtschaftlichen Nutzung wiedervernässter Moorbodenflächen"*. Available at: https://www.bundesumweltministerium.de/download/foerderrichtlinie-palu (Accessed: 28 August 2026).

BMUV – Bundesministerium für Umwelt, Naturschutz, nukleare Sicherheit und Verbraucherschutz (2022) *Nationale Moorschutzstrategie: Kabinettsbeschluss vom 9. November 2022*. Berlin: BMUV. Available at: https://www.bmuv.de/fileadmin/Daten_BMU/Pools/Broschueren/nationale_moorschutzstrategie_bf.pdf (Accessed: 28 August 2026).

Braun, V. and Clarke, V. (2006) 'Using thematic analysis in psychology', *Qualitative Research in Psychology*, 3(2), pp. 77–101. Available at: https://doi.org/10.1191/1478088706qp063oa

Bruisch, K. (2023) 'Umweltgeschichte: Der Mensch im Moor', in Heinrich-Böll-Stiftung, BUND and Michael-Succow-Stiftung (eds.) *Mooratlas 2023: Daten und Fakten zu nassen Klimaschützern*. 8th edn. Berlin: Heinrich-Böll-Stiftung, pp. 20–21. Available at: https://www.boell.de/de/mooratlas

Brust, K., Krebs, M., Wahren, A., Gaudig, G. and Joosten, H. (2017) 'The water balance of a Sphagnum farming site in north-west Germany', *Mires and Peat*, 20(10), pp. 1–12. Available at: https://doi.org/10.19189/MaP.2017.OMB.301

Bryman, A. (2008) *Social research methods*. 3rd edn. Oxford: Oxford University Press.

Byg, A., Martin-Ortega, J., Glenk, K. and Novo, P. (2017) 'Conservation in the face of ambivalent public perceptions – the case of peatlands as "the good, the bad and the

ugly"', *Biological Conservation*, 206, pp. 181–189. Available at: https://doi.org/10.1016/j.biocon.2016.12.022

Campbell, N.A., Reece, J.B., Urry, L.A., Cain, M.L., Wasserman, S.A., Minorsky, P.V. and Jackson, R.B. (2009) *Biology*. 8th edn. San Francisco: Pearson Benjamin Cummings.

Chan, K.M.A., Guerry, A.D., Balvanera, P., Klain, S., Satterfield, T., Basurto, X., Bostrom, A., Chuenpagdee, R., Gould, R., Halpern, B.S., Hannahs, N., Levine, J., Norton, B., Ruckelshaus, M., Russell, R., Tam, J. and Woodside, U. (2012) 'Where are cultural and social in ecosystem services? A framework for constructive engagement', *BioScience*, 62(8), pp. 744–756. Available at: https://doi.org/10.1525/bio.2012.62.8.7

Christie, M., Martín-López, B., Church, A., Siwicka, E., Szymonczyk, P. and Mena Sauterel, J. (2019) 'Understanding the diversity of values of "nature's contributions to people": insights from the IPBES Assessment of Europe and Central Asia', *Sustainability Science*, 14(5), pp. 1267–1282. Available at: https://doi.org/10.1007/s11625-019-00716-6

Cottet, M. et al. (2022) 'What are the political, social, and economic issues in river restoration? Genealogy and current research issues', in Morandi, B., Cottet, M. and Piégay, H. (eds.) *River Restoration: Political, Social, and Economic Perspectives*. Hoboken, NJ: Wiley. Available at: https://doi.org/10.1002/9781119410010

Creswell, J.W. (2014) *Research design: qualitative, quantitative and mixed methods approaches*. 4th edn. Thousand Oaks, CA: Sage.

Daun, C., Huth, V., Gaudig, G., Günther, A., Krebs, M. and Jurasinski, G. (2023) 'Full-cycle greenhouse gas balance of a Sphagnum paludiculture site on former bog grassland in Germany', *Science of The Total Environment*, 877, 162943, pp. 1–12. Available at: https://doi.org/10.1016/j.scitotenv.2023.162943

Dean, G., Rivera-Ferre, M.G., Rosas-Casals, M. and López-i-Gelats, F. (2021) 'Nature's contribution to people as a framework for examining socioecological systems: the case of pastoral systems', *Ecosystem Services*, 49, 101265. Available at: https://doi.org/10.1016/j.ecoser.2021.101265

Deickert, S. and Piegsa, J. (2016) 'The relationship between humans and mires over time', in Wichtmann, W., Schröder, C. and Joosten, H. (eds.) *Paludiculture – Productive Use of Wet Peatlands: Climate Protection – Biodiversity – Regional Economic Benefits*. Stuttgart: Schweizerbart, pp. 157–161.

Díaz, S. et al. (2018) 'Assessing nature's contributions to people', *Science*, 359(6373), pp. 270–272. Available at: https://doi.org/10.1126/science.aap8826

Emmel, M. (2008) 'Growing ornamental plants in Sphagnum biomass', *Acta Horticulturae*, 779, pp. 173–178. Available at: https://doi.org/10.17660/ActaHortic.2008.779.20

European Commission (2025) 'Land use sector', *Climate Action*. Available at: https://climate.ec.europa.eu/areas-action/land-use-sector_en (Accessed: 28 August 2026).

European Commission (2026) 'European climate law', *Climate Action*. Available at: https://climate.ec.europa.eu/areas-action/european-climate-law_en (Accessed: 28 August 2026).

European Parliament and Council of the European Union (2021) *Regulation (EU) 2021/2115 of the European Parliament and of the Council of 2 December 2021 establishing rules on support for strategic plans to be drawn up by Member States under the common agricultural policy (CAP Strategic Plans).* Official Journal of the European Union, L 435, pp. 1–186. Available at: https://eur-lex.europa.eu/eli/reg/2021/2115/oj/eng (Accessed: 28 August 2026).

European Parliament and Council of the European Union (2024) *Regulation (EU) 2024/1991 of the European Parliament and of the Council of 24 June 2024 on nature restoration and amending Regulation (EU) 2022/869*. Official Journal of the European Union, L 2024/1991. Available at: https://eur-lex.europa.eu/eli/reg/2024/1991/oj (Accessed: 28 August 2026).

Gaudig, G., Fengler, F., Krebs, M., Prager, A., Schulz, J., Wichmann, S. and Joosten, H. (2014) 'Sphagnum farming in Germany – a review of progress', *Mires and Peat*, 13, pp. 1–11. Available at: https://www.mires-and-peat.net/article/129422.pdf

Gaudig, G. and Krebs, M. (2016) 'Torfmooskulturen als Ersatzlebensraum', *Biologie in unserer Zeit*, 46(4), pp. 251–257. Available at: https://doi.org/10.1002/biuz.201610600

Gaudig, G. et al. (2018) 'Sphagnum farming from species selection to the production of growing media: a review', *Mires and Peat*, 20(13), pp. 1–30. Available at: https://doi.org/10.19189/MaP.2018.OMB.340

Gaudig, G., Krebs, M. and Joosten, H. (2020) 'Sphagnum growth under N saturation: interactive effects of water level and P or K fertilization', *Plant Biology*, 22(3), pp. 394–403. Available at: https://doi.org/10.1111/plb.13092

Gliessman, S.R. (2015) *Agroecology: The Ecology of Sustainable Food Systems*. 3rd edn. Boca Raton, FL: CRC Press.

GMC – Greifswald Moor Centrum (2026) *Moore in Deutschland*. Available at: https://moorwissen.de/moore-in-deutschland.html (Accessed: 1 July 2026).

Gould, R.K., Klain, S.C., Ardoin, N.M., Satterfield, T., Woodside, U., Hannahs, N., Daily, G.C. and Chan, K.M. (2015) 'A protocol for eliciting nonmaterial values through a cultural ecosystem services frame', *Conservation Biology*, 29(2), pp. 575–586. Available at: https://doi.org/10.1111/cobi.12407

Guba, E.G. and Lincoln, Y.S. (1994) 'Competing paradigms in qualitative research', in Denzin, N.K. and Lincoln, Y.S. (eds.) *Handbook of Qualitative Research*. Thousand Oaks, CA: Sage, pp. 105–117.

Günther, A., Jurasinski, G., Albrecht, K., Gaudig, G., Krebs, M. and Glatzel, S. (2017) 'Greenhouse gas balance of an establishing Sphagnum culture on a former bog grassland in Germany', *Mires and Peat*, 20(2), pp. 1–16. Available at: https://doi.org/10.19189/MaP.2015.OMB.210

Heindorf, C., Schüler, S. and Plieninger, T. (2024) 'Poetic inquiry to explore the relational values of a transforming peat landscape', *People and Nature*, 6(3), pp. 1189–1205. Available at: https://doi.org/10.1002/pan3.10629

Heindorf, C., Plieninger, T. and Schüler, S. (2025) 'Linking co-production of peat landscapes ecosystem services and human well-being under different future scenarios: a fuzzy cognitive mapping approach', *Journal of Environmental Management*, 391, 126315. Available at: https://doi.org/10.1016/j.jenvman.2025.126315

Hünnebeck-Wells, A., Loos, J., Abel, S. and Nordt, A. (2025) 'Transformation towards the sustainable management of peatlands: a characterisation of farmers in the Teufelsmoor, Germany', *People and Nature*, 7(2), pp. 346–359. Available at: https://doi.org/10.1002/pan3.10701

IVG – Industrieverband Garten (2024) *Heimische Torfvorräte deutlich geringer als angenommen*. 6 May. Available at: https://ivg.org/2024/05/06/heimische-torfvorraete-deutlich-geringer-als-angenommen/ (Accessed: 17 August 2026).

IVG – Industrieverband Garten (2025) *IVG: Produktionsmengen und Absatzzahlen der Substratbranche 2024 konstant – Torfanteil sinkt weiter*. 19 March. Available at: https://ivg.org/2025/03/19/ivg-produktionsmengen-und-absatzahlen-der-substratbranche-2024-konstant-torfanteil-sinkt-weiter/ (Accessed: 17 August 2026).

IPBES (2019) *Summary for policymakers of the global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Díaz, S., Settele, J., Brondízio, E.S., Ngo, H.T., Guèze, M., Agard, J., Arneth, A., Balvanera, P., Brauman, K.A., Butchart, S.H.M., Chan, K.M.A., Garibaldi, L.A., Ichii, K., Liu, J., Subramanian, S.M., Midgley, G.F., Miloslavich, P., Molnár, Z., Obura, D., Pfaff, A., Polasky, S., Purvis, A., Razzaque, J., Reyers, B., Roy Chowdhury, R., Shin, Y.J., Visseren-Hamakers, I.J., Willis, K.J. and Zayas, C.N. (eds.). Bonn: IPBES secretariat. Available at: https://doi.org/10.5281/zenodo.3553579

IPBES (2022) *Summary for policymakers of the methodological assessment report on the diverse values and valuation of nature of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. Pascual, U., Balvanera, P., Christie, M., Baptiste, B., González-Jiménez, D., Anderson, C.B., Athayde, S., Barton, D.N., Chaplin-Kramer, R., Jacobs, S., Kelemen, E., Kumar, R., Lazos, E., Martin, A., Mwampamba, T.H., Nakangu, B., O'Farrell, P., Raymond, C.M., Subramanian, S.M., Termansen, M., Van Noordwijk, M. and Vatn, A. (eds.). Bonn: IPBES secretariat. Available at: https://doi.org/10.5281/zenodo.6522392

IPCC (2018) 'Summary for policymakers', in Masson-Delmotte, V., Zhai, P., Pörtner, H.-O., Roberts, D., Skea, J., Shukla, P.R., Pirani, A., Moufouma-Okia, W., Péan, C., Pidcock, R., Connors, S., Matthews, J.B.R., Chen, Y., Zhou, X., Gomis, M.I., Lonnoy, E., Maycock, T., Tignor, M. and Waterfield, T. (eds.) *Global Warming of 1.5°C: An IPCC Special Report...*. Cambridge: Cambridge University Press, pp. 1–24. Available at: https://doi.org/10.1017/9781009157940.001

Joosten, H. and Clarke, D. (2002) *Wise use of mires and peatlands: background and principles including a framework for decision-making*. Jyväskylä and Greifswald: International Mire Conservation Group and International Peat Society. Available at: https://archive.org/details/wiseuseofmirespe0000joos

Kadykalo, A.N., López-Rodriguez, M.D., Ainscough, J., Droste, N., Ryu, H., Ávila-Flores, G., Le Clec'h, S., Muñoz, M.C., Nilsson, L., Rana, S., Sarkar, P., Sevecke, K.J. and Harmáčková, Z.V. (2019) 'Disentangling "ecosystem services" and "nature's contributions to people"', *Ecosystems and People*, 15(1), pp. 269–287. Available at: https://doi.org/10.1080/26395916.2019.1669713

Kalinski, K., Höper, H., Kruse-Dörgeloh, H., Lange, G., Schröder, U., Tegge, A. and Vogel, I. (2021) *Modellprojekt „Gnarrenburger Moor": Abschlussbericht*. Hannover: Landesamt für Bergbau, Energie und Geologie (LBEG).

Khosravi, F., Clough, J.A. and Lindsay, R.A. (2025) 'Paludiculture in the UK: a paradigm shift in agricultural practice and farmers' perceptions', *Mires and Peat*, 32(22). Available at: https://doi.org/10.19189/001c.145203

Khosravi, F., Assan, A.A., Clough, J. and Lindsay, R. (2026) 'Scaling paludiculture: stakeholder perspectives on adoption and enabling conditions in England', *International Journal of Agricultural Sustainability,* 24(1). Available at: https://doi.org/10.1080/14735903.2026.2743390

Klimke, M., Plieninger, T. and Zengerling, C. (2026) 'Transformation towards temperate agroforestry and the role of law: a typology of actor perspectives', *Agroforestry Systems*, 100(6), Article 155. Available at: https://doi.org/10.1007/s10457-026-01528-1

Knott, E., Rao, A.H., Summers, K. and Teeger, C. (2022) 'Interviews in the social sciences', *Nature Reviews Methods Primers*, 2(73). Available at: https://doi.org/10.1038/s43586-022-00150-6

Kröner, L., van Grinsven, H.J.M., Erisman, J.W., Graversgaard, M., Immerzeel, T., Olesen, J.E., Rodríguez, A., Soriano, B., Sanz-Cobena, A. and van der Lippe, T. (2025) 'Climate change skepticism of European farmers and implications for effective policy actions', *Communications Earth & Environment*, 6(396). Available at: https://doi.org/10.1038/s43247-025-02304-2

Kuckartz, U. and Rädiker, S. (2024) *Qualitative Inhaltsanalyse: Methoden, Praxis, Umsetzung mit Software und künstlicher Intelligenz*. 6th edn. Weinheim: Beltz Juventa.

Kumar, S. (2017) 'Sphagnum moss as a growing media constituent: some effects of harvesting, processing and storage', *Mires and Peat*, 20(7), pp. 1–11. Available at: https://doi.org/10.19189/MaP.2016.OMB.232

Lourenco, M., Fitchett, J.M. and Woodborne, S. (2022) 'Peat definitions: a critical review', *Progress in Physical Geography: Earth and Environment*, 47(4). Available at: https://doi.org/10.1177/03091333221118353

Mainda, T., Krebs, M. and Michalik, P. (2025) 'Exploring the potential of Sphagnum paludiculture as a substitute habitat for peatland-associated beetles: insights from a

long-term study in northwestern Germany', *Wetlands*, 45, Article 95. Available at: https://doi.org/10.1007/s13157-025-01957-1

Malterud, K., Siersma, V.D. and Guassora, A.D. (2016) 'Sample size in qualitative interview studies: guided by information power', *Qualitative Health Research*, 26(13), pp. 1753–1760. Available at: https://doi.org/10.1177/1049732315617444

Merkelbach, M., Kmoch, L.M., Plieninger, T. and Heindorf, C. (2026) 'Readiness to transform: pioneer farmers' motivations and barriers for adopting paludiculture in Germany', *PLOS Sustainability and Transformation*, 5(1), e0000214. Available at: https://doi.org/10.1371/journal.pstr.0000214

Millennium Ecosystem Assessment (2003) *Ecosystems and human well-being: a framework for assessment*. Washington, DC: Island Press. Available at: https://wedocs.unep.org/rest/api/core/bitstreams/ac68d5a3-4aaa-4027-88e1-deba6376ff7b/content

Moreira, M., Alves, J., Frazão, L., Gouveia, A.C. and Freitas, H. (2025) 'A systematic review of Nature's Contributions to People: impacts on science, policy, and sustainability', *Sustainability Science*, 20(6), pp. 2297–2311. Available at: https://doi.org/10.1007/s11625-025-01694-8

Müller, R. and Glatzel, S. (2021) 'Sphagnum farming substrate is a competitive alternative to traditional horticultural substrates for achieving desired hydro-physical properties', *Mires and Peat*, 27(21), pp. 1–12. Available at: https://doi.org/10.19189/MaP.2021.OMB.StA.2157

Muster, C., Gaudig, G., Krebs, M. and Joosten, H. (2015) 'Sphagnum farming: the promised land for peat bog species?', *Biodiversity and Conservation*, 24(8), pp. 1989–2009. Available at: https://doi.org/10.1007/s10531-015-0922-8

Muster, C., Krebs, M. and Joosten, H. (2020) 'Seven years of spider community succession in a Sphagnum farm', *Journal of Arachnology*, 48(2), pp. 119–131. Available at: https://doi.org/10.1636/01618202-48.2.119

NABU Niedersachsen (n.d.) *Huvenhoopsmoor*. Available at: https://niedersachsen.nabu.de/natur-und-landschaft/schutzgebiete/nabu-schutzgebiete/huvenhoopsmoor/index.html (Accessed: 15 May 2026).

Nabuurs, G.-J. et al. (2022) 'Agriculture, forestry and other land uses (AFOLU)', in Shukla, P.R. et al. (eds.) *Climate Change 2022: Mitigation of Climate Change*. Cambridge: Cambridge University Press. Available at: https://doi.org/10.1017/9781009157926.009

Nassauer, J.I. (1995) 'Messy ecosystems, orderly frames', *Landscape Journal*, 14(2), pp. 161–170. Available at: https://doi.org/10.3368/lj.14.2.161

Neudert, R., Nordt, A., Kleine, S., Wichmann, S., Spanjers, B., Hirschmann, H., Vogel, T. and Beckmann, V. (2026) 'Paludiculture – a scoping review of the agricultural, economic and social science literature', *Frontiers in Environmental Science*, 14(1868484). pp. 1-22. Available at: https://doi.org/10.3389/fenvs.2026.1868484

Neudert, R., Kleine, S., Wichmann, S., Hirschmann, H., Nordt, A., Spanjers, B., Vogel, T. and Beckmann, V. (2026) *Die Entwicklung der Projektlandschaft zur*

Paludikultur – Eine Übersicht und Analyse für Deutschland. Greifswald Moor Centrum-Schriftenreihe 01/2026. Greifswald: Greifswald Moor Centrum. Available at: https://greifswaldmoor.de/files/dokumente/GMC%20Schriften/2026/2026-01_GMC%20Schriftenreihe%20032026.pdf

O'Brien, K. and Sygna, L. (2013) 'Responding to climate change: the three spheres of transformation', in *Proceedings of Transformation in a Changing Climate International Conference*, Oslo, 19–21 June 2013. Oslo: University of Oslo, pp. 16–23.

Ohlsson, M., Queiroz, C., Nyström, M., Dickson, E., Sieber, P. and Lososová, Z. (2025) 'Nature's contributions to people across Europe: a review of stakeholder preferences', *Ecosystems and People*, 21(1), 2591075. Available at: https://doi.org/10.1080/26395916.2025.2591075

Pascual, U., Balvanera, P., Díaz, S., Pataki, G., Roth, E., Stenseke, M., Watson, R.T., Başak Dessane, E., Islar, M., Kelemen, E. et al. (2017) 'Valuing nature's contributions to people: the IPBES approach', *Current Opinion in Environmental Sustainability*, 26–27, pp. 7–16. Available at: https://doi.org/10.1016/j.cosust.2016.12.006

Point, S. and Baruch, Y. (2023) '(Re)thinking transcription strategies: current challenges and future research directions', *Scandinavian Journal of Management*, 39(2), 101272. Available at: https://doi.org/10.1016/j.scaman.2023.101272

Pop, A.-M., Hognogi, G.-G. and Bătinaș, R.-H. (2025) 'Who's voice counts? Managing conservation and sustainable valorisation of peatlands', *Environmental Sciences Europe*, 37(1), 46. Available at: https://doi.org/10.1186/s12302-025-01087-9

Pouliot, R., Hugron, S. and Rochefort, L. (2015) 'Sphagnum farming: a long-term study on producing peat moss biomass sustainably', *Ecological Engineering*, 74, pp. 135–147. Available at: https://doi.org/10.1016/j.ecoleng.2014.10.007

Psistaki, K., Tsantopoulos, G. and Paschalidou, A.K. (2024) 'An overview of the role of forests in climate change mitigation', *Sustainability*, 16(14), Article 6089. Available at: https://doi.org/10.3390/su16146089

Quadra, G.R., Käärmelahti, S., van Dijk, G., Gaudig, G., Krebs, M., Prager, A., Koks, A.H.W., Vroom, R.J.E., Liu, W., Temmink, R.J.M. and Fritz, C. (2025) 'The effect of water table fluctuation on 12 Sphagnum species during establishment: implications for peatland restoration and paludiculture', *Restoration Ecology*, 33(3), e14384. Available at: https://doi.org/10.1111/rec.14384

Reed, M.S., Kenter, J.O., Hansda, R., Martin, J., Curtis, T., Prior, S., Hay, M., Saxby, H., Mills, L., Post, J., Garrod, G., Proctor, A., Collins, O., Guy, J.A., Stewart, G. and Whittingham, M. (2020) *Social barriers and opportunities to the implementation of the England Peat Strategy: final report*. Newcastle upon Tyne: Newcastle University, for Natural England and Defra.

Schmilewski, G. (2008) 'The role of peat in assuring the quality of growing media', *Mires and Peat*, 3, Article 2, pp. 1–8. Available at: https://www.mires-and-

peat.net/article/128252-the-role-of-peat-in-assuring-the-quality-of-growing-media.pdf

Schmilewski, G. (2019) 'Socio-economic impact of the peat and growing media industry on horticulture in the EU', *Peat in Horticulture*, pp. 160–164.

Schultz, M., Jamieson, J., Piontek, E. and Halsey, S.J. (2022) 'The importance of cultural values in ecological restorations: a systematic review', *Society and Natural Resources,* 35(9), pp.1021-1039. Available at: https://doi.org/10.1080/08941920.2022.2073625

Sieber, A.C. and Bauerochse, A. (2018) 'Ein Moor im Wandel — das Huvenhoopsmoor in alten Karten und Luftbildern', *TELMA — Berichte der Deutschen Gesellschaft für Moor- und Torfkunde*, 48, pp. 49–70. Available at: https://doi.org/10.23689/fidgeo-3290

Simkin, J., Ojala, A. and Tyrväinen, L. (2021) 'The perceived restorativeness of differently managed forests and its association with forest qualities and individual variables: a field experiment', *International Journal of Environmental Research and Public Health*, 18(2), 422. Available at: https://doi.org/10.3390/ijerph18020422

Sommer, P. and Frank, L. (2024). 'Peatland rewetting as drainage exnovation: a transition governance perspective', *Land Use Policy*, 143(107191), pp.1-10. Available at: https://doi.org/10.1016/j.landusepol.2024.107191

StatsGeo (2026) Peat Production by Country. Available at: https://statsgeo.com/peat-production-by-country (Accessed: 1 September 2026)

Succow, M. and Jeschke, L. (2022) *Deutschlands Moore: Ihr Schicksal in unserer Kulturlandschaft*. 2nd edn. Rangsdorf: Natur+Text.

Tanneberger, F., Abel, S., Couwenberg, J., Dahms, T., Gaudig, G., Günther, A., Kreyling, J., Peters, J., Pongratz, J. and Joosten, H. (2021) 'Towards net zero CO2 in 2050: an emission reduction pathway for organic soils in Germany', *Mires and Peat*, 27(5). Available at: https://doi.org/10.19189/MaP.2020.SNPG.StA.1951

Tannert, E. (2023) 'Moore und Mythen: Mehr als nur ein Leichenfundort', in Heinrich-Böll-Stiftung, BUND and Michael-Succow-Stiftung (eds.) *Mooratlas 2023: Daten und Fakten zu nassen Klimaschützern*. 8th edn. Berlin: Heinrich-Böll-Stiftung, pp. 44–45. Available at: https://www.boell.de/de/mooratlas

Temmink, R., Fritz, C., van Dijk, G., Hensgens, G., Lamers, L., Krebs, M., Gaudig, G. and Joosten, H. (2017) 'Sphagnum farming in a eutrophic world: the importance of optimal nutrient stoichiometry', *Ecological Engineering*, 98, pp. 196–205. Available at: https://doi.org/10.1016/j.ecoleng.2016.10.069

Temmink, R.J.M., Vroom, R.J.E., van Dijk, G., Käärmelahti, S.A., Koks, A.H.W., Joosten, H., Krebs, M., Gaudig, G., Brust, K., Lamers, L.P.M., Smolders, A.J.P. and Fritz, C. (2024) 'Restoring organic matter, carbon and nutrient accumulation in degraded peatlands: 10 years Sphagnum paludiculture', *Biogeochemistry*, 167(4), pp. 347–361. Available at: https://doi.org/10.1007/s10533-023-01065-4

Temmink, R.J.M., Lång, K., Vroom, R.J.E., Leifeld, J., Fritz, C., Zeug, W., Thrän, D., Kleinspehn, C., Gaudig, G., Neubert, J., Kreyling, J., Rhymes, J.M., Evans, C.D., Kotowski, W., Nordt, A. and Tanneberger, F. (2026) 'Agriculture on wet peatlands: the sustainability potential of paludiculture', *Agricultural Systems*, 231(104561). Available at: https://doi.org/10.1016/j.agsy.2025.104561

Thünen Institute (2023) *Aktualisierte Kulisse organischer Böden in Deutschland*. Available at: https://atlas.thuenen.de/catalogue/#/dataset/200 (Accessed: 1 September 2026).

Timmermans, S. and Tavory, I. (2012) 'Theory construction in qualitative research: from grounded theory to abductive analysis', *Sociological Theory*, 30(3), pp. 167–186. Available at: https://doi.org/10.1177/0735275112457914

Tittonell, P. (2014) 'Ecological intensification of agriculture — sustainable by nature', *Current Opinion in Environmental Sustainability*, 8, pp. 53–61. Available at: https://doi.org/10.1016/j.cosust.2014.08.006

Tittonell, P. (2023) *A Systems Approach to Agroecology*. [e-book]. Cham: Springer. Available at: https://doi.org/10.1007/978-3-031-42939-2

UBA – Umweltbundesamt (2026) *Emissionen der Landnutzung, -änderung und Forstwirtschaft*. Available at: https://www.umweltbundesamt.de/daten/umweltzustand-trends/klima/treibhausgas-emissionen-in-deutschland/emissionen-der-landnutzung-aenderung (Accessed: 17 August 2026).

UNEP – United Nations Environment Programme (2022) *Global Peatlands Assessment: The State of the World's Peatlands*. Nairobi: UNEP. Available at: https://www.unep.org/resources/global-peatlands-assessment-2022 (Accessed: 17 August 2026).

van Giersbergen, Q., Barthelmes, A., Couwenberg, J., Lång, K., Martin, N., Tegetmeyer, C., Fritz, C. and Tanneberger, F. (2025) 'Identifying hotspots of greenhouse gas emissions from drained peatlands in the European Union', *Nature Communications*, 16(1), 10825. Available at: https://doi.org/10.1038/s41467-025-65841-6

Vroom, R., Temmink, R., van Dijk, G., Joosten, H., Lamers, L., Smolders, A., Krebs, M., Gaudig, G. and Fritz, C. (2020) 'Nutrient dynamics of Sphagnum farming on rewetted bog grassland in NW Germany', *Science of The Total Environment*, 726(138470), pp. 1–11. Available at: https://doi.org/10.1016/j.scitotenv.2020.138470

Wezel, A., Bellon, S., Doré, T., Francis, C., Vallod, D. and David, C. (2009) 'Agroecology as a science, a movement and a practice: a review', *Agronomy for Sustainable Development*, 29(4), pp. 503–515. Available at: https://doi.org/10.1051/agro/2009004

Wezel, A., Gemmill Herren, B., Bezner Kerr, R., Barrios, E., Rodrigues Gonçalves, A.L. and Sinclair, F. (2020) 'Agroecological principles and elements and their implications for transitioning to sustainable food systems: a review', *Agronomy for*

Sustainable Development, 40(40). Available at: https://doi.org/10.1007/s13593-020-00646-z

Wichmann, S., Krebs, M., Kumar, S. and Gaudig, G. (2020) 'Paludiculture on former bog grassland: profitability of sphagnum farming in Northwest Germany', *Mires and Peat*, 26, Article 08. Available at: https://doi.org/10.19189/MaP.2019.SNPG.StA.1768

Wichmann, S. and Nordt, A. (2024) 'Unlocking the potential of peatlands and paludiculture to achieve Germany's climate targets: obstacles and major fields of action', *Frontiers in Climate*, 6(1380625). Available at: https://doi.org/10.3389/fclim.2024.1380625

Wichtmann, W. and Joosten, H. (2007) 'Paludiculture: peat formation and renewable resources from rewetted peatlands', *IMCG Newsletter*, 3, pp. 24–28. Available at: https://www.researchgate.net/publication/265622374_Paludiculture_Peat_formation_and_renewable_resources_from_rewetted_peatlands

Wichtmann, W., Schröder, C. and Joosten, H. (eds.) (2016) *Paludiculture – productive use of wet peatlands: climate protection – biodiversity – regional economic benefits*. Stuttgart: Schweizerbart Science Publishers.

Ziegler, R., Wichtmann, W., Abel, S., Kemp, R., Simard, M. and Joosten, H. (2021) 'Wet peatland utilisation for climate protection – an international survey of paludiculture innovation', *Cleaner Engineering and Technology*, 5(100305). Available at: https://doi.org/10.1016/j.clet.2021.100305

Zoch, L., Budig, S. and Reich, M. (2024) 'Sphagnum cultivation sites as habitat for beetles (Coleoptera) and the effect of vegetation structure on species occurrence and abundance', *Journal of Insect Conservation*, 28, pp. 75–88. Available at: https://doi.org/10.1007/s10841-023-00524-5

Zoeller, K.C. and Cumming, G.S. (2024) 'Towards an integrated framework for understanding social-ecological interactions: nature's contributions to people meets cultural ecosystem services', *Ecosystems and People*, 20(2329576). Available at: https://doi.org/10.1080/26395916.2024.2329576

ZukunftMoor (n.d.) *ZukunftMoor – Wir wiedervernässen trockengelegte Moore*. Available at: https://www.zukunftmoor.de/#betrieb (Accessed: 29 August 2026).

Popular science summary

When it comes to climate mitigation, rewetting peatlands has become an increasingly prominent topic in the news lately. For a good reason. In a wet state, they store huge amounts of carbon, invisibly below our feet. Indeed, peatlands store twice as much as all the world's forests combined. But because most of our peatlands today are drained and used for agriculture, they turn from carbon sinks to active carbon sources, exacerbating the climate crisis.

Raising the water table again is seen as one of the most effective ways to cut emissions from agriculture. Though most of these areas are actively used for farming. Simply flooding them would mean farmers losing their livelihood. Paludiculture offers an alternative land-use, allowing the land to be wet while growing crops that thrive in these conditions and cutting emissions at the same time.

Despite its promise, paludiculture is still rarely adopted among farmers. This thesis aims to explore potential reasons for this by asking what these landscapes mean to people who live and work there. It identified sociocultural barriers and enablers to rewetting for paludiculture.

I spoke with twelve farmers and one representative from the peat industry in the Gnarrenburger Moor, a peatland region in northern Germany. Roughly 250 years ago peatlands were systematically drained to establish these villages. Farming has played a significant role for the people back then and still shape the landscape and its community today. Farmers built their home and their livelihood around this landscape that can hardly be recognised as a natural peatland anymore. Persisting negative perceptions about peatlands as vast mystic places continue to matter how people think about rewetting. Many fear flooding the land would mean giving up generations of hard work. Others worry the landscape would look wild or unmanaged, losing its characteristic open pastures with grazing cows. At the same time, many farmers also said that they would consider the adoption of paludiculture if it could guarantee a stable income, and if they were involved in shaping the transition rather than having it imposed on them by policymakers.

These findings suggest that broader adoption among farmers requires more than better policies and further development of market chains for paludiculture products. It also means taking farmers' values and meanings attached to this landscape into account.

Appendix 1: Interview questionnaire

Ice-breaker question

- When you think about the peatlands around here, what are the first things that come to your mind?

Introduction:

- Can you tell me a bit about your farm and its history? How long have you been farming here? Did you grow up here in this region?
- What do you mainly produce on your farm?
- What size does your farm roughly cover (in ha)?
- Do you know what type of peatland is found on your farm? (bog or fen)
    - Do you know the depth of the peat layer?
- Have you heard about the term paludiculture before? Are you familiar with the approach of ZukunftMoor in this region?

Supporting identities:

Identity, cultural heritage & tradition, place attachment and connection with non-living and living elements

- Can you describe places, plants, animals or other elements in the peatland that are important to you? What do you feel when you think of these?
- Are there any memories, traditions, or stories connected to peatlands, where you live and work?

Learning & inspiration:

Ingenuity, inspiration, knowledge & learning and perspective

- Have you ever learned anything from working with peat soils?
- Has this landscape ever inspired you about anything?

Physical & psychological experiences:

Aesthetic value, existence & uniqueness of the landscape, non-physical value of activities

- What do you think is special or unique about the landscape here?
- Do you engage in any other activities in the peatland landscape apart from farming?
- How do you feel when you spend time in the peatland in your area? What emotions, moods or sensations do you experience?

Ceremony, spirituality and mental well-being

- Are there moments when being out in the landscape that give you a sense of peace or help you clear your mind?

Other categories:
Intergenerational/ moral responsibility and social relations

- What are your thoughts about the future of farming on peatlands here?
- How do you describe the farming community in this area? Do peatlands play any role in how people cooperate or interact with each other here?
- Have you noticed any changes in the peatland or the landscape during your time farming here?

Attitudes towards paludiculture, interventions & recommendations:
Awareness, attitudes, barriers and enablers

- What thoughts and feelings come to your mind when you think about this changing landscape? Can you distinguish between negative and positive?
- What have you heard about paludiculture so far? What are your initial thoughts or impressions of this approach?
- Do you see any sociocultural benefits paludiculture could bring? *For your own farm or the environment.*
- What would encourage you or other farmers in this area to adopt paludiculture? Can you think of any existing values/beliefs or traditions related to peatlands that might influence people's openness to this approach? *Show prompt cards for support*.
    - Do you think any of these aspects influence how you feel about paludiculture? Why?
    - Do you think adopting paludiculture would strengthen or weaken any of these aspects?
    - Which of these aspects would be most important to you when making decisions about adopting paludiculture?
- What kinds of support do you think would make paludiculture more feasible for farmers here (e.g. policies, markets, technical advice etc.)?

Closing questions:

- Reflecting on our conversation, can you tell me the one thing that motivates you the most in your work as a farmer?
- Is there anything about peatlands or paludiculture that we have not discussed but that you think is important

Demographic information:

- Age
- Gender

Appendix 2: Photos



(own photograph)



(own photograph)



(own photograph)



(own photograph)



(own photograph)



(own photograph)



(own photograph)



(own photograph)

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Paludiculture Adoption

Sociocultural Barriers and Enablers: Case Studies from the Gnarrenburger Moor, Germany



Why paludiculture?

Peatlands are among our most efficient natural carbon stores (UNEP 2022), yet 95% of Germany's peatlands are drained and farmed, becoming major carbon sources (GMC 2026). Paludiculture, the productive use of wet and rewetted peatlands has emerged as a viable alternative. Yet, adoption among farmers remains low. The ecological and economic potential is increasingly studied but the understanding of sociocultural factors shaping farmers acceptance remains limited. Therefore this study asks:

- **RQ 1:** What sociocultural values and meanings do stakeholders associate with peatland landscapes?
- **RQ 2:** How do these act as barriers or enablers to rewetting for paludiculture?

Study Area

The Gnarrenburger Moor is in the North German Plain between Hamburg and Bremen. It covers an area of approximately 6,120 ha with predominantly raised bog soils (see Fig. 1). Most of the farmers in the region are dairy farmers.

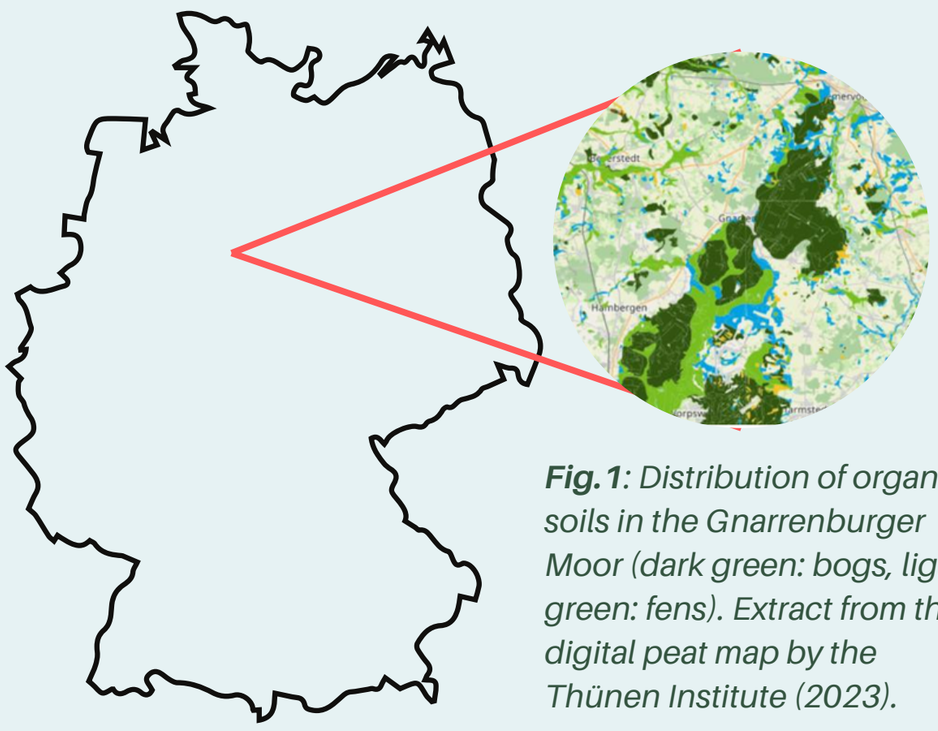


***Fig. 1**: Distribution of organic soils in the Gnarrenburger Moor (dark green: bogs, light green: fens). Extract from the digital peat map by the Thünen Institute (2023).*

Key findings

- Farmers' sense of identity is tied to the drained agricultural landscape, their farm, and the local community.
- Sociocultural values are highly diverse: for some, they outweigh economic incentives altogether; for others,economic incentices remain the decisive factor.
- Political recognition of farmers' realities and planning certainty matters beyond economics.

12 semi-structured interviews

6 full-time farmers

4 retired farmers

1 employee at a peat-processing facility

Methodology

For the assessment of sociocultural values and meanings, this study draws on the Nature's Contributions to People (NCP) framework, developed by IPBES to provide a more holistic understandings for the diverse values of nature (Christie et al. 2019). The non-material contributions formed the basis of the thematic analysis. In addition to those 3 sub-categories, a fouth, responsibility was added inductively as it emerged as a significant category during coding. Qual Coder was used for coding and category management, from which code trees emerged and were then translated into sub-themes presented below.

References:
GMC – Greifswald Moor Centrum (2026) Moore in Deutschland.
UNEP – United Nations Environment Programme (2022) Global Peatlands Assessment: The State of the World's Peatlands. Nairobi: UNEP.

Results

RQ 1: SOCIOCULTURAL VALUES

Supporting identities

Local rootedness, farmer-nature connection & farming as livelihood

Learning & inspiration

Embodied peatland-farmer knowledge build over generations

Physical & Psych. Experiences

Aesthetic appreciation of moor pastures; fear of decline and farming existence in the region

Responsibility

Stewards of land and agricultural species: Active management seen as a duty to keep the land habitable

RQ 2: Barriers

- **Identity:** Attachment to current practices, food production & generational legacy
- **Learning & inpiration:** Technical scepticism, loss of agency & political distrust
- **Aesthetic and physical:** Fear of floods & landscape changes
- **Responsibility:** Trade-offs with biodiversity conservation & food security concerns

> ***"We don't want everything we rewet here to end up as just birch forest and deep, swampy moor [...] then nobody would want to live here anymore. People are glad that we have wide views and structure here."***
>
> **- Mareike* (31)**

*Synonymes

RQ 2: Enablers

- **Socioeconomic**: Economic incentives & livelihood security
- **Sociopolitical**: political recognition of farmers' realities & planning certainty
- **Sociocultural**: securing a future for the village and community

> ***"First of all, awareness. And secondly, once they're aware of that, they need a clear plan that actually works. [...] And even if we did that, the question is: what should actually happen on this land economically [...]? Then you could have a plan, and you could try to sensitise the people affected by it."***
>
> ***- Timo* (~35)***

Discussion

The findings suggest that socioeconomic and policy considerations remain key drivers for paludiculture adoption, but sociocultural factors further shape farmers' openness towards change. This study has shown that sociocultural values and meanings are highly diverse, for some farmers they outweigh economic incentives altogether, while for others, economic incentices remain the decisive factor.

Recommendations

1. Secure farmer's livelihoods as a precondition through adapted polices.
2. Provide binding, locally-adapted pathways and planning security.
3. Ensure local participation and respect for local knowledge and traditions.
4. Listen to farmers' concerns and fears.
5. Focus on finding compromises with farmers.
6. Invest in regional market and processing infrastructure.
7. Shift communication away from climate framing towards more tangible benefits.
8. Facilitate local-led peer-to-peer echange among farmers.
9. Ensure voluntariness as a guiding principle for paludiculture adoption.
10. Expand existing technical advisory structures and conflict mediation capacity.

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