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A qualitative case study in the Veluwe region in the Netherlands

Understanding sheep keepers' intentions to use livestock protection measures in areas with wolf presence

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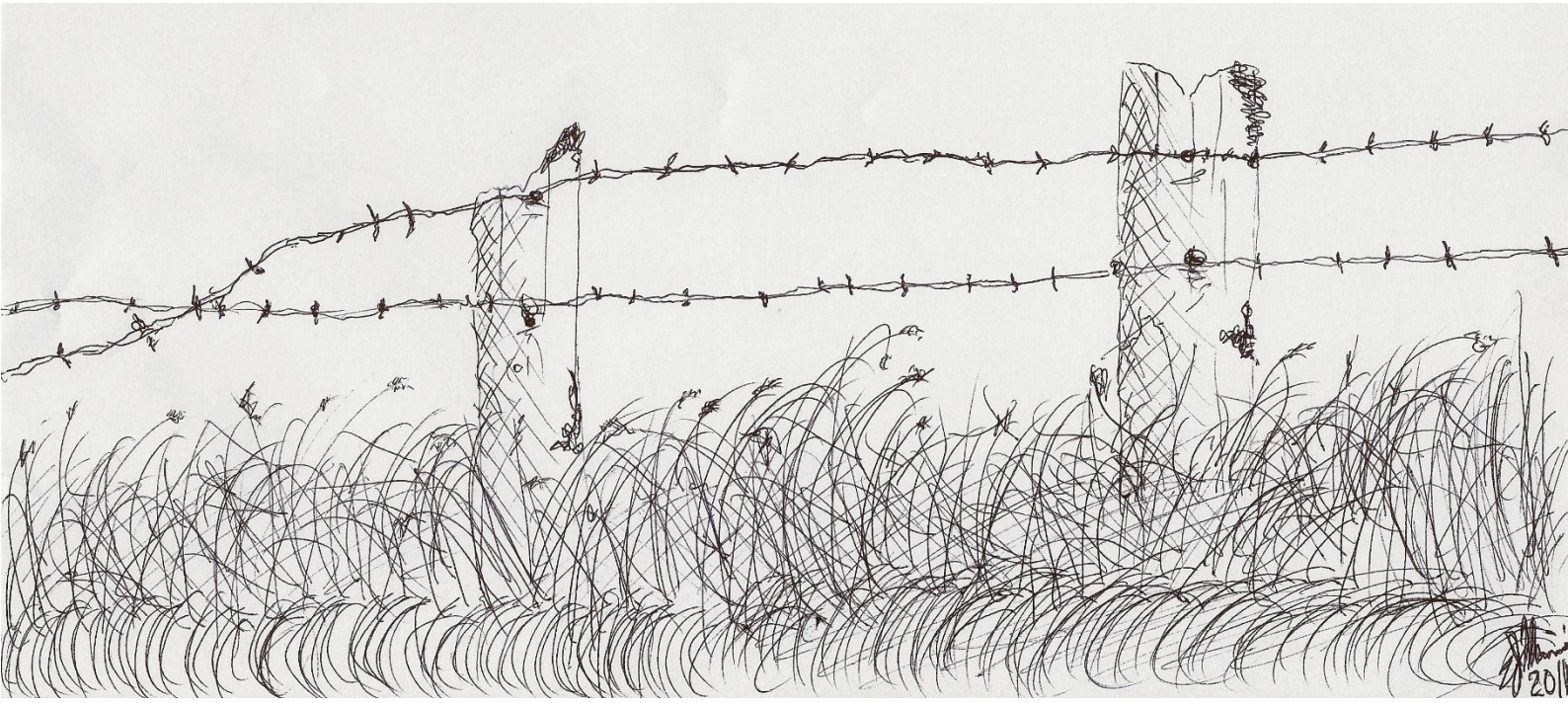

ABSTRACT

This thesis aims to provide an in-depth understanding of the factors influencing the intention of sheep keepers on the Veluwe to use various livestock protection measures (LPMs). Conducted over five months at the Forest and Nature Conservation Policy group at Wageningen University, this social science research involved fieldwork in the Veluwe region in the Netherlands and included fifteen detailed interviews with a diverse group of sheep keepers. The global biodiversity crisis has led to international wildlife conservation policies that aim to restore ecosystems, resulting in increased wildlife populations across Europe, including wolves in the Veluwe region. Wolves, strictly protected in the Netherlands, can play a crucial role in ecosystem regulation. However, their return after over 150 years is both celebrated and contested due to the increased attacks on domesticated animals. Despite subsidies and education efforts, the uptake of LPMs among livestock keepers remains low. Using the Theory of Planned Behavior (TPB), this study investigates the attitudes, subjective norms, and perceived behavioral control (PBC) influencing sheep keepers' intentions to implement LPMs.

The results underscore the importance of attitudes, subjective norms, and perceived behavioral control in shaping sheep keepers' intentions and behaviors regarding LPM adoption. Key drivers include perceived wolf abundance, lack of wolf management, declining prey availability, low trust in the government, and a strong sense of responsibility for sheep welfare. The emotional impact of wolf attacks on sheep keepers highlights the need for effective support and practical measures to mitigate stress and improve LPM feasibility. The study recommends that policymakers enhance LPM adoption by addressing practical challenges, increasing financial support, and fostering positive social norms. Additionally, it calls for further research on the effectiveness of LPMs, innovation in protective technologies, and exploring non-lethal wolf management strategies.

Recognizing sheep keepers as caretakers, deeply invested in their animals' welfare, is crucial for fostering a supportive environment and advancing human-wildlife coexistence. Understanding sheep keepers' attitudes towards LPMs is crucial for developing effective conservation policies and management plans to improve human-wolf coexistence in a shared landscape such as the Veluwe. The findings emphasize the importance of recognizing sheep keepers' dedication and addressing their concerns to enhance the adoption of LPMs, thereby fostering better human-wolf relations. This study underscores the need for ongoing research into effective LPMs and equitable support for livestock keepers, ensuring a balanced approach to wildlife conservation and agricultural sustainability.

SAMENVATTING

Deze scriptie heeft tot doel een diepgaand inzicht te bieden in de factoren die de intentie van schapenhouders op de Veluwe beïnvloeden om verschillende beschermingsmaatregelen voor vee (LPM's – *Livestock Protection Measures*) te gebruiken. Dit vijf maanden durende sociale wetenschappelijk onderzoek, uitgevoerd bij de leerstoelgroep Bos- en Natuurbeleid van Wageningen Universiteit, betrof veldwerk in de Veluwe en omvatte vijftien gedetailleerde interviews met een diverse groep schapenhouders. De mondiale biodiversiteitscrisis heeft geleid tot internationale natuurbehoudsbeleid dat erop gericht is ecosystemen te herstellen, wat heeft geresulteerd in toegenomen wildpopulaties in heel Europa, waaronder wolven op de Veluwe. Wolven, strikt beschermd in Nederland, spelen een cruciale rol in het reguleren van ecosystemen. Hun terugkeer na meer dan 150 jaar wordt zowel gevierd als betwist vanwege de toegenomen aanvallen op

gedomesticeerde dieren. Ondanks subsidies en voorlichting blijft het gebruik van beschermingsmaatregelen onder veehouders laag. Met behulp van de Theorie van Gepland Gedrag (TPB – *Theory of Planned Behavior*) onderzoekt deze studie de attitudes, subjectieve normen en waargenomen gedragscontrole (PBC – *Perceived Behavioral Control*) die de intentie van schapenhouders beïnvloeden om beschermingsmaatregelen te implementeren. De interviews onthulden belangrijke inzichten in de gedrags-, normatieve en controle-overtuigingen over beschermingsmaatregelen. Deze inzichten benadrukken de behoefte aan meer financiële steun en innovatieve, praktische en effectieve beschermingsmaatregelen. De steun voor de strikte beschermingsstatus van wolven neemt af in Nederland, voornamelijk door de frequente en ernstige aanvallen op vee, waarbij schapen het vaakst worden aangevallen. Het begrijpen van de houding van schapenhouders ten opzichte van beschermingsmaatregelen is cruciaal voor het ontwikkelen van effectief natuurbeleid en beheersplannen om het samenleven van mensen en wolven te verbeteren in een gedeeld landschap als de Veluwe. De bevindingen benadrukken het belang van erkenning van de toewijding van schapenhouders en het adresseren van hun zorgen, om het gebruik van beschermingsmaatregelen te bevorderen en op deze manier betere relaties tussen mens en wolf te stimuleren. Deze studie onderstreept de noodzaak van voortdurend onderzoek naar effectieve beschermingsmaatregelen en rechtvaardige ondersteuning voor veehouders, om zo een gebalanceerde benadering van natuurbehoud en duurzame landbouw te waarborgen.

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TABLE OF CONTENTS

ABSTRACT 2
SAMENVATTING 2
ACKNOWLEDGEMENTS 3
TABLE OF CONTENTS 4
1. INTRODUCTION 6
1.1 Problem statement 6
1.2 Objectives 7
2. THEORETICAL FRAMEWORK 8
2.1 The importance of human dimensions in wildlife conservation 8
2.2 Conceptual discussion: Interactions between humans and wildlife, conflicts and coexistence 9
2.3 Livestock protection measures as a coexistence strategy 13
2.4 Theoretical framework: the Theory of Planned Behavior 15
2.5 Sub-research questions 17
3. RESEARCH METHODOLOGY 18
3.1 Overall research design 18
3.2 Case study: sheep keepers and wolves in the Veluwe region 18
3.3 Sampling strategy 19
3.4 Methods for data collection 20
3.5 Methods for data analysis 21
3.6 Adaptations during the research process 21
3.7 Ethical considerations, data management and positionality 23
4. RESULTS 24
4.1 Movable fences 24
Attitudes towards using movable fences 24
Subjective norms regarding using movable fences 32
Perceived behavioral control over using movable fences 38
4.2 Livestock guarding animals: dogs and donkeys 43
Attitudes 43
Subjective norms 45
Perceived behavioral control 47
4.3 Keeping sheep indoor: only at night or most of the time 47
Attitudes 47
Subjective norms 48

Perceived behavioral control 49
5. DISCUSSION 50
Interpretation and analytical considerations 52
Contextualizing within the field 52
Recommendations for research and practice 55
Conclusion 57
BIBLIOGRAPHY 59

Appendices

A. Characteristics of participants 67
B. Background information on the study area: the Veluwe 68
C. Interview guide (Dutch) 76
D. Information and consent form used in interviews (Dutch) 79
E. Tangible contributions of the study to society 81
F. Timeline of research project 82
G. Illustrations of different livestock protection measures 83
H. E-mail sent to network of sheep keepers 84

List of figures

Figure 1 Theoretical framework 15
Figure 2 Conceptual model 16

Abbreviations

EU	European Union
LPM	Livestock Protection Measure
PBC	Perceived Behavioral Control
TPB	Theory of Planned Behavior
OVP	Oostvaardersplassen

1. INTRODUCTION

Historically, human livelihoods and natural ecosystems have been interconnected. However, ongoing habitat loss and degradation (Baisero et al., 2020; Hoekstra et al., 2005; Powers & Jetz, 2019; Segan et al., 2016), projected impacts of climate change (IPCC, 2023; Sundström et al., 2014), and increasing urbanization driven by a growing human population (McKinney, 2006) are intensifying this co-occurrence (Nyhus, 2016). In addition, carnivore populations in Europe, including wolves, are recovering due to biodiversity conservation efforts at the EU level (Chapron et al., 2014; Kuijper et al., 2019; Trouwborst & Fleurke, 2019). International legislation aimed at curbing global extinction rates prohibit the lethal prosecution of species like wolves, lynx and bears (IPBES, 2019; Ripple et al., 2014). As a result, the challenge of sustainable coexistence between humans and wild animals is becoming more pressing, affecting both human livelihoods (Bautista et al., 2019) and biodiversity conservation (Nyhus, 2016).

In Europe, wolves are expanding into human-dominated landscapes, even in densely-populated countries like the Netherlands (Kuijper et al., 2019). Without measures to promote sustainable coexistence, wolves can cause significant problems for humans and domesticated animals (Blanco & Sundseth, 2023; Nyhus, 2016; Pettersson et al., 2022). The rise in livestock attacks and feelings of unsafety, especially in rural areas, has sparked political debate in the Netherlands and the European Union[1] (Blanco & Sundseth, 2023). In a Dutch setting lethal population management (like practiced in Scandinavia) is not an option until a favorable conservation status is reached. Therefore, the national policy focuses on providing subsidies for animal keepers to implement livestock protection measures, and providing damage compensation after attacks. The local wolf population is projected to increase from nine to at least twenty-three packs, particularly in the Veluwe region (Biersteker et al., 2024; NOS, 2024). Therefore, effective livestock protection is crucial for preventing increased wolf predation, reducing human-wolf conflicts, and ensuring the sustainability of rural livelihoods.

1.1 Problem statement

Although the overall impact of wolves on livestock in the EU is minimal, certain rural areas face substantial pressures (Blanco & Sundseth, 2023; Pettersson et al., 2022). The Veluwe region exemplifies this, with high wolf density and increasing livestock conflicts, particularly affecting sheep (BIJ12a, 2024; Tweede Kamer, 2024). The return of wolves to the Netherlands has led to increasing conflicts with the animal keeping community, posing challenges for both conservation efforts and rural livelihoods (Provincie Gelderland, 2024a). Especially for sheep keepers living close to wolf areas, it has become risky to keep their animals outside without guarding, wolf-deterring fences, or other forms of protection (Kuijper et al., 2019). Without these measures, domesticated animals are increasingly at risk of depredation by wandering wolves and settled wolf packs - at night, but increasingly also during daytime (RTV Drenthe, 2023).

[1] Important topics under discussion include the selection of management strategies to prevent or minimize conflicts and the division of responsibilities among various stakeholders to enhance coexistence (Tweede Kamer, 2024). In Dutch wildlife management, nuisance-causing animals are typically removed from rural areas to reduce conflicts, such as agricultural damage caused by deer or foxes. However, wolves are strictly protected under binding international conservation laws, making hunting them impossible. Despite national interests in lowering their protection status, the slow policy change processes at the EU level and the requirement to achieve a favorable conservation status make lethal population management an unrealistic option.

Despite governmental recommendations and subsidies, adoption of livestock protection measures remains low in the Veluwe region, with only 10% of sheep keepers in Gelderland implementing these measures at time of writing (Gebiedscommissie Gelderland, 2023). Most of the attacked sheep are not protected according to guidelines, and regardless of the damage compensation, these attacks seem to lead to a lot of worry (BIJ12**a**, 2024; Provincie Gelderland, 2024b). Insufficiently protected livestock are easy prey for wolves and can exacerbate the conflict, as wolves may specialize in preying on sheep, making future prevention even harder. The amount of attacks is still increasing in this area. This situation has led to growing frustration and decreased public support for wolves, which has dropped from 57% to 42% in the past three years (Motivaction, 2024). The primary concern among wolf opponents is livestock attacks, with worries rising from 42% to 76% in the same period (Motivaction, 2024).

If left unaddressed, the issue can undermine what is often described as sustainable coexistence (Büscher and Fletcher, 2019; Madden, 2004; Kuijper et al., 2019), as has been the case in other countries with a history of human-wolf conflicts, resulting in retaliatory killing of wolves or increased polarization over the conservation status (Bruns et al., 2020; Janeiro-Otero et al., 2020). Policymakers and ecological scientists have explicitly called for social research into livestock protection behavior in the Veluwe region, highlighted during a round table meeting about the wolf in the Netherlands in April 2024 (Tweede Kamer, 2024). The reasons for the low adoption rate of protective measures among sheep keepers in the Veluwe region, despite available subsidies and recommendations, remain unclear. This poses a clear knowledge gap concerning sheep keepers' attitudes to, norms about, and barriers to implementation of preventive measures.

1.2 Objectives

Based on the above outlined knowledge gap, the goal of this research is to gain a comprehensive understanding of the factors influencing the intention to implement livestock protection measures among sheep keepers on the Veluwe. By identifying these factors, efforts can be better directed to increase the adoption of livestock protection measures and enhance the effectiveness of related policies in the Province of Gelderland.

From a scientific standpoint, this study seeks to expand the knowledge base on human-wildlife interactions and the application of the theory of planned behavior - introduced in the next chapter - in the context of wildlife conservation. The societal objective is to support the protection of sheep in an established wolf territory on the Veluwe against wolf attacks, thereby promoting coexistence between humans, sheep, and wolves on the Veluwe.

To achieve this objective, the main research question guiding this research is: *Which factors influence sheep keepers' intention to implement livestock protection measures on the Veluwe, Netherlands?*

To answer the main research question, a qualitative research methodology was employed, using semi-structured interviews that were grounded in the theory of planned behavior. Related to the theoretical lens, the main research question was divided into the following sub-questions:

1. What are the attitudes and related behavioral beliefs of sheep keepers towards using LPMs?
2. What are the perceived subjective norms and related normative beliefs of sheep keepers regarding using LPMs?
3. How do sheep keepers perceive their behavioral control and related ease, resources and obstacles towards using LPMs?

Given that the formulation of the sub-questions was guided by the theoretical framework this step is further explained in Chapter 2.

2. THEORETICAL FRAMEWORK

This chapter defines key concepts and presents scientific debates and literature about wildlife conservation, human-wolf coexistence and livestock protection measures. It also presents the conceptual framework - based on the theory of planned behavior – that is guiding this study.

2.1 The importance of human dimensions in wildlife conservation

It is well-documented that human activities are rapidly consuming natural resources. Studies such as those by Steffen et al. (2007) and the reports by the IPCC (2023) provide comprehensive evidence of this trend. The conversion of natural habitats for human development, including transport and energy infrastructure, resource extraction, and food production, is a well-established phenomenon (Nyhus, 2016; Powers & Jetz, 2019; Segan et al., 2016). Studies like those by Hoekstra et al. (2005) and McKinney (2006) highlight how these activities lead to habitat loss and fragmentation. The mass consumption of resources and habitat destruction are indeed causing serious environmental problems, contributing to accelerated extinction rates. This is supported by scientific assessments such as the IPCC reports and studies by Baisero et al. (2020) and Sundström et al. (2014). The idea that we are currently experiencing a sixth mass extinction, often referred to as the Anthropocene or Holocene extinction, is supported by numerous studies and scientific opinions. Researchers like Ceballos et al. (2015) and Barnosky et al. (2011) have provided substantial evidence that current extinction rates are significantly higher than natural background rates, largely due to human activities.

During this period of accelerated species extinction, conserving biodiversity is becoming increasingly important (Büscher & Fletcher, 2019). Globally, institutions are intensifying efforts to protect biodiversity through measures such as strictly protected areas and species (IPBES, 2019; Ripple et al., 2014). Top predators like wolves can contribute to ecosystem restoration through cascading effects on vegetation, and by providing food sources to scavengers like ravens, kites, foxes, wild boar, and various insects (Gerber et al., 2024; Nature Today, 2019; Nature today 2020a,b; Ripple et al., 2014). Other ecological studies suggest that they can play a crucial role in regulating populations of large herbivores, alleviating overgrazing, and distributing nutrients in natural areas (Bump et al., 2009; Ripple & Beschta, 2012). Based in these key functions in ecosystems, carnivores have gained special protection status, leading to international conservation laws aimed at increasing large carnivore populations to counteract biodiversity loss (Trouwborst & Fleurke, 2019). The consequential return and reintroductions of keystone species like wolves has sparked debate over the ecological benefits and social challenges. While rewilding – the return of species of wild animals that have been driven out or exterminated - can restore ecosystems and increase biodiversity, it also raises concerns among local communities about livestock predation and land use (Chapron & López-Bao, 2014; Perino et al., 2019; Ripple & Beschta, 2012).

Despite the ecological importance of wildlife conservation, including carnivore conservation, dominant conservation strategies in the field are increasingly criticized for their narrow focus on the natural dimension, often neglecting the socio-political implications for human communities (Brockington et al., 2006; Holmes & Cavanagh, 2016). Conservationists frequently possess more political power to determine human interactions with nature than the rural communities most affected by these measures (Holmes & Cavanagh, 2016). Consequently, conservation organizations often prioritize the

needs of nature, such as global ecological restoration, over the needs of humans, particularly local rural livelihoods. This can lead to severe livelihood restrictions and even human rights violations through land evictions (Brockington, 1999; Brockington et al., 2006; West et al., 2006).

Research by social scientists indicates that when those directly involved in wildlife conservation feel that wildlife needs are prioritized over their own, it can harm their economic and social wellbeing, reduce local support for conservation, and ultimately undermine conservation efforts (Madden, 2004; Treves et al., 2006). In contrast, community-based conservation emphasizes the role of local populations in wildlife management (Agrawal & Gibson, 1999). This approach fosters sustainable coexistence by involving communities in decision-making processes and conservation activities, aiming to empower residents and potentially leading to greater acceptance of wildlife and innovative, locally-tailored solutions.

Despite the challenges with stakeholder representation, equitable distribution of benefits and costs and participatory process design (Agrawal & Gibson, 1999), bottom-up conservation approaches that involve local people can enhance the effectiveness and legitimacy of conservation efforts by integrating cultural values and traditional knowledge (Reed et al., 2015; Berkes, 2004). *Critical* social further critique conventional conservation policies and practices, challenging their underlying assumptions, values and power structures (see for example Adams & Hutton, 2007; Escobar, 1998; Fletcher, 2010; Massarella et al., 2021).

2.2 Conceptual discussion: Interactions between humans and wildlife, conflicts and coexistence

In research on the human dimensions of wildlife conservation, the concept of *human-wildlife interactions* is central. These interactions date back to humanity's origin, with both competing for resources and habitats (Nyhus, 2016). Historically, many wildlife species have been driven to extinction or significantly reduced due to human competition. However, recent awareness of biodiversity's importance has led to efforts to preserve wildlife, resulting in increased interactions that range from negative to positive (Frank, 2016; Nyhus, 2016).

Negative encounters are often labeled as *human-wildlife conflicts.* In contrast, the idea of *coexistence* suggests a more harmonious relationship, signifying the shared existence of humans and animals, though not necessarily free from conflict (Frank, 2016). The *social-ecological systems framework* provides a comprehensive lens to examine human-wildlife interactions (Ostrom, 2009). It considers the interconnectedness of ecological dynamics and human activities, emphasizing resilience and adaptability. This framework helps identify feedback loops and potential interventions that can enhance coexistence.

The nature of these interactions depends on various factors, including the frequency and severity of interactions, the wildlife species involved, the location and landscape, perceived and real impact on livelihoods, and socio-political and cultural contexts (Frank, 2016; Jacobs et al., 2014; Manfredo & Dayer, 2004; Peterson et al., 2010; Treves & Bruskotter, 2014; Van Leest, 2019). Biological factors such as the life stage and sex of the animal and prey availability, and human factors like risk perception and wildlife value orientations (Fulton et al., 1996), gender, historical context of the conflict and adopted livestock husbandry and management practices (Nyhus, 2016), also play significant roles.

Positive attitudes toward wildlife often lead to tolerant or protective behaviors, whereas negative attitudes can result in harmful actions such as poaching. These attitudes are influenced by cultural, psychological, personal, economic and social factors, including materialist or post-materialist needs,

religious versus scientific perspectives on nature, and mutualist versus utilitarian perspectives on wildlife (Manfredo & Dayer, 2004).

As human populations expand and natural habitats shrink, boundaries between humans and wildlife are becoming increasingly blurred. In some cases, humans and wildlife have co-evolved and learned to coexist or co-occur. For example, Pooley and Marchini (2020) describe coexistence between humans and crocodiles), achieved through management programs focusing on public education and the removal of problematic animals (Fukuda et al., 2014). However, these programs are not universally applicable and must be tailored to regional circumstances (König et al., 2020). Despite efforts for achieving coexistence, interactions with wild animals are leading to increasingly severe conflicts in many places (IUCN, n.d.; Madden, 2004). In Europe, strict conservation legislation for large carnivores like lynx and wolf has led to their recovery and subsequent conflicts in regions where people have long lived without these predators (Trouwborst, 2010). Consequently, wildlife conservation and development organizations are increasingly focusing on human-wildlife conflicts and strategies to mitigate them. These efforts aim to prevent further damage to both human and wildlife populations and ensure sustainable coexistence.

The study of human-wildlife conflicts (HWC) is a relatively new and increasingly popular field spanning various disciplines, including anthropology, psychology, biology, political science, history, natural resource management, economics, environmental studies and geography. Addressing HWC is widely considered crucial for the success and stability of conservation efforts, as well as the support of local communities. As Madden (2004) notes, "without properly addressing HWC in the effort to conserve wildlife and their habitat, conservation efforts will lose stability and progress, as well as the support of local communities" (p. 249). HWC is defined in multiple ways. Some definitions emphasize only the negative impact of interactions on wildlife. For instance, the FAO and WWF define HWC as "any interaction between humans and wildlife that results in negative impacts of human social, economic or cultural life, on the conservation of wildlife populations, or on the environment"(FAO, n.d.). Other definitions consider the negative impact on both sides: "Human-wildlife conflict occurs when the needs and behavior of wildlife impact negatively on the goals of humans or when the goals of humans negatively impact the needs of wildlife. These conflicts may result when wildlife damage crops, injure or kill domestic animals, threaten or kill people" (Madden, 2004, p. 248). The IUCN Human-Wildlife Conflict Task Force also includes both human and wildlife dimensions: "Human-wildlife conflict occurs when animals pose a direct and recurring threat to the livelihood or safety of people, leading to the persecution of that species"(IUCN SSC, n.d.).

Human-wildlife conflict varies in frequency and impact, involving a wide range of species and occurring on different scales (Nyhus, 2016). Numerous case studies worldwide have documented conflicts of diverse groups of species, including human-carnivore conflicts (with bears, raptors, lions, leopards, cheetahs, tigers, lynxes, wolves, dingo's and coyotes) and human herbivore conflicts (with elephant, monkeys, deer, rodents, starlings and wild boars). These conflicts occur in both rural and urban environments, across terrestrial and aquatic ecosystems, and stems from competition, depredation or human injury (Nyhus, 2016). A global characteristic of these conflicts is the unequal distribution of vulnerabilities and benefits related to wildlife within society, often leading to human-*human* conflicts over wildlife (Manfredo & Dayer, 2004; Treves et al., 2006).

While the term 'human-wildlife conflict' is widely used by research agencies and practitioners, it has been criticized by several scholars (Frank, 2016; Peterson et al., 2010). These scholars advocate for re-framing human-wildlife interactions from a negative focus on 'conflicts' to a more neutral focus on '***tolerance'*** or '***coexistence'***, and for incorporating human dimensions. Peterson et al. (2010) argue that the term 'human-wildlife conflict' positions wildlife as conscious antagonists, as if they intentionally

create conflict. This framing, they contend, upholds a false human-nature dichotomy, portraying wildlife as a threat to human existence and potentially hindering coexistence. Frank (2016) further argues that framing interactions as conflicts constrains solutions by forcing practitioners to focus on reducing negative interactions rather than increasing positive human-wildlife relations.

Another significant criticism of contemporary human-wildlife conflict mitigation strategies is their anthropocentric approach, which generally aims to minimize direct wildlife damage. Boonman-Berson (2018) argues in her PhD thesis that human-wildlife conflicts should not be approached as 'wildlife problems', where wildlife are seen as the source of issues that humans need to control. This perspective obscures the human factors and broader structures of economy, power and global forces that may have influenced or created the conflict in the first place (Van Leest, 2019). Such an approach is problematic because it reduces animals to silent, non-political objects, masking the more complex roots of the problems. For instance, the increasing conflicts between wolves and humans are not solely due to the spontaneous resurgence of predatory species or intolerant human behavior. Their resurgence in human landscapes is also driven by larger political and economic developments, such as habitat destruction due to resource extraction and capital accumulation (REF).

Geographer Srinivasan also critiques the anthropocentric focus of human-wildlife conflict mitigation strategies, questioning the human exceptionalism and biopolitical emphasis within political ecology approaches to conservation. She calls for a new field of political animal ecology that includes the agency of non-human entities (Srinivasan, 2016, 2017; Srinivasan & Kasturirangan, 2016). Srinivasan criticizes the exclusion of non-human, vulnerable lives in political ecological development approaches and suggests including animals as 'proper subjects of justice'. This resonates with later work by Margulies & Karanth (2018), who advocate for a more expansive view of justice within political ecology that considers the impacts of conservation on non-human lives, not just the burdens on the rural poor (Van Leest, 2019). However, these eco-centric, more-than-human right of nature approaches are criticized for the fundamental fact that animals cannot articulate their desires and thus always require human representatives. While behavioral science might assist, it risks projecting human desires onto animals (Fletcher, 2019).

Considering these criticisms, it is crucial to be cautious with the notion of 'human-wildlife conflict'. Framing interactions this way may limit solutions and obscure the fundamental root causes of conflicts. To overcome HWC, alternative notions, or 'comic reparations' (Peterson et al., 2010), have been developed, such as ***human-wildlife coexistence, cohabitation*** (Boonman-Berson, 2018, Ch. 1.2.2), ***living together, multispecies communities, positive interactions*** and ***tolerance***. According to Peterson (2010), such terms "can redirect attention to the mutuality between humans and wildlife, while still addressing cases where humans and wildlife compete for limited resources" (p. 80). He argues that solutions must include and foster positive interactions, human-wildlife coexistence and attitudes of tolerance toward wildlife to maximize success.

Frank (2016) defines ***human-wildlife coexistence*** as "a state or a set of behaviors reflecting tolerance attitudes" (p. 740). This concept acknowledges that humans and wildlife can share the same landscape or environment. In a global context of increasing interactions due to blurring boundaries, it is reasonable to frame the problem and solution in terms of 'coexistence', 'cohabitation' or 'co-occurrence'. Projects aimed to increasing coexistence, and thereby promoting neutral to positive human-wildlife interactions, focus on fostering tolerant attitudes toward wildlife among those involved in conflicts. Several conservation organizations have already integrated such concepts in their practices through education, training and engaging local communities in conservation efforts like eco-tourism. A significant component of these programs is changing the human factor by influencing tolerance and acceptance levels and the social norms and values toward wildlife. Long-term

coexistence can only be achieved when local people value wildlife and these values outweigh the negative impacts of living together. Values can be economic, cultural, intrinsic or ecological and the more they are internalized, the greater the chance of sustainable coexistence (IUCN, n.d.).

Governments and conservation agencies often implement economic incentives in order to reduce the perceived costs of predator conservation and thereby increase tolerance for predators. These measures include subsidizing livestock protection measures and damage compensation (Treves & Bruskotter, 2014). Other factors influencing human tolerance levels include education about the presence of predators and the social norms of peers (Treves & Bruskotter, 2014). However, changing human tolerance and behavior is complex and challenging. Human values are generally static, acquired early in life and are unlikely to change significantly within a lifetime (Fulton et al., 1996; Manfredo & Dayer, 2004; Van Leest, 2019). Additionally, economic incentives have not always been effective in increasing tolerance for predators, as intolerant behavior is not primarily motivated by the perceived damage to livelihoods (Treves & Bruskotter, 2014).

Also, the underlying political, cultural and economic dimensions shaping conflicts are often complex and poorly understood (IUCN SSC, n.d.). These conflicts vary by region, making it difficult to create universally transferable solutions. Tolerance, for instance, varies widely around the world: in some cases, relatively poor people tolerate extreme losses caused by wildlife, while in other cases, minor economic losses are enough to trigger intolerance toward a species and an unwillingness to accept their presence under any condition (IUCN SSC, n.d.). This variability indicates that tolerance is not necessarily influenced by education, income, land ownership or the species involved, further complicating solutions. Therefore, addressing HWC is challenging because the human-*human* conflicts surrounding them are often complex and can exacerbate the situation if not properly addressed (IUCN SSC, n.d.). Solutions must be multi-dimensional, involving both social and biological sciences in human-wildlife conflict mitigation strategies (Madden, 2004; Treves & Bruskotter, 2014). Since humans are the constant factor in the conflict capable of understanding multiple perspectives, models of human behavior are crucial in dealing with human-wildlife conflicts (Manfredo & Dayer, 2004). Rather than focusing solely on mitigating conflict, several authors propose focusing on creating more positive human-wildlife relationships and addressing the 'human' factor, as previously mentioned.

Following recent critical sociological theory, this thesis acknowledges the broader political, environmental, and economic developments contributing to the resurgence of wolves in human landscapes. It is crucial to address systemic issues driving biodiversity loss, such as habitat destruction due to climate change, resource extraction, and unchecked economic growth. A more critical ***political ecology***-oriented study might identify systemic drivers of land-use change and increasing human-wildlife interactions, placing responsibility on powerful actors such as governments, organizations, and institutions. Such an approach would be essential for tackling root causes and ensuring that those who bear the costs of living with wildlife are not unfairly burdened. Convivial conservation offers an alternative vision, aiming to democratize conservation by focusing on broader political and economic changes rather than solely on behavioral change in local people directly interacting with wildlife.

However, this thesis does not extend to such an expansive scope. Instead, it aims to practice qualitative research methods in the field and provide tangible recommendations for short-term policy improvements. This research addresses the human factor in fostering coexistence between wolves and people in the Netherlands, conceptualizing sheep keepers as individual agents of change through a psychological approach. It underscores the importance of increasing the uptake of livestock protection measures and promoting behavioral change for biodiversity conservation. The current legal framework compels the Dutch government to encourage sheep keepers to take preventive measures and protect the wolf population until it reaches a favorable conservation status. Even if wolves were to lose their

protected status, they would likely never fully disappear and remain a threat, as they can migrate from other countries. Furthermore, lethal management efforts have not proven to minimize depredation effectively, especially for sheep (Harper et al., 2008), highlighting the importance of non-lethal protection measures.

For the sake of sheep keepers, it is crucial to find ways to relief those negatively affected by wolves and to identify measures that decrease the perceived disadvantages of taking action. Given the projected increase in wolf populations and the low probability of short-term change in the root causes of human-wolf conflicts, this thesis focuses on a more immediate and tangible topic: supporting sheep protection against wolf attacks in the Netherlands. Solid evidence on factors that drive intentions to use measures could inform policymakers in designing more effective strategies to increase people's willingness to adopt such measures.

2.3 Livestock protection measures as a coexistence strategy

This study starts with the premise that livestock protection measures (LPMs) can be effective when properly implemented, and that barriers to correct implementation may cause functional ineffectiveness. This is supported by the rapid increase in subsidy requests in Gelderland since 2024, following policy responses to the growing number of wolves and livestock attacks. Policies were developed to support animal keepers in protecting their animals against wolf attacks. In April 2024, the Province of Gelderland expanded the subsidy scheme for the purchase of wolf deterring measures. Initially, only those keeping sheep or goats near wolf territories were eligible for subsidies, while those farther away received support only after attacks had occurred. Since April 2024, all pasture animal keepers in Gelderland can apply for the subsidy once every three years. The Province is also working to further improve the subsidy, such as considering funding for automatic winders for other livestock and increasing the overall funding due to the surge in requests (Barneveldse Krant, 2024).

However, several studies have identified a lack of scientific evidence on the functional effectiveness of various LPMs (Eklund et al., 2017; Van Eeden et al., 2018). Previous studies abroad and empirical examples in the Netherlands have demonstrated that merely using a measure does not necessarily prevent predation (BIJ12, 2024a). The effectiveness of LPMs depends on the type of measure, its maintenance, and potential adaptation by wolves, influenced by factors such as local wild prey abundance and the proximity of sheep pastures to wolf territories.

LPMs are assumed to enhance harmonious coexistence between people and wolves (König et al., 2020). Various tools, methods, and techniques can be employed to protect livestock from predators (see Appendix G). There is a distinction between lethal and non-lethal livestock protection measures. Historically, hunting wolves was common, supported by society and encouraged by the government (see Appendix B for more information). Nowadays, lethal methods have become more controversial. Several studies suggest that non-lethal preventive measures are more effective at reducing livestock losses compared to lethal measures (Treves et al., 2016). Lethal control of settled packs can lead to recolonization by another pack, necessitating further protection actions (Bruns et al., 2020; Kuijper et al., 2019). Studies have found that livestock predation does not correlate with the number of predators or livestock in a certain area but with the application and effectiveness of preventive measures (Bruns et al., 2020; Santiago-Avila et al., 2018; Treves et al., 2016). Eklund et al. (2017) showed that predator removal can be effective when problem individuals are specifically targeted (Harper et al., 2008). Among sheep owners in Eklund et al. (2020c), the selective removal of problem individuals was the most acceptable intervention, believed to have high effectiveness and low potential for conflict. However, Harper et al. (2008) also showed that increased wolf killings led to more depredations the

following year. Additionally, lethal control is prohibited by the European Union, so this study focuses exclusively on non-lethal livestock protection methods.

Non-lethal preventive measures can be categorized into two main groups based on their operational systems: (1) physical barriers that separate livestock from predators, such as wire or electric fences, and (2) devices that disrupt the predatory sequence, including sirens, flashing and strobe lights, and guard dogs (Dondina et al., 2015). Furthermore, livestock protection measures (LPMs) can be classified into two types based on their duration and effectiveness: (1) ad hoc measures, effective in the short term, and (2) permanent measures, which may not always be immediately implementable in all situations. Ad hoc measures tend to lose effectiveness over time due to habituation (Van Bommel et al., 2015) but can be a more reasonable management choice in the case of wandering wolves seeking territory, as the financial investment may be substantial relative to the potential damage. Functional, quick and relatively inexpensive temporary measures include optical deterrents such as fences reinforced with fladry barriers - flags hanging from ropes to deter wolves - a less reliable but cost-effective method used for example by the Edese Schaapskudde (Nyhus,2016; Van Bommel et al., 2015; van Snippenberg, 2020). However, wolves can become habituated, losing fear within several weeks (Musiani et al., 2003).

Long-term preventive measures proven most effective include fences reinforced with electricity or other deterrents (mechanical tools and chemicals), the use of livestock guardian dogs, and keeping animals in night stables (Nyhus, 2016; Van Bommel et al., 2015). The most effective permanent damage prevention strategy combines multiple herd-guarding dogs with electric fences (Drenthen & Lelieveld, n.d.; Gebiedscommissie Gelderland, 2020; Niesen, 2020; Van Bommel et al., 2020). Electrified fences have shown significant effectiveness in other countries (Bruns et al., 2020). A popular method from Sweden, in use for over 20 years, involves adding a 5-wire fence to the existing grid at 20, 40-60 and 120 cm heights, effectively keeping wolves out and sheep in. This system requires a constant power supply of 4.5 kV and a bottom wire 20 cm above the ground to prevent wolves from crawling or digging under the fence. Wolves are highly sensitive to electric shocks and typically avoid attempting to breach such barriers after an initial shock. Electrified barriers come in various forms, including movable fences, electric flex nets, and the mentioned 5 wire system (Van Bommel et al., 2015). However, these systems require significant maintenance, such as regular mowing under the bottom wire to prevent current loss and frequent fence repairs, adding considerable labor for livestock keepers.

Livestock guarding dogs are another historical and highly effective method for preventing wolf predation. However, they can be noisy and not always suitable for areas with public access, and maintaining them is labor and capital intensive (Gebiedscommissie Gelderland, 2020). Housing livestock in night stables and corrals is also an effective and reliable permanent method for smaller, domesticated herds. For free-roaming, natural herds with larger territories, the natural herd structure with dominant individuals fiercely defend their groups can sometimes be effective over time.

New strategies are continually being developed to protect livestock from wolves. A promising method involves using stress collars on sheep and other domesticated animals (Nyhus, 2016). These collars send signals to a system that deters predators with acoustic and chemical tools and alerts the supervisor, who can then take action (which is very limited in the Netherlands due to legal prohibition of disturbing wolves). The effectiveness of this system lies in its activation only when the sheep are disturbed, preventing habituation (Nyhus, 2016; Van Bommel et al., 2015, 2020).

2.4 Theoretical framework: the Theory of Planned Behavior

Understanding the drivers of behavior is essential for influencing it, and the Theory of Planned Behavior (TPB) is one of the most widely recognized theories for explaining human behavior, also in pro-environmental contexts (Badsar, 2023; Savari et al., 2023; Tama et al., 2021; Yuriev et al., 2020). A meta-analysis of online behavior-change interventions (Webb et al., 2010) demonstrated that interventions grounded in a theoretical framework were more successful in modifying health-related behaviors compared to those lacking a theoretical basis. Specifically, the Theory of Planned Behavior (TPB) emerged as a particularly effective framework for designing behavior-change interventions (Ajzen, 2020; Steinmetz et al., 2016). Therefore, this research utilizes the TPB to investigate what factors influence sheep keepers' intentions to implement livestock protection measures (LPMs).

Developed by Icek Ajzen in 1991, the TPB suggests that an individual's behavior is best predicted by their intention to perform that behavior, which is influenced by attitudes, subjective norms and perceived behavioral control (Ajzen, 1991). The theory assumes that peoples' intentions and behaviors follow reasonably from their beliefs about the behavior's consequences, the normative expectations of others, and the factors that may facilitate or impede performance of the behavior (Ajzen, 2020). In short, it predicts that beliefs can encourage or discourage behavioral performance. These beliefs do not necessarily have to be based on knowledge, and can be influenced by non-rational factors such as affective states and incomplete knowledge (Ajzen, 2020). In this way, the TPB does not assume people to be rational, just that their behavior is consistent with the held beliefs.

Figure 1 illustrates the key concepts and relationships within the TPB. The arrows depict how an individual's attitudes, subjective norms, and perceived behavioral control regarding a certain behavior can influence their intention to perform that behavior.

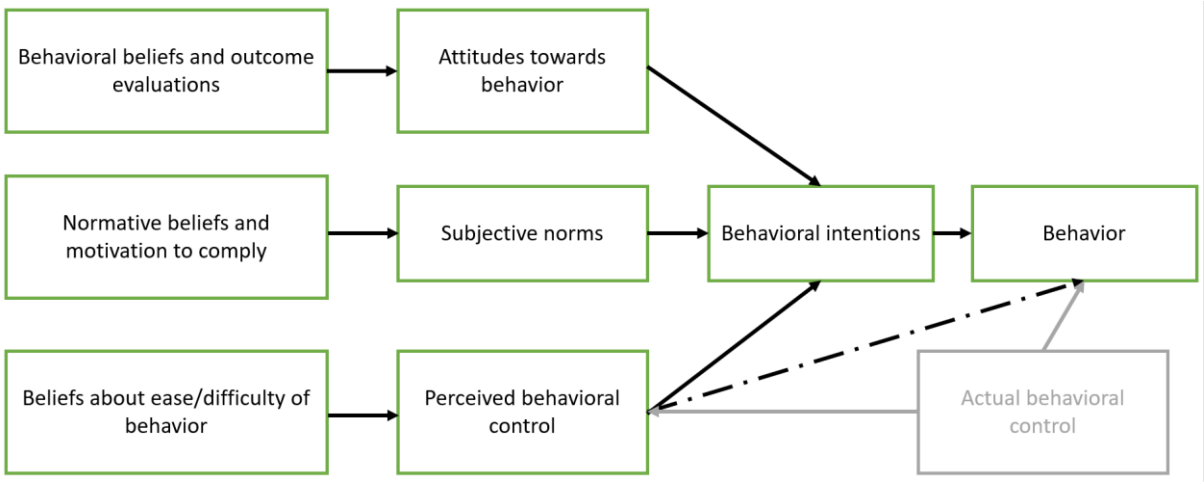

Figure 1 Theoretical framework

Attitudes reflect an individual's evaluation of a behavior, weighing its positive and negative outcomes, based on feeling and cognition (Miller, 2017; Stauder, 2023). Positive attitudes towards LPM use imply favorable evaluations of its outcomes, whereas negative attitudes suggest unfavorable evaluations. Emotions play a role in shaping attitudes (Ajzen, 2011). Positive moods can lead to more favorable evaluations of behaviors and their outcomes, while negative moods have the opposite effect. Studies

on human-wildlife relations have shown that emotions significantly influence behavior (Eklund et al., 2020b; Jacobs et al., 2014; Jacobs et al., 2012; Manfredo & Manfredo, 2008)[2].

Subjective norms refer to the perceived social pressures or influences related to a behavior, derived from cultural, social, or peer group norms (Miller, 2017). These norms involve perceptions of approval or disapproval from significant individuals or groups, such as family, friends, colleagues, community members, authorities, and organizations.

Perceived behavioral control (PBC) is the evaluation of whether an individual believes they can perform a behavior, reflecting their perceived ability to engage in it (Miller, 2017). PBC is influenced by self-efficacy beliefs and perceived controllability. Self-efficacy refers to confidence in one's ability to use LPMs, influenced by personal factors such as skills, physical condition, knowledge, and past experiences. Perceived controllability involves external factors that facilitate or hinder LPM use, such as natural circumstances, political reasons, legislation, and resource availability.

Figure 2 shows the anticipated connections between the theoretical concepts and LPM use. In depicts how attitudes, subjective norms, and perceived behavioral control influence the intention to use LPMs. Actual behavioral control considers factors needed to perform the behavior or those that might interfere with its performance, but is not the primary focus of this study due to its focus on perceptions and short timeframe.

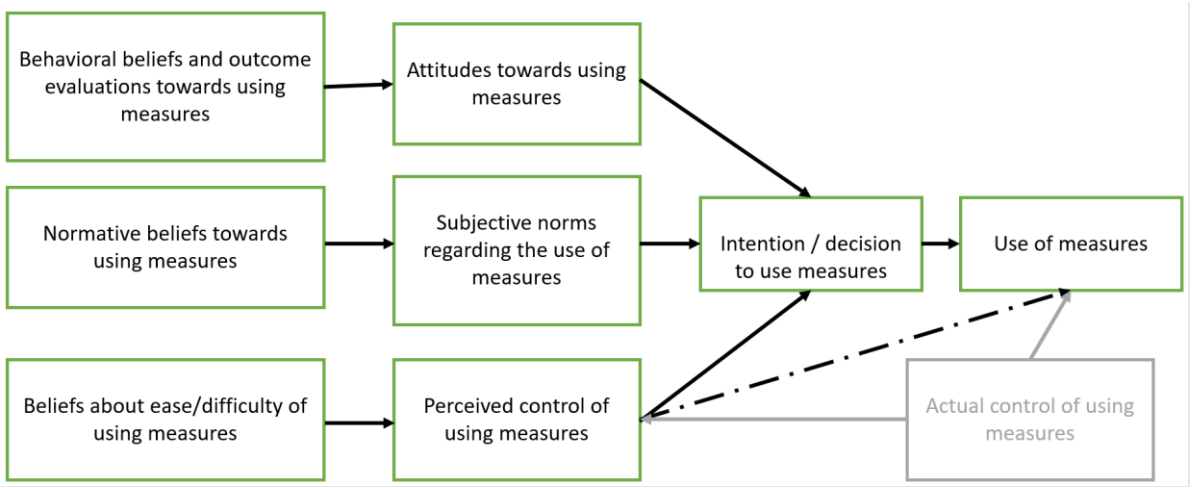

Figure 2 Conceptual model

The TPB has been effectively applied in studies examining the drivers behind intervention use among animal keepers, as demonstrated in research conducted in Sweden (Eklund et al., 2020b) and Switzerland (Stauder, 2023). These studies found that TPB could predict LPM use intentions effectively. Eklund et al. (2020b) revealed that 22% of variance in behavioral intention was explained by TPB constructs. The largest variance was explained by subjective norm, followed by perceived behavioral control. Attitude did not have a statistically significant effect on behavioral intention to use interventions. In contrast, the qualitative results of Stauder (2023) showed that negative attitudes toward LPMs prevailed among her participants because of the perceived technical constraints, excessive workload, and emotional stress. Participants also named more non-supportive than supportive references, with family, friends and other sheep farmers being the most important referent

[2] For instance, the acceptability of lethal control of wolves in the Netherlands was predicted up to 20% by a person's emotional disposition towards wolves (Jacobs et al., 2014a). An extrapolation of this study's findings could suggest that the "emotional disposition towards wolves […] might explain opposition or support for a variety of potential management actions" (p. 595).

group. In her case, PBC was constrained by a lack of professional advice in the province regarding protection measures and a lack of funding for additional costs involved. Willingness to use LPMs varied widely, with the sheer necessity of needing LPMs to continue keeping sheep as the primary motivator to implement measures.

However, the beliefs driving and significance of each construct in predicting behavioral intention can differ across various contexts and environments. Therefore, this study aims to explore this subject in the Netherlands, which has unique policies, population densities and socio-cultural perspectives. Unlike previous TPB studies, no social science research has specifically examined the reasons behind the non-use of subsidies and preventive measures among sheep keepers in Gelderland. This research aims to fill this knowledge gap by exploring and describing sheep keepers' perspectives on the use of preventive measures, focusing on their experiences and expectations.

Despite the complexity of changing human behavior, I believe in the willingness and ability of people to change their behavior, given the right measures and sufficient time. The theory of planned behavior is a promising approach to better understand intentions to perform a behavior, despite the availability of other approaches for studying human behavior[3] and ongoing debates about the role and effectiveness of LPMs in human-wolf coexistence. This study employs the TPB for several key reasons: its predictive validity, its widespread acceptance as a framework for explaining human behavior, and the political necessity for a deeper understanding of the factors influencing LPM use.

2.5 Sub-research questions

The main research question guiding this research is: *Which factors influence sheep keepers' intention to implement livestock protection measures on the Veluwe, Netherlands?* According to the TPB, an individual's intention to perform a behavior is largely determined by three components: personal attitudes, subjective norms, and perceived behavioral control.

Based on the TPB, this study hypothesizes that sheep keepers' intentions to use LPMs are significantly influenced by these three components. To explore the relative importance of these concepts, the study investigates the following sub-research questions, structured according to the conceptual framework:

1. What are the attitudes and related behavioral beliefs of sheep keepers towards using LPMs?
2. What are the perceived subjective norms and related normative beliefs of sheep keepers regarding using LPMs?
3. How do sheep keepers perceive their behavioral control and related ease, resources and obstacles towards using LPMs?

These sub-research questions aim to uncover the specific attitudes, norms, and perceptions that shape sheep keepers' intentions and behaviors regarding the use of livestock protection measures. By addressing these questions, the study seeks to provide insights that can inform effective strategies to promote the adoption of LPMs and enhance human-wildlife coexistence on the Veluwe.

The hypotheses for each construct are as follows:

- For RQ1 (Attitudes): If a sheep keeper has a more favorable evaluation of certain LPM use and expects positive outcomes (i.e., a 'positive attitude towards LPM use'), this will positively affect their intention to use certain LPMs.

[3] Such as the Technology Acceptance Model (Davis, 1989), Protection Motivation Theory (Rogers, 1983) or the Norm Activation Model (Schwartz, 1977).

- For RQ2 (Subjective Norms): If a person perceives that supportive subjective norms for using certain LPMs outweigh norms supporting non-use, this will positively affect their intention to use those LPMs.
- For RQ3 (Perceived Behavioral Control): If a person perceives high behavioral control over the use of certain LPMs, including ease, resources, and minimal obstacles, this will positively affect their intention to use those LPMs.

By exploring these hypotheses, the study aims to provide a comprehensive understanding of the factors influencing sheep keepers' intentions to adopt livestock protection measures, thereby supporting strategies to foster human-wildlife coexistence on the Veluwe.

3. RESEARCH METHODOLOGY

This chapter presents the overall research design, sources of information, methods and instruments for selecting research locations and participants, and techniques for data collection and analysis. It also covers adaptations during the research process, describes the case circumstances and addresses relevant ethical considerations and data management issues.

3.1 Overall research design

The significance of understanding human dimensions of wildlife conservation is paramount for the success of conservation projects and policies. By focusing on those involved in human-wolf coexistence, this thesis integrates these human dimensions into the study of wildlife conservation. Specifically, it seeks to identify solutions that support both wolf conservation and the resilience of rural communities in the Veluwe region. To achieve this, it is crucial to deeply understand the experiences and perceptions of sheep keepers regarding livestock protection measures.

The study employs a qualitative research methodology to explore the factors influencing the adoption of livestock protection measures among sheep keepers in the Veluwe region. Qualitative research provides a deep, detailed understanding of participants' experiences, perceptions, and motivations, uncovering rich insights that quantitative methods might lack (Kvale & Brinkmann, 2009). It employs methods such as in-depth interviews, focus groups, participant observations, and content analysis to gather detailed, contextual, and nuanced data about people's experiences, behaviors, and social phenomena (Lune & Berg, 2017).

To answer the main research question, this thesis comprises 15 face-to-face, in-depth, semi-structured interviews with sheep keepers in the Veluwe. These interviews were conducted, audio-recorded, and transcribed to capture the nuanced perspectives of the participants. The data, comprising interview transcripts, were analyzed using a deductive approach with the software program ATLAS.ti. For addressing the sub-research questions, a coding system based on the conceptual framework was applied to the interview data. These methodological steps are elaborated in the following sections.

3.2 Case study: sheep keepers and wolves in the Veluwe region

This study examines the challenges faced by sheep keepers in the Veluwe region, serving as a case study for human-wolf conflicts. Human-inhabited areas within the Veluwe region, such as Apeldoorn, Barneveld, Ede, and Nunspeet, exemplify the intersection of conservation measures and the livelihoods of sheep keepers. Since the reappearance of wolves in the Netherlands in 2018, after over 150 years of absence, debates have intensified, with urban and rural areas showing contrasting views

on their conservation (Drenthen, 2015; Huijsmans, 2023). Currently, the Netherlands is home to nine wolf packs, seven of which are concentrated in the Veluwe region in the Province of Gelderland (see Map 1, 2, 5 and 6 in the Appendix B).

The Veluwe region spans over 186,000 hectares and includes diverse landscapes such as woodlands, sand dunes, heathlands, agricultural lands, cultural heritage sites, villages and cities (CBS, 2024b)[4] (see Map 7 and 8 in Appendix B). It encompasses two national parks - National Park Hoge Veluwe (5,400 ha) and National Park Veluwezoom (5,000 ha) – along with multiple smaller natural regions, collectively making up approximately 91,000 hectares of natural area (Visit Veluwe, n.d. a,b, c). These areas are notable for their populations of red deer, roe deer, and wild boar, which are primary prey for wolves (de Jong et al., 2024; Ramirez et al., 2021; see Map 9 in Appendix B). The Veluwe's varied ecosystems support rich biodiversity, making it an ideal location for studying wolf populations and their interactions with humans (Bijlsma, 2002; Stoutjesdijk, 1959).

In addition to wildlife, the Veluwe is home to approximately 722,500 residents and 50,000 sheep across over 300 sheep keeping locations (CBS, 2023b; CBS, 2024a) (see Map 10 in Appendix B). In the year 1500, there were already approximately 100,000 sheep in the area, as sheep were indispensable for food production on the Veluwe's infertile lands '(Valouwe' – from the Dutch term *Vale Ouwe* - literally meaning 'bad soil') (Elbertsen et al., 2003). However, overgrazing and intensive heathland digging for fertilization often led to the formation of drifting sands that are now typical landscape characteristics (Neefjes, 2018). Nowadays, with artificial fertilizer and international competition for sheep wool, sheep keeping is economically modest compared to other agricultural sectors in the Netherlands. However, it still contributes to landscape management and provides societal benefits (Elbertsen et al., 2003; Tälle et al., 2016), reflecting a biocultural tradition deeply rooted in familial, aesthetic and ecological values (Gebiedscommissie Gelderland, 2020).

The return of wolves, protected under the EU's Habitat Directive, poses challenges to sheep keepers, particularly in areas like the Veluwe, where rural livelihoods and strict conservation policies intersect (Blanco & Sundseth, 2023). Despite the threat, the implementation of preventive measures against wolf attacks remains limited, with only a fraction of sheep farms equipped with wolf-deterrent fencing (Gebiedscommissie Gelderland, 2023). Given the region's environmental significance and presence of rural livelihoods, focusing on the Veluwe region for this study is both logical and necessary. Additional background information about the study area, including its history, environmental characteristics, and socio-demographic details, is provided in Appendix B.

3.3 Sampling strategy

Participants were selected from the entire Veluwe region, a known wolf territory in Gelderland and an administrative sub-division commonly used for statistical and research purposes. The specific research locations were determined by the places where participants keep their animals. Due to the need for anonymity, exact research locations cannot be disclosed as they might reveal the identities of the participants. However, a list indicating the general geographical locations within the Veluwe (e.g. North, South) is included (see Appendix A).

The focus on sheep keepers was driven by the fact that the majority of governmental wolf damage compensation funds are allocated to sheep/lambs (90%), followed by various types of cows (6%) (BIJ12, 2022). To identify potential participants, I utilized my personal network to find shepherds and hobby sheep keepers and further employed snowball sampling. For instance, a pilot study was conducted with a sheep keeper to refine the interview guide (see Appendix C). While the data from

[4] As administrative sub-region (see Appendix B for more information)

this interview was not used in the research, the participant connected me to a shepherd and a hobby sheep keeper. For professional commercial sheep keepers, I contacted a Dutch sheep farmers organization, which operates within the study area. Through email and phone communications with a representative who was enthusiastic about my research objective, my information sheet was shared with their network, resulting in direct responses (calls and e-mails) from individuals willing to participate (see Appendix H).

Given the limited scope of a thesis project, I conducted 15 interviews, each lasting approximately one hour. Participants were selected based on their willingness to participate, provided they met the following criteria: they were at least 18 years old, informed about the research purpose, and gave consent for anonymous use of their data in the final report. Additionally, they had to be sheep keepers within or near wolf territory in the Veluwe, capable of making independent decisions regarding the use of livestock protection measures (LPM). I aimed to balance the sample by including individuals who had adopted LPMs and those who had not. Furthermore, the sample was designed to represent different parts of the study area: locations with high exposure (presence of wolf packs) and low exposure (wandering wolves). The sample also covered sheep keepers with diverse motivations for keeping sheep. Despite some challenges in reaching female sheep keepers and those in the eastern side of the Veluwe, the sampling strategy effectively captured a broad range of experiences and perspectives, essential for the study's objectives.

3.4 Methods for data collection

Semi-structured interviews were selected for this study to gain comprehensive insights into the factors affecting sheep keepers' decision-making regarding the adoption of livestock protection measures. This method entails detailed conversations where participants answer predefined open-ended questions. While the interviewer adheres to a structured guide, they have the flexibility to delve into pertinent topics that emerge organically (Bernard, 2017). This method facilitates probing into participants' attitudes, subjective norms, and perceived behavioral control concerning LPM usage, with the ability to adjust questioning during interviews as necessary.

An interview guide was developed based on the Theory of Planned Behavior (TPB), adapted to explore predictors such as emotions regarding LPMs (see Appendix C). Questions were designed to cover the main research question and operationalize sub-research questions, ensuring comprehensive coverage of relevant themes and concepts. Prior to data collection, the interview guide was piloted with a participant experienced in social science research and familiar with sheep keeping to refine question clarity and flow.

After selecting participants based on criteria aligned with the study's objectives, interview appointments were scheduled, preferably at participants' homes to ensure comfort and convenience. During the meeting, participants were introduced to the study's purpose and procedures. Informed consent was obtained, emphasizing confidentiality and the voluntary nature of participation. Interviews were audio-recorded with participants' consent for accurate transcription, using an audio-recording device. Time management strategies ensured efficient use of interview time, allowing for breaks if needed. Interviews typically lasted between 40 to 90 minutes, concluding with gratitude for participation and a summary of next steps. Participants were informed about receiving a summary report of study findings at a specified time. All interviews were conducted following ethical guidelines, with participants fully informed about the research purpose and their rights, and providing informed consent.

The interviews commenced with introductory questions aimed at establishing rapport and gathering socio-demographic data. Topics then progressed to explore attitudes towards LPMs, including beliefs about their importance, necessity, and effectiveness. Discussions also encompassed perceptions of advantages, both tangible and intangible, associated with LPMs. Probing techniques were employed to delve into the emotional and practical implications of LPM use on sheep, emotional well-being, the local community, and other wildlife species. Then, participants were queried on their perceptions of social pressures and support from others (e.g., family, peers, other sheep keepers) regarding LPM use. Insights were sought into how others' opinions and behaviors influenced their own decisions regarding LPMs. Then, participants' perceived ability and confidence in using LPMs were explored through inquiries into past experiences, self-efficacy beliefs, and personal factors influencing performance. External factors affecting perceived controllability, such as environmental conditions, regulatory constraints, and resource availability, were also examined.

3.5 Methods for data analysis

To investigate the factors influencing sheep keepers' adoption of livestock protection measures (LPMs), a deductive coding approach rooted in the Theory of Planned Behavior (TPB) was employed. This theoretical approach posits that attitudes, subjective norms, and perceived behavioral control shape behavioral intentions. Qualitative data, including written transcripts and interview notes, were analyzed using ATLAS.ti software. Codes were organized into three primary categories aligned with the TPB:

1. Attitudes
2. Subjective norms
3. Perceived behavioral control

Each category included sub-codes such as positive/negative attitudes, supportive/non-supportive subjective norms, and high/low perceived behavioral control. This structured coding enabled a systematic exploration of participants' perspectives on LPMs.

Initially, transcripts were reviewed to identify instances of LPM use or discussions related to LPMs. Subsequently, codes were applied to relevant data segments. For instance, segments depicting negative attitudes were further categorized into sub-codes like 'negative experience' or 'perceived ineffectiveness'. This hierarchical coding process facilitated a nuanced analysis of participant responses.

In addition to the deductive coding based on the Theory of Planned Behavior (TPB), I wanted to employ inductive coding and thematic analysis to explore broader themes emerging from the data. The aim was to provide new insights into the factors influencing sheep keepers' intentions to use LPMs. Following methodological guidelines articulated by Kvale and Brinkmann (2009), this approach could be facilitated using ATLAS.ti software. However, due to time restrictions this is not included in this report.

3.6 Adaptations during the research process

In conducting the research, my goal was to conduct approximately 15 semi-structured interviews with sheep keepers to explore their attitudes and intentions towards using Livestock Protection Measures (LPMs). Fortunately, I successfully recruited 15 willing participants who were interviewed in person at their homes between March and May 2024 (see Appendix E). The timeline of this research project with all main activities is presented in Appendix E.

Initially, participant selection was open without specific criteria related to demographics such as hobbyist or professional status, gender, or age. However, as I aimed for greater diversity in my sample, I reassessed my approach when five interviews remained outstanding. I sought to achieve balance across various demographic factors including age groups, gender, geographical regions, and types of sheep keepers interviewed. Despite challenges, I ultimately interviewed 12 men and 3 women, spanning all age categories from 18 to 91 years old, and representing a variety of motivations and reasons for sheep keeping. Twelve interviews were audio-recorded, while notes were taken for the other interviews. This was an attempt to see if not recording created a more open setting. However, I did not find that it led to different answers, and it was also tedious to concentrate on both the participant and note-taking simultaneously. Therefore, I ended up recording and transcribing most interviews (Bucher et al., 1956).

Geographically, my initial focus was on municipalities directly adjacent to known wolf territories—Apeldoorn, Barneveld, Ede, and Nunspeet. However, due to interest and requests from adjacent municipalities overlapping with wolf presence, I expanded the study area to include these regions. This strategic decision enabled a comparative analysis between higher and lower risk areas in terms of wolf interactions and perceptions of LPM effectiveness.

The research process encountered several challenges, primarily related to participant recruitment and achieving demographic balance. Despite efforts to diversify the sample, achieving gender parity and representation across all age groups proved challenging. Additionally, logistical considerations such as scheduling interviews across diverse geographic locations required careful planning and flexibility. Lastly, transcribing the interviews presented a significant challenge, particularly with participants who spoke with strong regional accents or dialects not easily captured by standard transcription software designed for clear, standard Dutch (ABN). On average, it took me 5 hours per interview to correctly transcribe. Additionally, interviews conducted outdoors or in windy conditions further complicated accurate transcription, as environmental noise often obscured speech and nuanced expressions, requiring meticulous review and manual correction during transcription.

Balancing objective and empathetic listening during interviews was another challenge. Respecting the emotional wellbeing of interview participants was always a priority. “Coexistence with wolves” is a subject that significantly impacts the lives of those living in wolf territories. It affects their feelings of safety, freedom of movement in daily life, and concerns about the safety of their animals. Therefore, I approached the interviews with caution, listening empathetically and expressing my sympathy. The limitation of this approach is that I, as the researcher, might not always have maintained my objective role during or after the interviews. The positive side of this sensitive, emotional approach was that it facilitated meaningful conversations with the participants, creating a safe space for them to talk about their feelings, perceptions and opinions. Literature suggests that such qualitative research interviews can have therapeutic effects on participants, even when they are aware that the main purpose of the interview is data collection and not therapy (Birch & Miller, 2000; Murray, 2003; Rossetto, 2014).

Overall, I trust the validity of my data because I tested participants’ statements with follow-up questions and was not afraid to ask questions from a devil’s advocate perspective. I regularly summarized my interpretation of their answers to check for accuracy and allow participants to provide additional nuance. After the interviews, I often debriefed with my mother or roommates to check for bias, making reflective notes based on these conversations.

In addition to the TPB-related factors that sheep keepers mentioned in relation to the use of different LPMs, I intended to explore non-TPB-related factors through inductive coding and thematic analysis of

the transcripts. However, I did not have time to complete this last part. Consequently, these results are not included in this thesis report.

Due to time restrictions, I also had to limit the list of LPMs in the analysis phase. From chapter 2, it became clear that the most effective permanent measures include fences reinforced with electricity, the use of livestock guardian dogs, and keeping animals indoors. For sustainable co-existence, it does not make sense to better understand and enhance the uptake of non-effective measures. Therefore, I included the following methods in the analysis: movable and permanent fences, keeping sheep indoors most of the time or only at night, and livestock guarding dogs. Results for other measures – such as livestock guarding donkeys and auditory deterrents - can be requested from the researcher. Still, the research process provided valuable insights into the complexities of human-wildlife coexistence in areas affected by wolf presence.

3.7 Ethical considerations, data management and positionality

To maintain the integrity and reliability of the research, ensuring that participants' rights and privacy were respected throughout the research process, several ethical and data management issues were addressed. First of all, participants were fully informed about the study's purpose, methods, potential risks, data handling, and future data use. Specific and explicit consent was obtained using consent forms, which were sent to participants prior to the interviews (see Appendix D). These forms detailed the scope of the data sharing and future use. Second, confidentiality was maintained by anonymizing personal data to protect participants' identities. This involved removing or altering direct and indirect identifiers, such as the number of sheep, and places of residence. The data was shared with FNP using secure websites and only after anonymization. Lastly, data was stored securely with controlled access, encryption, and regular backups to prevent data loss. Only the main researcher had access to sensitive data. Comprehensive documentation practices, including metadata standards and data dictionaries, ensured that the data was well-organized and understandable.

Recognizing the potential for researcher bias, I continuously reflected on my positionality. My background in nature conservation influences my perspective, acknowledging the critical role of biodiversity for human well-being, economies, and future generations. This perspective informed my understanding of the ecological importance of wolves in maintaining balanced ecosystems. As an outsider with a non-agricultural background, I initially underestimated the actual costs associated with LPMs. However, through interviews, I recognized significant costs, such as those related to sheltering, fly management, and water provision. This realization helped me appreciate the practical challenges faced by sheep keepers. While I strongly advocate for nature conservation, I reserve judgement on the likelihood of achieving ecological balance in the Netherlands, given the heavily fragmented and human-influenced natural areas. Although wolves can alleviate browsing pressure from red deer and wild boar, the fragmented nature of the Veluwe and extensive human activities pose challenges. I remain curious about future developments and open to various outcomes, acknowledging that the positive ecosystem effects observed in other regions may not be directly replicable in the Veluwe.

4. RESULTS

This chapter presents the factors identified by sheep keepers regarding livestock protection measures. The results varied significantly depending on the specific measures, so this chapter is organized by measure, with each section detailing the relevant factors (attitudes, norms, and perceived behavioral control). Illustrations of the different livestock protection measures is provided in Appendix G.

4.1 Movable fences

Attitudes towards using movable fences

Beliefs about effectiveness influenced by perceived behavioral control

Most participants believed that movable fences can be effective in protecting sheep under specific conditions, such as being well-placed, having sufficient electric current running through, and when other prey is available in the area, at least in the short-term. Participants mentioned that placing the fence properly to ensure effectiveness is challenging due to factors like labor intensity, environmental conditions, and maintaining electric tension (discussed further under Perceived Behavioral Control). An influential background factor was the distance to human-inhabited areas and wolf territories; increased distance to wolf living areas and decreased distance to human living areas were believed to enhance the perceived effectiveness of movable fences. This belief in the effectiveness of movable fences under specific circumstances is illustrated by the following quotes:

> *"I do think that a wolf-resistant fence is certainly helpful. But first of all, and this is often the case, it depends on the placement – how it is set up. But it's quite labor-intensive to set it up properly. And then you have the conditions to consider. Look, with those wolf-resistant nets, when there's a storm, you have to check if everything is still standing. They just bend and sway. […] So when there's wind or a storm, they sway, and the height changes."* (P1)

> *"The wolf comes, sees the net with the voltage, smells the voltage, and thinks, 'I'll just look elsewhere, see if there's something over there.' Yeah, I can walk another 30 km, I'll surely find something, you know. But if I don't have a net in place there, he will think, 'I don't really need to walk far today, just over this little wire, and I'll get one. […] He acts just like a burglar. If you always leave the door unlocked and the windows open, and you go visit Aunt Jannie, well, when you come home, there's a chance the burglar has been there. But if you lock everything properly and secure everything, the harder you make it, the more the burglar thinks, 'I'll look elsewhere.' And I think the wolf does the same.[…] the more difficult you make it, they go to the next one. Unless they can't find anything. They become bolder. Then they'll get bolder."* (P3)

> *"The bottom wire is the ground wire, and if a branch or twig touches the ground wire and the first live wire, then you already have a short circuit! And normally you have 8,000 volts on those wires, and then suddenly there's only 4, 4,000. You lose a lot of voltage. And if there are three twigs, and the grass grows too, if the grass grows against it and touches the bottom wire and the second wire, you also lose voltage. […] And they say you need at least 5,000 volts on a wolf-resistant fence. A wolf can feel the electricity from a distance, and so can sheep. They can sense from a distance that the wire is live."* (P8)

Sheep keepers shared the belief that the electric shock is what makes movable fences effective. Beliefs about the required current varied, with one sheep keeper believing that 2.5 kV is sufficient, while others used 8 kV or even 10 kV. Some used 4,5 kV in line with theory and policy guidelines (e.g., P13). There were also different beliefs about whether a wolf will jump over a 1.20 m fence. Some believed that wolves can easily jump over the fence because they don't get shocked while in the air, while others argued that a wolf's instinct is to find a way under or around the fence to drag its prey, rather than jumping.

> *"When you see how they jump, those nets are 1.20 meters high. If the wolf wants to, he can easily jump over them. So, at some point, he will try that too. And while it's in the air and touches the net, it doesn't get shocked." (*P5*)*

> *"The wolf will initially always look for a way to get under or around the net via the ground. But not by jumping at first."(*P6*)*

> *"They'll definitely jump over that. […] For sure. They are very smart, you know." (P12)*

> *"First he starts digging something, but how quickly he already has a trench! He doesn't take a day for that, I think within half an hour he's under that wire here." (P13)*

Even when all the conditions for effectiveness are met by the sheep keeper (i.e., well-placed and with enough electric current running through), many participants expressed doubts about the long-term effectiveness of movable fences as long as wolves are still abundant in the Veluwe area. Settled wolf packs on the Veluwe are not necessarily perceived as a threat to domestic animals, as long as there is enough wild prey available. Wandering wolves in rural areas that leave their pack to look for their own territory are particularly perceived as a threat to sheep. Doubts about long-term effectiveness are often substantiated with beliefs that wolves are intelligent, opportunistic, and creative top-predators that can ultimately learn to overcome movable fences. Long-term effectiveness was also associated with the availability of domestic or wild prey in the area, the uptake of measures by neighbors, and the development of the local wolf population.

> *"The wolves keep getting smarter and they find every little gap, thinking, 'Well, I can dig this little hole a bit and get through.' [..] the first generation of wolves can still be partially or completely stopped by those fences. But eventually, the wolf learns and learns. […] and he is smart. So, he will eventually get through again. He will surprise you at some point."* (P6)

> *"Look, if a wolf wants to jump over it, it's easy for a wolf. Because you're not dealing with a small dog. It's much stronger than people think. […] But then they always say, 'As long as there's enough power on the fence', but as soon as the wolf is off the ground, it can touch a wire without getting shocked. It only gets a shock when it grabs the wire and makes contact with the ground. That's when it gets a charge. […] a wolf-resistant fence is now about 1.35 meters. But that's no trouble for a wolf, really, if it wants to."* (P1)

Negative emotions and concerns regarding use and non-use of movable fences

Several participants mentioned or anticipated negative feelings related to using movable fences. They expressed initial doubts and anxiety about relying on wolf-deterring fences to protect their sheep, resulting in sleepless nights and frequent checks on the fences. Sheep keepers believed that wolves could detect from a distance if the wire was live. Therefore, when there wasn't enough electric current on it, or if branches interfered with the fence, wolves were expected to exploit those opportunities. There was frustration that wolves could still breach the fence due to various circumstances (e.g., weather conditions, neighbors also installing fences) or adaptive behavior by the wolves. Many

participants experienced anxiety and low levels of trust, believing that wolves would eventually get through the fence, posing a constant threat not only to livestock but also to human safety in rural areas. Some participants also mentioned that they found a rural landscape full of fences ugly, while others mentioned that they would get used to that.

> *"Maybe your battery is dead for a moment, there is no power on the fence, or the wind or snow has reduced the power, or branches have interfered – there are countless examples – but he will find a moment to get in. And that is frustrating. […] It is not satisfactory, that fence, because he will utlimately come in again."* (P6)

> "*I really had sleepless nights....Because in the beginning, you don't trust those fences because you think, well, I'm not sure about this. ... And also, well, then he was spotted again, and then I was completely panicked again, going everywhere to check those hooks and things extra, checking the electricity every time, walking along the fence completely because you think, well, if I do something wrong, it's my fault or something.[...] You basically have to learn to trust those fences. Ideally, I'd prefer to have a solid fence, but the downside is that you might neglect checking if a branch is touching it or something. But I find these fences vulnerable, so it does invoke some anxiety, especially during storms when a branch could fall and flatten the net. There was a time when it all collapsed. In the summer, the grass grows so fast that it causes power loss, so then you have to mow everything. [..] and I'm not paid for this, so that's different. Like yesterday, I was talking to (other sheep keeper), and he gets paid quite well. So naturally, you work differently. If I go to the (place of other sheep keeper), I get 25 euros each time." (P7)*

> *"I go to bed with it, I wake up with it. It's different for you. You don't deal with it (..) you see, in the city, the wolf doesn't come. They don't have any problems with it there. It's logical that... But here, yes, here in the area... what happened in Elburg and such... yeah. You hear about it and then you forget it again. But here, you wake up with it and you go to bed with it." (P12) "Really?" (Julia) "You go to bed with the wolf here." (P12) "Is it that bad?" (Julia) "Yes, it is, as far as you're concerned. Like that sheep that had 50 killed, the wolf had been there 3 times, yeah..." (P12)*

Sheep keepers also expressed feelings of isolation and helplessness, and the sense that their efforts were undervalued. Both the general benefits of sheep keeping to society and the protection work that might not always meet guidelines were perceived as underappreciated.

At the same time, *not* using movable fences was also associated with negative perceptions and feelings due to increased risks for attacks on sheep (including feelings of sadness, distress, astonishment and disgust). These negative feelings were not limited to hobby sheep keepers, who generally do not make a profit and care for sheep out of passion. Professional commercial sheep keepers also highlighted the emotional toll of witnessing wolf attacks on sheep. They shared anecdotes about the severity and brutality of such attacks, including instances where sheep were left half-dead or severely injured, which deeply impacted those who witness such events (including family members).

> *"And whenever there was another attack, you would feel so disheartened that you had tears in your eyes thinking, damn it, what do we do now?" (P3)*

> *"The tricky thing with the wolf is that I actually find it a very fascinating animal. And I used to be completely pro-wolf, but now that I have sheep with a fence and he walks along it, I also become a bit more anti-wolf. Then I think, "Yeah. You really shouldn't touch my sheep." I understand a bit better now why people develop a kind of hatred for them. Because yeah, the impact, I hear that from people I know who have had an attack, the impact on them is really huge, and you know" (P7)*

"I find it really sad, you know, when they are attacked. Sheep are so, um, there has been too little research done on their intelligence, they are extremely intelligent, but it's hard to study because they always stay in a flock. But sheep are very smart, you know. They can remember 50 different human faces for up to two years. If they've seen you once, they will always remember, so to speak. And they also look at your facial expressions. So whether you look friendly or angry, and once a vet came, the second time he came in, and immediately, whoop, they were in the corner. And they can smell very well. They're always aware if you've been somewhere with your hands, some cleaning product or something, and then you come with treats [..] and they have a very good memory for the route. But they can't do anything. It's an unfair fight. Apparently, after a wolf attack, the sheep that survive are completely traumatized. It's sad, isn't it? And then people say, it doesn't matter, those sheep are going to die anyway. It's like throwing your grandmother off a cliff and saying, well, she's old anyway. (laughs) Well, we absolutely don't send them to slaughter. And generally, we don't get rid of them. We just had two castrated. But I think even those who do send them to slaughter do it carefully, and a wolf kills some and injures some that it can come back for a few days later. Yes. And that's really gruesome. Because they just start eating them alive, yuck."(P14)

"Sheepherders seem like insensitive types, but they're actually often quite sensitive people. And they really love their animals (..) I think even the commercial ones, because no one wants to find their animals dead, half-eaten, or half-dead, that's also a problem, that they're half-dead." (P7) "Does that happen, that they're half-dead?" (Julia) "Yeah. Like you'll have 4 killed, and then one half-eaten, and another one is still suffering and needs stitches, you know, like that. Once they start on something, I think they just take whatever they can get, whatever it is. […] or that their belly is completely open, but the sheep is still alive, you know, those kinds of things." (P7)

Also, cases where sheep were not lethally attacked were distressing for sheep keepers. Euthanizing did not always happen quickly and the killing could be painful for the sheep. In this light, the governmental damage compensation money was perceived as blood money and a minimal effort to support livestock keepers in the challenge of coexistence.

*"If I see such an animal with a hole in its belly, I do think 'why? Why does this have to happen', if that wolf wasn't here, there wouldn't be a problem, but well.." (*P3*)*

"It was a month ago. So 3 rams, 1400 meters away from here. (..) Our sheep veterinarian had been in Harskamp with a large number of sheep (20). And she also had to euthanize a number of them. Euthanizing is terrible. When the animals are already partially drained of blood, they can't find a vein and have to stab in the heart. And there was also a misunderstanding here, because they thought they had to wait for Bij12, so they had a sheep that was very cut up, and it was more cut up than the ones that were cut up, but the heart was still beating, he was still alive, he was still conscious, and they could hardly kill him. So that was really distressing too. (..) Yes, and that you get compensation or something. No, that's blood money, the compensation. It's just terrible for the sheep." (P14)

Frustration about governmental policy was also present among many participants. Many felt not taken seriously by the government, and thought the government would be happy to see more wolves and less animal keepers in rural areas of the Veluwe. These concerns also reflected discontent with government policy, and the feeling that their view of nature was different than that of biologists and policymakers, causing their perspective to be not represented in public policy and nature conservation. Some also worried that extensive fencing efforts in the sheep keeping community might make the government (even more) complacent or reluctant about managing wolves (P10, P11).

"Those ecologists shouldn't get involved. They want to control everything. A manageable world. (..) They want a manageable world. But that's not possible." (Husband P14) "Yes, they must come back (referring to wolves, lynxes, bear). Super fun, the bear. (P14, sarcastically)

"I was in the Province, and there was a lady from Volt. And we had read a letter from the collective sheep keepers, you have speaking time, so we did that. So we went there, to the gallery, the guy read the letter, then, and at the moment, the last one had spoken, and that lady wanted to ask a question, and she said, if the wolf is there, why does the farmer still live there? So I left, because I said this is pointless. This is going nowhere. It's just frustration. If it has to be like this, you will never reach a solution. (..) Because the wolf has received a status above other animals in terms of protection, and even above humans. Because it would take quite a lot in the Netherlands for someone to get five years in prison. (P1)

"If I do it, I do it for myself, because I find it terrible that a few sheep have been attacked again. […] But the government won't do this, of course. Never a professional... the government says everyone should fend for themselves, everyone should earn their own money, and this is just the world in the Netherlands, that animal is here, and you get subsidies for wolf protection, but not for the labor. And then they say that's market forces. Well, yes, if there are fewer animals, that's supply and demand. The more wolves, the fewer animals. Because that's naturally - I want to make that clear - that's naturally the government's main intention. Having wolves here discourages it, so you get fewer animals, fewer farmers, and that's naturally... that suits them very well. It suits them very well at the moment, with all the regulations, and also Europe. This suits them just fine. […]" (P3)

There were also some misconceptions about sheep keepers that came forward in the interviews. Sometimes, sheep keepers were blamed for the attacks on their sheep in the media, even when they put in efforts to protect their sheep. This 'victim blaming' was experienced as very negatively and frustrating. Similarly, many sheep keepers' emotions about livestock losses were not taken seriously in the media, as ultimately, their animals will also be slaughtered. This way of reasoning was also criticized, as wolves were perceived to cause a lot of suffering during killing sheep, sometimes severely wounding sheep without killing them. Also, it was perceived as unfair that they are blamed for exaggerating, while they perceive tendencies among wolf proponents to sentimentalize, anthropomorphize, or romanticize the wolf (e.g. by giving it names or human characteristics). Talking about sheep in an emotional way is seen as political and untrue, while talking about wolves in a sentimental way in the media, by nature organizations and scientists is not questioned.

"In Renkum, they had the same situation, they also had 22 dead sheep, and then almost the owner was held liable for not protecting his sheep. And that is actually the world turned upside down. That man didn't do anything wrong, but because the wolf comes, 'yes, you didn't actually protect them properly.' And then I always say, that's easy to say, but, uh, firstly, that man, the person who does that, if that guy can show that he doesn't have the means for it, or doesn't have the time for it, then I think you should send a bunch of civil servants to that man, so that he has help to take those protective measures." (P1)

"*And what I wanted to say is, there was a documentary about the wolf. The wolf is really portrayed as a human being there. Because there's the 'father' wolf, and the 'mother' wolf, and those are the wolf 'children'. And I think, eh hello, a 'female and the male', and those are the 'cubs'. They are not children. And then it's portrayed very sentimentally about the wolf. But if you do the same about a sheep, which gets attacked, then well. When it's about sheep, (then it is seen as) Exaggeration. "Sheep are stupid". But that's not true. (..) look at the documentary*

about the wolf and I think it's a children's film. But it was not a children's documentary." (…) *"what I also find very worrying, about people, what I read. And that annoys me enormously. My sheep have names, but they are pets. My dog has a name. But they also give names to the wolves. They're called 'Anouk', or 'Noel'. Yes. Maybe send a birth announcement? Should there be biscuits with mice? I find that eh, I get a bit cynical about. It immediately brings a whole lot of emotion.*" (P14)

Positive feelings as a result of movable fences

Despite the predominantly negative moods among participants, several mentioned positive feelings resulting from using movable fences as protection. Positive feelings included increased safety, peace of mind, and a sense of fulfilling the responsibility to protect sheep. This was particularly mentioned by those who had experience with wolf attacks themselves or in the area, or where wolves were spotted close to the sheep. For P10 and P11, these feelings were significant drivers of the intention to install fences.

"The nets? Well, it gives me the feeling that I've done everything I can. So it also provides a certain level of safety, confidence." (P7)

*"I have placed wolf-resistant measures in one place, you'll see it later, where I had two attacks on a plot last week. (…) Last Wednesday. But I had 500 sheep in that area. So I put up a net along the edge of the forest, so the wolf from that side of the forest couldn't get in. So, I put up a net there for peace of mind. (…) it was 500 meters, I didn't have more nets. That was it. […] after I got that wolf attack there, I moved the flock. You have to see it; there's a little road, and on one side was a plot with 100 sheep, and on the other side were 100 or 200 sheep, and a bit further up were a few hundred more. But anyway, on one side of the road, there was the attack, so I moved them away and put a net completely on the other side of the road, so that whole side was protected." (*P3*)*

Practical considerations and side-effects of movable fences

Direct experiences with movable fences were mixed, with several participants describing positive outcomes, such as the demonstrated effectiveness in protecting sheep from wolf attacks.

"I have placed those nets there, and that went well. And those are the same nets that I have used in the forest behind here. And that also went well, but well…" (P3)

"So far, now half a year here, it's going well." (P7)

Despite the positive experiences with movable fences, participants encountered significant challenges. These included increased unpaid labor, difficulty in handling and maintaining the fences, and new forms of anxiety. Due to the increased labor of moving around sheep across pastures, it is sometimes not feasible to keep a rotational system. As a result of using electric fencing, grazing management systems on the Veluwe might change from more rotational to more continuous. A disadvantage of continuous grazing systems is that it increases the susceptibility of sheep to grass-borne diseases. Concerns also arose about unintended effects on wildlife, such as water birds, herons, roe deer, and foxes, which could no longer access water sources within the fenced pastures. Additionally, there were worries about bees being close to the high-voltage power device (<3 meters).

"You have to go around every 14 days or so with a brush cutter and pruning shears to keep the wires clear. All in all, it's a bout a kilometer. Here and I have another little field over there. I bend

over and I can do it standing. (…) So that's the maintenance. And then with the s cutter, you might catch the bottom wire, so you have to tie that back up. (…) Ohhhh. (…) a lot of work. Before, you could put in stakes, 2 wires, and that was enough. At least for the sheep, one was enough. (…) Just the weight of a roll alone. Otherwise, you could carry a roll on your shoulder, or two. But now you can hardly carry one. And with a brush cutter, you didn't even need it before, not with the wires. Nets, yes." (P13)

"A downside I find is that they are very difficult to move. So it's a lot of work. […] you have to take them all out of the ground and lay them flat, and then take them in a specific way, roll them up, carry them, and because they're quite tall due to the wolf, those small nets you can still lift quite easily, but these are heavy. […] in a landscape like this, you can't really... [...] and look, it's standing there now, but we really had to put in a lot of work. (it takes) about two whole days or so? And then another day to put in extra pegs to make sure it's really secure. […] It was more relaxed back then (before she took movable fences) because the sheep were just standing here. Whether I came here for a week or not in the summer, if there was enough to eat, now I feel like I have to come here every day (to check the fence). I also go every day. And I said to (land owner's name), I only have three sheep, but whether you have three or 200, it doesn't matter; you have to go there every day. Sometimes, that feels like a lot." (P7)

These negative aspects were also anticipated by participants who did not yet use movable fences. Most participants mentioned perceived disadvantages, noting that while they protect livestock, they can also harm other wildlife like birds, deer, and rabbits. Unintended animal deaths were seen to influence hostility towards livestock keepers.

*"You don't want an animal to get entangled in it. Because you understand as well, that if it's even just a hare, or a badger, or whatever, they can get stuck in the net and receive a shock of 8,000 volts every 2 seconds, and they have to wait until they die after about an hour or so. […] 100% that happens." (*P1*) "Yes" (*P1's wife*) "No one can prevent that" (*P1*)*

*"At some point, the whole of the Netherlands will need to be fenced in. […] you can put up all those nets, but soon there will be all kinds of special birds in them, right?" (*P5*)*
*"Yes!" (*P6*)*
*"An owl that gets caught in them." (*P5*)*
*"Yes, but also deer, hares, rabbits, they'll all get shocked and end up stuck by the fences." (*P6*)*
*"Yeah. Is that a reason not to do it?" (*Julia*)*
*"Well..." (*P6*)*
*"Well, first of all, I need to protect my own animals." (*P5*)*
*"Yes, exactly." (*P6*)*
*"And if another animal gets killed because of it, that's unfortunate, but... […] If an owl, it hasn't happened yet, but if an owl gets caught in that net, it's not a big deal by itself, but if it flies into it and gets entangled, I can't sit by that net 24 hours a day to see if something happens. And if someone finds a dead owl the next day, they'll say, 'Look, a rare bird got killed,' well, I didn't kill it, but yeah. And then you'll have more discussions about that." (*P5*)*
*"Yes, yes." (*P6*)*
*"Or a hare, or a deer." (*P5*)*

*"It happens a lot with deer getting caught in nets. You see that a lot." (*P6*)*
*"Yes, they get a serious shock from it. There's a lot of power on those nets."(*P5*)*
"Yes, you just find them the next morning. It's very simple. I mean, if they get entangled in such a net once, it's over. […] That's totally not what we want."

*(*P6*) "That's why we deliberately have the electric wires inside my nets. They're set a bit away from the nets. Purely to prevent my own sheep from getting entangled, because that can also happen, they might think they can get close, or their heads might get through, and I'll find them the next day too."(*P5*)*
*"They only need to get their ear tag caught. And then panic and get completely entangled." (*P6*)*
*"So that's also extra work for me. Well, that's because you want to be good to your animals, so you add an extra electric wire." (*P5*)*
*"Yes, but then you create extra risks." (*P6*)*
*"Yes, yes." (*P5*)*

"F*lexinet is vulnerable. And it is also vulnerable to wildlife that gets chased."* (P4)

"You fence in. You know, what they used to say, that there were little white farmhouses everywhere. Then they said that it was the white plague, and that it was extremely ugly in the landscape. But aside from it being extremely ugly, putting up huge fences everywhere, (…) (it is) also bad for the other wildlife that roams around there are also deer here, sometimes 6 or 7, only recently I haven't seen them anymore, but then they can't pass through either. So you hinder the wildlife that is already there." (P14)

Another disadvantage mentioned by multiple participants was that fencing in natural water sources meant wildlife could not easily access them, while fencing out water sources required the sheep keeper to provide artificial water sources, increasing labor. Additional disadvantages included the lack of escape routes for panicking sheep if a wolf enters the grid[5], the need to replace the fence each time mowing was necessary, and the risk of sheep getting stuck in the net and receiving electric shocks. To prevent the latter, some sheep keepers added extra electric wires inside the fences to prevent their own sheep from getting entangled.

Due to these disadvantages, several participants preferred using moveable fences made of six wires instead. They perceived it as easier to mow underneath six-wire fences compared to flexinets, which need to be replaced every time mowing was required. However, these were not shared by everyone.

"You mentioned the wires, but a net is indeed a much better physical barrier than wires. I mean, that's just a fact. However, while wires can still be somewhat managed, nets are hardly workable, especially in large quantities. […] It's all manual work. So yes, there's willingness, but at some point, you just hit a wall." (P6)

"I believe more in nets than the 5 or 6 wires they have. Because I see the sheep myself. Some sheep stay about a meter away from it. From the electric wire. But some sheep are like '1, 2, 3 and I jump over it, I jump through it'. (laughs) Yeah yeah yeah, that happens, yeah. (..) that's dangerous, especially with the horns. (…) And then I think if one sheep stays well away, and the other one stays, well, I'll risk it, '1, 2, 3', and I think a wolf has that too. There are wolves who are

[5] *"Look, when a wolf comes to such a net. First, it's curious. Then it thinks, 'Wow, a sheep is dumb.' Sorry, but that's just how it is. So naturally, it goes first, 'Hey, who is that!' So if the wolf sees a sheep here, the sheep almost comes to it. That's its nature. When the wolf thinks, 'Oh, it makes a sort of threatening sound,' then there's a chance the sheep will run away. But not at first, it goes first, and that's true, yeah, I would do that too. Look, humans are also herd animals, but a sheep even more so. When a wolf does get in and grabs a sheep, not all the sheep will run away immediately. At first, they go towards the sheep making noise, hoping they can still do something. And at the moment when panic breaks out, that's what we're most afraid of. So we lock our sheep up. So they're kind of in prison.* ***When the danger comes inside, there's no escaping it****." (*P1*)*

really scared. They got a shock once and they think I'll never go near that again, but there are also some who think 'oh well, but I'm nicely in the pen where I want to be!' (laughs)" (P13)

Necessity of using movable fences despite all disadvantages

Most participants considered is necessary to use measures to protect sheep in wolf habitats. This necessity was often grounded in the observation that sheep attacks were increasing in their region and that the wolf population was growing, but also on subjective norms of responsibility to take good care of their animals (see next section). At the same time, participants argued that a lower abundance of wolves in their living area would make the demanding task of using fences less necessary. The intention to use measures was lower in pastures that were considered far away enough from wolf habitats.

"*Like here, a bit further from the forests, a bit further from the forests, yes, then I do bring them there, and if I have another attack, well, that's how it is. I find it annoying, but I can't [prevent it] all. [...] It is what it is. It doesn't work! And I do have one place with (wolf-resistant measures), you'll see that later, where I had two attacks on a plot last week.*" (P3)

"*But what are we doing here? Do we really want the wolf here so badly? (Silence of a few seconds) You can't fence off everything. This farmer has 5 hectares of land and the sheep graze there for a while, but then the grass needs to be eaten down, and he can't put a fence around it. Next week, they need to be in another pasture. That's not feasible. If you go to that path, I don't know if you're going there, but you should see how high the mesh is there. They didn't get to the sheep, but they caught the three ponies there."*

Subjective norms regarding using movable fences

Influence of expert knowledge on evaluating the use and effectiveness of movable fences

Several participants referred to expert knowledge within their social environment to support their beliefs about the effectiveness of movable fences. This expert knowledge came from both formal training sessions and informal advice. For instance, one professional commercial sheep keeper mentioned attending a training led by a German expert. The expert explained that wolves are less likely to jump over a fence and more likely to try to get under or around it via the ground. This information reinforced the keeper's intention to use movable fences in the future.

"Recently, we had a demonstration from a German expert who has been working on this for ten years. He said, 'You have to continue to be concerned about it, keep surprising the wolf, because he learns, and he is smart. So, he will eventually get through again. He will surprise you at some point." (P6)

"A friend of mine who is a complete expert on dogs says they need to feel a pain stimulus. So initially, they are afraid. Otherwise, they think nothing will happen." (P7)

Other participants were skeptical or dismissive of experts' knowledge. By some, the expert's input, despite seeking advice or assistance, was not deemed valuable or practical in addressing their concerns regarding wolf management or fencing solutions for their natural and uneven terrain. For others, the world view of so-called experts (especially consulted ecologists and biologists) was unrealistic, impossible, and based on utopic thinking.

"Our daughter contacted a wolf expert, and he came to visit from Drenthe, but the message was.." (P14*) "He had nothing useful to say" (*Husband of P14*) "No but, we could get a small compensation for a fence. Our land isn't entirely flat. It's very natural here. So you see, everything is mowed straight, plowed straight, sown straight. And imagine if you spray the grass dead and*

reseed it every 6 years, then your pasture is nice and flat. And then you can put up a fence. But that's not possible here. And for the number of sheep we have, which is quite low, we could only get a small compensation. And because of worm infestation, this breed is very susceptible to it, we move them daily. And that would also be very difficult with a wolf fence… And not just more work, what I hear from other people is that animals crawl under it too." (P14) "*Those proponents of the wolves, like Nico Kofferman, and what's his name Hugh Jansman, they are such arrogant bastards. Really terrible. And they call themselves wolf experts."(Husband of P14)*

Social reassurance and disapproval of using movable fences

Positive reinforcement from others in the social environment served as a significant motivator. Reassurance from knowledgeable individuals provided peace of mind and helped reduce stress and anxiety among sheep keepers. For example, P7 found comfort in the words of a shepherd who assured her that her efforts were effective.

"The nice thing was that (name of shepherd) the shepherd said at some point, '(name of participant), you've done everything you could. And it seems to be working. Otherwise, he would have been inside long ago.' And that reassured me a lot. And then I could let go of it... like, okay, I'm doing what I can now, and the rest is letting go..." (P7)

However, not all feedback was positive. Some participants experienced disapproval from neighbors and hikers who had seen the wolf in the area. These individuals doubted the effectiveness of movable fences and encouraged the use of shelters instead.

"When I had those very low nets, people would really call me and talk to me about it, saying, "Hey, this is really not good for the wolf." […] more like they'd approach me, I think. Here, the neighbors, people who walk here. […] they also thought I should bring them inside. And at that time, there wasn't even a shelter. So then they would also ask if there was going to be a shelter. […] and these are all people who have seen the wolf themselves. So they were quite serious when they said, "You know, he's just walking around here." (P7)

Support from other people for using movable fences

Participants experienced support from a deputy of Province of Gelderland, Harold Zoet, who is responsible for the nature and agricultural policy on the Veluwe. He was perceived as a proponent of sheep keepers, with agrarian background as horse breeder and a common sense. A clear obstacle that he removed was the license that was initially needed to install a fence higher than 1 meter. He also organized multiple local informational events on municipality level where various stakeholders gathered. Sheep keepers that participated highlighted the exchange of information, insights and emotional experiences during those events. A central element that was highlighted was the shared fear for attacks on livestock and concerns about human safety, especially children.

"When there were so many wolf attacks last year, also in Speuld, there were a lot of wolf attacks then too. Then from the Province, I think there was also a meeting. One in Ermelo and one in Elspeet. And there were people from Bij12 there too. Anyway, my husband went there, and he asked, 'can you guarantee that it won't attack children?' And no, he said, he can't. (..)" (P15)

Participants mentioned a lack of support from other people. Professional commercial sheep keepers, in particular, often did not have enough land for their sheep and had to rent land from livestock owners and arable farmers. These rented lands were frequently unfenced, leaving sheep keepers to ensure protection on their own using movable fences. In some cases, landowners in wet areas disapproved of

using movable fences as a night corral due to concerns about the soil becoming muddy. Sheep keepers also experienced a lack of support with installation and maintenance of the fences, although support with information exchange and subsidy application was experienced as positive.

"I think they did offer a lot of help (the wolf consultants during the application process). If you called them, they would come and help you. In that respect, it was well organized." (P13)
"Did they also help with installing the fence?" (Julia)
"No (*chuckles*) *no, no." (P13)*
"So you really have to do that yourself." (Julia)

"We did that ourselves, and the maintenance too. Now they had an information evening here. Well, that was all the agencies. And you hear that in some places, uh, the wolf friends, so to speak, help. But (laughs) not around here (chuckles again)" (P13)
"*Yeah, in Belgium, they do that a lot" (Julia)*
"Yeah (chuckles) not around here!" (P13)

Negative experiences with and shared stories about movable fences

Negative experiences with movable fences were shared among the sheep keeping community, influencing subjective norms. Participants frequently mentioned other sheep keepers who had used movable fences without success. Bart Kemp, a prominent figure in the community, was often cited as an example. Kemp stopped keeping sheep after experiencing multiple attacks within wolf-deterrent movable fences. Several participants also recall an incident near Otterlo where a wolf managed to breach a high fence and crawled through a hole of 25 cm in a fence, emphasizing that if there's no electric current running through, the height of the fence becomes irrelevant.

"They climb over everything. Like here on that path, near those ponies, there's a fence that's 1.5 meters high with 2 wires on top, and he (the wolf) still got through. […] They (the local rural community) don't trust that the wolf will stay behind it. Because they've experienced around here that they just go under it or climb over it. " (P12)

"Bart Kemp, for instance, was really willing to take action to a certain extent. But now, he has had several attacks within his wolf-resistant fences. (..) Properly approved fences. But these wolves are getting smarter and finding every little gap. They think, 'well, I can dig this little hole a bit, and then I'm through. (..) In Drenthe, you (also) see it happening. They've been using those wolf-resistant fences for a few years now, and the wolves just get in with ease. Wolves are so smart, they're such top predators." (P6)

"The wolf keeps circling around, waiting for its chance of course. Because with (colleague's name), he had one (places emphasis on "one") stake not in place, and the wolf got in immediately." (P7)

"He climbs over that. Because he can. He's shown that, yeah. In Otterlo. Or he crawls underneath it, or he digs underneath it." (P13)

And then the primary school principal of Speuld, I think he was there too (information event of municipality), and he said, if you ask people, if you ask wolf experts, can I let my elementary school children play in the forest like we used to, then I would say no, I wouldn't. Then I also think, yes, then you're giving a very contradictory message. So yeah... I think it's okay here. If you say, I think that my son, he goes to school. Well, you know, in broad daylight. Well, I'm not really afraid of that. If at some point he has to go to Apeldoorn, to high school, then I would find it really scarier. That's also, cousins of mine who are older. They also come from here to

Apeldoorn, you have (name of a path), they just really, they have frequently seen entire packs of wolves there. And then it's like that children no longer go to school by bike, but by bus." (P15)

"The risk that it will come in, what we just discussed, that will always come in, and that wolf will become creative." (P5) *"Yes! Doubtless. I'm convinced of that."* (P6)

These shared stories and experiences contribute to a collective understanding of wolves as an adaptable, intelligent, opportunistic animal, and skepticism about the effectiveness of movable fences, reinforcing negatives attitudes towards movable fences within the sheep keeping community.

Negative perceptions of *not* using movable fences

Several participants mentioned negative perceptions about not using movable fences, particularly in forested areas. They emphasized that responsible sheep keepers must protect their sheep to prevent wolf attacks. This belief underscored a shared sense of responsibility and care among sheep keepers, reinforcing the intention to use movable fences. The conviction that livestock protection is essential and necessary to prevent suffering among sheep and to avoid the traumatic experience of finding dead or injured animals was commonly shared, either based on personal experiences or stories from others.

"Like here in the forests, I think, yeah (mentions own name), you can't let them out there without protecting them. Because then you know for sure they will be eaten." (P3)

"I'm responsible so I want everything to be arranged properly. […] yes, you just want it to be well arranged." (P7*)*

"*I take good care of them until the end. If I don't take good care of them... That's also a rule: If you don't take good care of them, it doesn't work. They don't grow, they don't become what... And maybe it's the same as nitrogen. A good farmer never over-fertilizes his land. Because if he over-fertilizes, it also backfires and so that's also a rule.*" (P2)

"*Anyone can keep 100 cows. But taking care of 100 cows, I can't do that.*" (P1)

Belief in the necessity to complement livestock protection with management of wolf movements

Most participants considered livestock protection crucial, driven by the belief that preventing wolf attacks is essential for the welfare of their sheep, at least on the short-term. The perception that wolf attacks are horrible, causing immense suffering to sheep, was a strong motivator for taking preventive measures. This negative evaluation of *not* using measures also drove positive attitudes towards using measures, as discussed in previous sections. However, most participants felt that the primary reason for these attacks was the presence of wolves in rural areas, and that the absence of preventive measures was a secondary cause. Only directing solutions towards increasing the use of protective measures was seen as putting a sticking plaster on a wooden leg.

Despite their perceived concerns about labor and effectiveness of movable fences, one sheep keeping family I spoke to plans to install proper fencing soon (P10, P11). They see it as necessary due to a failing government that isn't managing the wolf population in the short term. They prefer good fencing to dead sheep but emphasize the need for long-term wolf population management. They see LPMs (livestock protection measures) as a temporary solution and hope for future action on wolf control.

Like them, most participants expressed the belief that managing wolf movements could be a viable solution, although they note legal and policy constraints that limit certain options like wolf deterrence. They expressed concern about a limitless growing wolf population, wolves settling in inappropriate

areas, also for human safety regions, and suggest that natural habitats like the other side of a highway or the natural areas like the Oostvaardersplassen (OVP) should be their proper domain. Regarding OVP, there were also concerns that the situation with the wolves would go out of hand like the situation with herbivores there, explained in the following quotes. This reflects doubts about the ecological assumption of wolves as playing an important role as predator key species in regulating balance within an ecosystem, by lowering grazing pressure and managing prey populations.

"But I still think, um, the government could do more to keep that wolf contained. (..) They have nature areas here in the Netherlands. Take for example the OVP. That's a disaster. It's just a concentration camp for animals. And that's just, that is not a nature reserve, sorry, I have no good words for it. They lock up those animals. Recently, they let the horses get through the winter, when there was almost nothing to eat, and now they have transported 9 truckloads of horses for slaughter, and those are then sold as pet food. So that's government policy, right? Okay. So the wolf gets all the space there is. But a horse does not. And the wolf is allowed to roam here, while I would say, I have to make sure my animals are inside, then the government could also say, we take a nature reserve the size of the Hoge Veluwe, and the wolf can be there." (P1)

"But that didn't happen, did it? They had nowhere to go. And furthermore, the municipality, the province, or the state put a fence around it, funded that fence, and then in 2015, the wolf came to the Netherlands, one wolf, and many people were very enthusiastic, but they didn't think it through well, just like those who once let a few fences and cows loose in the OVP, what the long-term expectation is. What will happen then. And if you don't manage it, it's like planting some nettles, the garden will soon be overrun, because that's a beautiful plant, but you'd rather not have it. (..) There were also biologists who were involved in the OVP. And then they thought 'that's nature'. But that's not nature. Because if you put a fence around it, it doesn't get the chance to behave naturally." (P14) "What kind of nature do they want back? If you want the nature from the time of the Romans, you need to have as many people living here as back then, and you need to remove all the dikes. (..) because 2000 years ago there were no dikes. (...) And then you would get real primeval forests." (Husband of P14) "The ideals of some people seem very beautiful. A creature that once lived here and was also driven out, by the way not driven out for nothing, uhm, they want it back. And for what reason, yes, biodiversity, or maybe to deal with the excess of wild boars and deer, but where is the limit? And there is a tipping point. (..) But is there any balance? Is there ever any balance? It is.." (P14) "I*f you want a natural balance, then there have to be a lot fewer people per square kilometer" (P14 husband) "Yes, maybe some people need to leave" (P14) "Because the wolf has no natural enemies, but bears belong there too." (Husband of P14, interrupts P14). "Yes, you know what that is a bit like. It's like taking a teacup and starting an aquarium in it, with goldfish. And then they die and you think oh that's very unfortunate, but it's just too small and too little. 'Yes, it's nature. He was in water, right? He had a plant too?'" (P14)*

"There are always people who enjoy it, but I think there are too many! And if you shoot, say, 20 now, it will get out of hand! We've seen this with the Oostvaardersplassen, with the ponies, horses, and deer. There were far too many of them. You know that!" (P12) "So you're afraid the same thing will happen with wolves as it did in the OVP?" (Julia) " Yes, I'm sure of it! (..) The wolves will have offspring, you know that." (P12)

"He's not supposed to be walking here. He's supposed to be on the other side of the highway. That's nature. If you let him go his way, he'll settle here too. […] At some point, you don't need to go to the zoo anymore to see wolves, you can see them here. And for sheep, you have to go to

the zoo. […] I'm convinced of that. […] We don't have young children, but our neighbors here do have young children. You live freely to let your children enjoy nature, play in nature. But you don't do that so easily because the wolf is here. That was evident at the information held by the municipality. It wasn't just about the sheep, no, it was also about people's fears. For the children." (P13)

"It's also just a very unsafe feeling, thinking that such an animal, it's literally in my backyard. Where my child's swing is, yeah, where my children play. I find that really scary. Somewhat, yes. When they're here. But yeah, that's what I find difficult as well, as I just mentioned earlier, um. Uh. That we really have a lot of experience, and so do many people in the neighborhood, because with the wolves being so abundant here, um, yeah, you really feel limited in what you do. So just like that wolf attack there, yeah, at one point my son, when we were called like 'hey, uh, are those wolves yours or my brother-in-law's?', well now they were actually my brother-in-law's that were in there. But yeah, my son comes up, well he's just really angry, but also very scared. Because he really doesn't dare anymore, when my husband wants to go mountain biking, he really doesn't dare anymore. And when we're walking or something, he's constantly looking like, hey, is everything still okay? And then the girls, who are still a bit younger, .." (P15)

"Let them pick them up and drop them off at the Oostvaardersplassen" (P5) "Yeah." (P) "Yeah, I mean, there are so many animals there just dying of, uh.." (P5) "Yeah, of hunger." (P6) "Yeah, so I think they can have some fun there. Yeah, I don't know how big the Oostvaardersplassen are, but they're hundreds of hectares. So I think a few packs could roam around there. (P5) "Yeah, but you see, there we go again, uh... There's plenty of wildlife here on the Veluwe, plenty roaming around. Uh, and sometimes you see that with those packs. We actually didn't have trouble with those packs for a few years. But what happens is, then you get those lonely wolves roaming around in the autumn, and they get rejected by the pack, that's when we have issues. Those need to be taken care of. If you start with that, they're only a few animals in total, but they're the biggest..." (P6)

"Yes, why can't you keep him in a fixed place, right? Because that's often suggested, right, that the wolf should just stay in the Veluwe area and such, or in the OVP, that idea and so on, and regulate it then, you know. If you let all those deer and all those cattle from the OVP roam everywhere, yes, they just multiply too, and so on." (P2)

Movable fences as only part of the road to livestock-wolf coexistence in the Netherlands

Participants believed that the Netherlands is a unique case for human-wolf coexistence due to its high population density. Many sheep keepers found it frustrating that policies and societal attitudes did not reflect this reality, treating the Veluwe as a wild region with abundant space and prey for wolves. They doubted the assumed positive ecological effects of wolves and worried that wolves would deplete wildlife populations and then target livestock. Some even feared that wolves could eventually pose a threat to humans. Another cause of frustration was that a few years ago, fences needed to be removed for nature conservation objectives. Due to low trust in the decisiveness of the Dutch government, and the idea that no action is taken until the situation deteriorates to crisis point, this belief was a significant factor shaping the subjective norms around the use of movable fences, as it reinforced the perception that protective measures are essential in such a densely populated and managed landscape.

The strong perception that management of wolf presence in rural areas could enhance the effectiveness of fences was grounded in their belief that wolf presence inherently increases the risk of attacks. In that scenario, if occasionally a sheep or two was attacked, this would be tolerated by most

participants, although there are also strong calls for lethal management of wolves that attack livestock. Therefore, these results suggest it would be interesting to further investigate legal and ecologically sound strategies for managing wolf presence in rural environments, in order to enhance human-wolf coexistence on the Veluwe.

> *"It may happen that a wolf escapes or runs away here, and grabs your sheep, but then, if there's management, you could call the hunter and say hey, we have a problem wolf here. It doesn't belong here. It needs to be managed (laughs) it needs to go away. Yeah. (..) Because otherwise, all of the Netherlands could become a zoo. (..) This is 1.25 (meters), but over there, they have almost 2 meters of fence, I think."* (P13)

> *"I think we need to be cautious about it. People sometimes take things lightly, even around here, near my house and all. How do they say it there? (Refers to: When the calf drowns, they fill the well.) We have to be careful not to dig our own grave, where we don't have any food left, and we become dependent on... They think we don't do everything well, but compared to other countries, we already ensure that everything has so many rules, borders, and requirements, too. And we need to be careful about that so poverty doesn't come later, too. Or it becomes unaffordable. Because if you start bringing food from other countries... yeah, that's the same as switching from meat to other products, too, and all. Those products don't grow for nothing, huh. In terms of cost. You need land for that. Probably a lot of land, too, and all. And then you can say, yes, those farmers should do it, that grassland should become forested, but I really think that for ourselves, and for our children later, uh, that's really important too, and all. And I'm quite worried about that, too. So, uh, we should be quite alert about things. But we shouldn't just throw everything away, so to speak. So that we want nothing left. (P2)*

> *"You are going to take some measures, but if nothing is done on the other side, regarding the management of the wolf and so on, then the credibility of it will also go away, right. I think people need to be aware of that too. It's not just about giving either. So that, uh. You expect something from people and okay to some extent, I think, but then I have to be very careful, how the situation is for me it's easy to talk with 10 sheep that I have now, or 15, with 1 hectare here, but yes if you have 50 hectares.. That's far from easy!" (P2)*

Perceived behavioral control over using movable fences

Factors enabling the use and maintenance of movable fences

Participants identified several enabling factors that enhanced their perceived behavioral control over using movable fences. These factors included manageable costs, financial support, support from family members or family friends, access to emergency kits, the manageable number of animals, information sharing during community events, and confidence in the effectiveness of well-maintained fences.

Participants acknowledged that the costs of movable fences are manageable, particularly compared to permanent fencing or other measures. The fences are perceived to last about 5 years. Participants also highlighted that ordering necessary equipment, including wires and tools, has been straightforward both online and from local suppliers. Some participants even benefitted from financial assistance provided by landowners, organizations, or government initiatives. This support alleviated the financial burden of purchasing and maintaining movable fences, making it easier for shepherds and hobby keepers to protect their livestock without incurring significant costs.

"I ordered them online but also from the local dealer here. It went smoothly. Applying for it (the subsidy) was, uh, yeah, uh, difficult, yes, difficult. I thought so, but in the end, it worked out. And after a call, I was called again, and the money came in very quickly. Yeah." (P13)

"Well, like shepherds, they just think you have to do it, but they have an organization, and that organization pays for it. So they don't have any costs themselves. And that organization has made sure that all their pastures and all their pens are very well fenced off, so they don't have any problems at all. […] Here (…) he (the landowner) had the choice of either buying a flail mower for 6000 euros with annual maintenance costs of 6000 euros, or sheep. And this is, of course, much cheaper." (P7)

"Those nets are of course not as expensive as having this fencing (permanent wolf-deterrent fencing). Now, this one (the fence he has in place now) is too low, but you can get taller ones, which are expensive. Those nets aren't that expensive. It's not too bad" (P12)

"But that's different for us, you know, because if I have to put up those wolf fences, I can pass on the cost. So the fences are already, uh, paid for by the Province and the work is paid for by the client. But if you have 20 sheep as a hobby... then there's no one who's going to pay for that extra work. That's quite different." (P8, who has a grazing company)

The availability of free emergency kits of movable fences from municipalities enabled sheep keepers to maintain outdoor grazing even in wolf areas. These kits provided a temporary solution that allowed participants to continue their practices while ensuring protection for their sheep. According to P5, a professional advisor visited his house the same evening and within 2 days he brought the nets. Formally, those nets need to be returned in 2 weeks but the advisor was lenient with this, which was experienced as positive. If he needs to return the nets, he will buy other type of movable fences (wire system) because of the previously mentioned advantages of that.

Another enabling factor was having a low number of animals to manage, which is more common for hobby sheep keepers.

"Those people who want to quit are often factory farming businesses with thousands of sheep, which just isn't right. So, in that regard, eh… I wouldn't think that's such a bad idea. […] I have 3 sheep and I can protect them well." (P7)

Some of the participants mentioned that using extra poles that conduct the electricity double increased participants' confidence in the reliability of their movable fences. This setup ensured a consistent and strong current, making the fences more effective.

"*I'm starting to really trust that it (flexinets) works because we now also have a sort of extra poles that conduct the electricity doubly. And they all have those extra clamps, two each time, and because of that, there's somehow a lot of electricity. Even though we only have 5 on it. Max 6." (P7)*

Several participants mentioned attending local informational events organized by government, where exchange of information, insights and emotional experiences took place among sheep keepers. This could work inspiring and informing, although it did not directly provide support with physical labor. Technical assistance during the subsidy application process was appreciated by sheep keepers.

"I think they did offer a lot of help. I think if you called them (the wolf consultant), they would come and help you (with the subsidy application). In that respect, it was well organized." (P13)

Also, certain technologies could make the use of movable fences a little bit easier, although minimal. A quad for example is now used to quickly fence a pasture, however, the automatic winding system that goes on the back of the quad is not adapted to the 1.20 long fences (but to 90 cm long sheep fences). This forces sheep keepers to do it by hand, preferably with two people. This could however become an enabling factor with innovative technologies.

> *"I had a good brush cutter but couldn't reach with it, so my brother has a small one which is a bit easier."* (P13)

> *"This is a rolling system that goes on the back of the quad. (..) I purchased it with the subsidy I received from the Province of Gelderland. (..) this setup costs 4500 euros, and then you have a rack in front to roll out the wires and to place your posts. I want to modify it myself a bit, maybe make a trailer behind my quad, but I need to look into that. (..) it's just a nightmare (the rolling system that goes on the back of the quad). (..) There's 600 meters on a spool. So with one set, you can set up 600 meters. I have two sets, so I've ordered for 1200 meters. I went to the demonstration, and you know, they do... Considering the possibilities, it's a very nice system. But if you're used to placing the old type of fencing, then this is just a big nightmare." (P6) "Okay, and what makes it so?" (Julia) "Well, it takes so much more work, so much more time. You spend three or four times as long on the same plot putting up a few extra wires. And this is all still new, but suppose you want to keep using this device in 5 or 10 years, and there are some knots in the wires and so on, yeah, it just gets worse." (P6)*

> *"Yeah, it gets heavier. With the sheep fencing, you can carry 200 meters on your back, but with the wolf fencing, only 100 because they're much heavier. (you have to) walk back and forth more often.. But we do a lot with the quad. If possible, we drive with the quad and put the nets on it." (P8) "Can you just lay them on the ground from the quad? And then set them up afterward?" (Julia) "Nah, no, that doesn't work. You really have to lay out those rolls by walking." (P8)*

The sheep keeper from the latter quote could declare the costs for the extra time this took at the landowner, as he had a grazing management company. This was an enabling factor grounded in his business model: getting paid for grazing public spaces such as dykes and natural areas that need to stay open.

Barriers and obstacles to using movable fences

Despite the enabling factors, participants also mentioned significant barriers and obstacles that lowered their perceived behavioral control. These included the difficult subsidy application process, increased labor demands, the labor-intensive nature of fence maintenance, requiring regular attention every two weeks, and the challenges of handling large batteries.

While participants appreciated the availability of subsidies, they also noted that the application process can be challenging. There were difficulties encountered during the application due to the amount of information required and occasional technical issues with the application website. Also, participants noted that while the basic equipment for fencing off a pasture could be subsidized, the labor required to maintain the effectiveness of these fences was not. There was also confusion and misinformation regarding the availability and extent of subsidies for movable fences. Some participants believed that subsidies were only available after three years of sheep keeping, while others thought that only a certain percentage of costs were reimbursed. The lack of updated

information and poor dissemination of subsidy details on websites that provide movable fences further complicated the situation for sheep keepers.[6].

"You had to fill in quite a lot and, uh, and sometimes when the site was very busy, it could throw you out, and throw you out again." (P13)

"It's like percentage-wise or something. Say you get 200 euros when it costs 1000 euros." (P12)
"No, that's not how it is. No." (Julia)
"You think you get more than half reimbursed?" (P12)
"Well, everything. All costs of the materials. Not the labor though. But if you go to the website now, agro website, and you order an electric fence device, posts, an earth stake, the wires themselves, and all the tools you need, everything you order can be reimbursed up to 20,000 euros." (Julia)
"Do you believe that yourself?" (P12)

One of the most prominent barriers was the increased amount of labor required to set up and maintain wolf-deterring fences. These fences are more complex and require more frequent adjustments than standard sheep fences, adding to the workload of sheep keepers. They noted the absence of external support with maintenance and installation of fences akin to what is seen in other regions.

"What barriers and obstacles do you experience?" (Julia)
"The labor. The labor and the time to set up and roll up, and yeah, that's just, for someone who keeps a lot of animals for other people, in winter, because in summer it's on your own plots, then it should be doable. But alright, I'm going to do it differently now, I'll just keep them inside ready so I don't have to fence it off anymore. I will mow and I will feed them indoors. But in winter it's just yeah the the the biggest um yeah the labor, it's undoable." (P3)

"(..) It's a lot of maintenance." (Husband of P14) "Very labor-intensive. Because we move it daily. If you have to move such a complicated fence daily, you are soon, now we are done in half an hour (orange sheep nets 90 cm). But if we have to use those wolf-resistant fences, you also have to brace them, then we are quickly 1.5 hours longer busy per day, that's 700 hours in a year. That's a job. That's a job." (P14)

Participants noted the importance of careful maintenance to ensure the effectiveness of the fences. Any mistakes or gaps in the fence could provide an opportunity for wolves to breach the barrier, which added to the stress and effort required. This is what made use of movable fences impractical.

"The wolf keeps circling around, waiting for its chance of course. Because with (colleague's name), he had one (places emphasis on "one") stake not in place, and the wolf got in immediately." (P7)

"Because if you leave a hole of 30 cm, or there is a small dip, and it's all uneven here, we can't get it even at the bottom. Then they go underneath. And then you have to put a pin every half meter to make sure nothing, yes sorry. (..) It sounds nice but it's not practical. I think the person who recommends it should just experience for a month how it is." (P14)

[6] On the internet, movable flexinets are available for approximately €140,- (excl. btw) per 50 meters (incl. 14 poles with double pens; 120 cm high). 500 meters then is €1400,-. An electric fence device is about €500,-. Perceived costs are also around 1500-2000 euro's.

The need to replace large batteries (25-30 kg) every 14 days was another significant labor-intensive task. This requirement added to the physical demands on sheep keepers, making it a challenging aspect of using movable fences.

Sheep keeping is often not a highly profitable business, making it difficult for keepers to afford extra labor. This financial strain meant that many sheep keepers had to manage the increased workload themselves, further reducing their perceived behavioral control over the use of movable fences.

Overall, while there were enabling factors that supported the use of movable fences, the significant barriers related to labor and maintenance challenges decreased participants' perceived behavioral control, making it a complex and demanding task for many sheep keepers.

Labor and practicality considerations

Participants noted several strategies and considerations aimed at decreasing the labor associated with movable fences. However, these strategies often introduced new challenges or had their own drawbacks.

To reduce labor, some sheep keepers mentioned creating sheep corrals in new pastures instead of fencing entire pastures with wolf-deterrent movable fences. This approach, while reducing the need for extensive fencing, introduced other forms of labor. Sheep keepers had to travel to the pastures – often several kilometers from home – every morning to open the corrals and every evening to close them. Another drawback of night corrals was the increased build-up of soil-borne diseases like worms. Additionally, night corrals could lead to increased soil muddiness in wet areas due to the high density of sheep in one place, causing many landowners to discourage their use. For shepherds, however, night corrals could be beneficial because it increases grazing pressure on certain vegetation types that need more grazing, such as pipe straw on heather fields.

Some participants suggested hiring employees to handle the labor associated with movable fences. However, this solution was often financially infeasible due to the low profitability of sheep keeping. Many participants mentioned that the incomes from sheep farming was not sufficient to justify the expense of additional labor.

> *"And how could you deal with that?" (Julia)*
> *"Yeah then you have to hire staff." (P3)*
> *"Hire staff, and is that possible?" (Julia)*
> *"Hmmm. Everything is possible. But whether it's financially feasible... I think... look... Sheep money is quickly counted. Eh." (P3)*
> *"yes. I've heard that saying before." (Julia)*
> *"Look with chickens and pigs you can earn a lot for a few years. And with sheep it's always a bit flat. You can earn your sandwich, but..." (P3)*
> *"So it's easy to say 'then just hire an extra employee'" (Julia)*
> *"Exactly. That's not fair. That's not fair." (P3)*

> *"There are already people who work 24/7 and barely make any money. It's really a very difficult job." (*P7*)*

> *"You don't need to earn a lot to be happy, it's a way of life, you know"* (P1)

One of the shepherds had positive experiences with volunteers helping with herding on the heather, as long as the volunteers are knowledgeable about animal care and listen to his instructions. He had a volunteer with long COVID who was not effective to work with. He prefers

someone who understands basic animal needs and can work from 10:30 AM to 4:30 PM without stress. He was very open for receiving help from new volunteers.

Environmental conditions were perceived as factors beyond control that increased the difficulty of using movable fences. Heavy winds could easily blow down the flexinets, and rain could cause electricity loss, reducing the effectiveness of fences.

> *"When it rains, it's very tricky because then you have some electricity loss." (P7)*

> *"They stand around the pasture, but it wouldn't be my own choice because there's so much work involved. Now I only have one hectare to fence off, and I can just about... you get 400 meters of net, so you can just, just about, (laughs), just about fence off one hectare. Of course, there are some double stakes, but with the strong wind, it stands again like that, and you have to check it every day. And now the grass is starting to grow again, so you actually have to mow underneath it, but that's really difficult with a net. Because I have to move the net, mow, and then put the net back, and you almost always end up in the same spot, so eventually, that thing just stands really loose. (P5)*

4.2 Livestock guarding animals: dogs and donkeys

Attitudes

Dogs: Contrasting outcome evaluations among shepherds

I interviewed two shepherd who keep traditional sheep flocks on heather fields of the Veluwe, of which one had a very positive attitude towards LGDs (and also used LGDs), and the other had very negative attitudes towards LGDs. Both shepherd had night enclosures, a traditional sheep stable, where the sheep are kept at night for safety. For them, the risks for wolf attacks are most prominent during the day, when they walk with the sheep over the heather fields amidst wolf territory. There is still a risk during the day when they do not use livestock guarding dogs.

One of the shepherds opposed working with livestock guarding dogs (LGDs), despite his **negative experience with non-use**. An incident occurred when a sheep was attacked while the shepherd was walking with his flock on the heather. Initially, he thought it was a dog and ran towards it, nearly getting attacked. When he came close, he saw it was a wolf and the wolf fled. The shepherd saw the wolf return later, which was quite thrilling in a negative sense.

His main **concern** is the interaction between dogs and the public, which he views negatively. His attitude towards dogs is negative. He sees many disadvantages, as he believes that LGDs often do not respond well to visitors and other dogs. This is based on experiences of other sheep keepers who work with LGDs. This is a significant issue for his flock, which is intended to be a public attraction. The public is welcome to come close. He already faces issues with the public, such as people throwing things at the sheep (including stones and branches), entering restricted areas (such as the stable), or causing other disturbances. He fears that dogs would only exacerbate these problems/conflicts. That is why he really does not foresee himself using LGDs in the future.

He cannot imagine spending the whole day with two dogs on leashes. We discussed how such dogs seem to do well in tourist areas in Romania, but he noted that shepherds and people there are very different from those in the Netherlands. Here, people think nature is something to cuddle, including the dogs, which leads to problems. In contrast to Romanian people, Dutch people might think you can come close to them, and therefore he is not intending to use dogs.

Therefore, he acknowledges the risk of occasional sheep attacks during the day. When I suggested increasing wild animals in the area, he sarcastically mentioned we could indeed start breeding deer for the wolves. In general, he was quite skeptical or sarcastic about livestock protection measures. However, he genuinely believes that having someone accompany the flock, like a ranger (boa) or forest warden (boswachter) with the authority to shoot at wolves to scare them away, could be a good solution. Also in general, when they are in the forest and see wolves, he thought it would be good to deter wolves when encountering them, especially in unwanted areas i.e., close to his sheep flock. He believed that this would reinstall fear for humans in wolves.

According to the female colleague, it varies by shepherd whether they want this authority. This particular shepherd is hesitant because he knows many people oppose shooting wolves, fearing backlash. However, he would not mind if someone else took on this role. He believes the best approach is to wound the wolf rather than kill it, so it can learn to avoid sheep. He is concerned about the opinions of others, fearing aggressive reactions from nature lovers who might oppose or even sabotage his efforts, e.g., damaging his fences or throwing in windows. He was seriously scared of that. So that is what he saw as a disadvantage of deterrence. However, he stressed the perceived advantage of effectively making wolves wild again.

We also discussed population management. We concluded that it might be better to shoot wolves that specialize in livestock predation, similar to the practice in Drenthe, where an individual wolf that killed 240 sheep was eventually shot. This is akin to how some lions specialize in hunting buffalo, and other lions on gazelle. He thinks a similar approach could work in the Netherlands.

Dogs: Practical considerations by hobby sheep keepers

Hobby sheep keepers also perceived many challenges in using LGD and intentions to use them were even lower than for shepherds. Practical considerations included that dogs do not immediately protect sheep after purchasing. Before being effective, the puppies need to grow up with the sheep and sheep keeper(s), and follow an intensive training. Another perceived disadvantage was the impact of LGDs on neighbors, visitors of the Veluwe area, hikers, and other people who pass the pasture. LGDs were expected to cause nuisance in the form of making noise and threatening people and their dogs when coming too close to the sheep.

Donkeys: Associated risks and low effectiveness

Donkeys were acknowledged by sheep keepers as potential livestock protection measures to prevent wolf attacks on sheep. However, most participants believed they were not very effective in preventing wolf attacks, and a big disadvantage included their potential to kill newborn lambs.

> "*We also bought donkeys against the wolf. (We have them since) I think about a year and a half, really a bit after the wolf attack we had next door. We thought, yeah, we had the fence there, and we had it just as good here, so if they can jump over there, they can do it here too, so we're trying to do everything that is possible... they say that donkeys at least make a lot of noise." (P15) "They're very territorial, apparently, right?" (Julia) "Yes, yes. That's why we have the donkeys. So that's also part of our intervention (smiling cheerful/proud)." (P15)*
>
> *"A donkey can naturally be unfriendly. Look, a donkey can also kill a sheep, which is not the intention" (*P1)
>
> *"I'd sooner believe in putting a donkey in there (than dogs)." (P6) "Yes, but that doesn't work either." (P5) "It (the sheep) gets eaten too." (P6)*

Regarding dogs, most of the participants mentioned various disadvantages. These include the high costs of purchasing the dogs, the costs and labor associated with their daily care (such as providing food, water, and medical care), the intensive training phase required, the need for at least two dogs, and the risks that the dogs might attack a person or another dog. Additionally, dogs can spread the disease Neospora, which causes abortion in sheep.

“No, look, a dog for us is, look, I understand with such a flock, that it works, and the man (shepherd) is with them all day, so he can keep an eye on those dogs all day. Because, oh dear, if a cyclist comes by and, and does. (..) And those dogs are dangerous, you know. They’ll eat you up. You should see what kind of beasts they are. If they stand up straight, they’re certainly taller than me.” (P6)

*"Those dogs are, of course, very expensive. You can get them though, there’s a man in the Ardennes who has about 8 of those dogs available, kind of. But the risk you run is that those dogs might attack a person or another dog... And I think those dogs also need to be in pairs, it’s very sad if you only have one dog, so you need two of those big dogs, and they also need a kilogram of meat per day. So in all aspects, it’s just... too much." (*P7)

“Well, and then you can use dogs, you see that too, but then you have the issue that you have to understand a dog. Yes, a dog actually has one task. It has to protect the sheep. So that means you first have to train with that dog. You can't just say, oh, I buy the dog. It has to grow up from a puppy with them, so the dog and the owner have to understand each other exactly, like reading a book, to know what the intention is. And what the task is for that dog. So you put the dog with the sheep, and then it's still not done, no, then that dog also needs care. It’s not just, well, I throw a dog in there and the problem is solved.

And then we are actually in a small open meadow area here. On this side of (place name) still. Uh, how should I say, it's quite touristy here (for cyclists and hikers). So imagine they are on the road, and it has already happened a few times, not here, but a dog doesn’t see the difference between a wolf and a child. So when you have a flock with two of those dogs, those sheepdogs, and supposedly a child walks towards them and thinks, oh, that's a nice dog, it goes terribly wrong, because the dog sees you as a threat. So it also sees the child as an enemy and not someone coming to pet it.

For me it’s certainly not an option. No. Look, such a dog, well first, it doesn't fit here, then you have to, and often it is, don't be shocked, but such a dog costs 10,000 euros. That’s a huge investment. Well, that’s not feasible for a hobby sheep farmer. Well, suppose we ever want to go back to 100, to what we always had, then, but it still wouldn’t be a dog. Because that dog, look, that dog really needs care. You can’t just say you put it in there and it has to fend for itself. The moment you assign that dog to your sheep, it’s in your service.

And then you actually have to, a dog, that is often forgotten, but Neospora is a disease, and Neospora is actually the abortion of the fetus by the mother. The dog causes that. So imagine a sheep thinks, or yes it happens, it aborts its fetus, so it leaves it in the field, and you have such a dog in the flock, it eats that, and that dog can then spread the bacteria, Neospora, (via its feces) which can only be caused by a dog. So the dog is the host. That is a huge disadvantage.” (P1)

Subjective norms

Social pressure regarding the use of livestock guarding dogs among shepherds

Both shepherd I interviewed could be described as quite headstrong and stubborn. One wanted to pioneer, even when others were not so far yet, and the other was opposed to change his practices. Even though he acknowledged that other shepherds use LGDs and other organizations encourage him to do it too. So despite the social pressure and opinions from society and colleagues they clearly felt, they did not let it influence their decision for use of livestock guarding dogs.

Therefore, those shepherds are lobbying for the use of auditory or visual deterrents, to scare away approaching wolves when they are encountered close to the flock, possibly with an exploding element that makes a loud noise when it hits something or the ground near the wolf. The aim of such measures would be similar to livestock guarding dogs, and that is to reinstall fear in wolves for humans and sheep.

Among shepherds, there were substantial differences in perceptions of livestock guarding dogs. For some, it is the only way to continue nature management using sheep during the day in wolf territories, as otherwise wolves will attack sheep flocks during the day (which has already happened). Most belief that human presence alone is not enough for shepherds. Some shepherds therefore intend to or are already using livestock guarding dogs. Others do not want to use livestock guarding dogs because they belief this is not possible to combine with the public role of sheep flocks.

Negative experiences with donkeys by others

Stories that go around the rural community about negative experience with donkeys of others. One time, a wolf still attacked sheep although there was a donkey in the pasture. It was acknowledged however that this donkey was a bit neglected / discarded / old / worthless.

> *"I know someone who has, I know two donkey stories. (Name of other sheep keeper) in (neighboring town), she had a donkey with her sheep, it went very well, but when they had lambs, she said, then he kills the lambs. Because he knows his own sheep, and then lambs come along, he doesn't know them, and he breaks their backs. So. And there was a hotel in (other neighboring town), the (name hotel), there were always elderly people in that hotel, and they were eating downstairs, and then the donkey (laughs) had grabbed the goose by its neck and was swinging it around. And broke its neck. So a donkey is not, it is very territorial. Doesn't come into my pasture. A donkey stallion. (P14)*

> *"He then added a donkey. Apparently, that works too. (…) My friend also had a donkey with his flock. And at some point, the donkey had to go away because instead of chasing the wolf away, it attacked the sheep. It really bit 2 or 3 sheep in the back until they were bleeding. So, it didn't work for him."* (P13)

> *"I was going to say, there by uh... the road."* (P5) *"Yes, they also had one there. But it seemed like a bit of a crappy donkey."* (P6) *"But it (the donkey) was in there (laughs)"* (P5)
> *"So there were sheep with a donkey, and it (the sheep) got eaten by the wolf?" (Julia)*
> *"No, the donkey wasn't eaten by the wolf. But the wolf did see the sheep walking in the field with that donkey. And not just one. [..] He did let the sheep suffer."* (P5)

Believed effectiveness of donkeys could also be grounded in the demonstrated use of donkeys by other community members.

> *"Our sheep veterinarian, our male sheep veterinarian, has donkeys, so he's not so afraid of wolves."* (P14)

Perceived behavioral control

Dogs: Low perceived behavioral control

Unmanageable costs of livestock guarding dogs:

> *"No, look, that dog has to be in your flock as a puppy, and it has to grow up, and it costs 40,000 euros per year, as they told me. I don't know if you can confirm that. Just the purchase already costs I don't know how many thousands of euros. And I just told you that I have six flocks running around everywhere, so you need two for each. 6*2 is 12*40,000 euros per year."* (P6)

Another factor that could impede use of dogs was the fact that using LGDs conflicts with regulations (P9). The female colleague suggested that it was mandatory to keep dogs at home, not just with the flock. Both the shepherd and his colleague were not inclined to live with that (literally).

Another obstacle is that most sheep keepers work with other people (e.g. family members), who all would need to develop a good relationship with the dogs, which takes time. One of the shepherds, for example, works with volunteers to herd the flock over the heather fields. He does not want to force using LGDs upon the other volunteers, which are scarce in number.

4.3 Keeping sheep indoor: only at night or most of the time

Attitudes

The most important perceived advantage of keeping sheep indoors was probably the increased feelings of safety and the **believed effectiveness** of keeping sheep safe, at least during the night. However, participants perceived many **disadvantages** of keeping sheep indoors most of the time. This mostly included concerns about animal welfare, but also, again, the increased labor demands and costs.

> *"I don't consider that (keeping sheep indoors permanently) animal welfare. Because what I absolutely notice now is that it's actually a solution towards the commercial side. [..] what you're getting very strongly now is that you have two groups, right? The group that wants to manage and preserve nature, and the group that wants to make money. And the group that wants to make money just wants nature to, well, that has to go. That has to go. [...] they don't see nature anymore. They think it's a shame that it even exists here. So might as well just get rid of it. ""* (P4)

> ***"T**heir happiness will be much less. I think their happiness will be much less" (P14) (..) "Intensive farming, right. Then all the livestock will be..." (P14's husband) "Yes because they also take the ponies. So then all the livestock has to go inside, and then wolves will be outside. And they will eat the wild animals until the wild animals are gone, and then... Then there will be no more pastures. (P14)*

> *"And in a pen you have a lot more disease pressure, uh, you need a lot more medication, you're going to have more hoof problems." (P6)*

> *"It's too much (money) to put them inside, and that's bad for their lungs. To physically put them inside at night. Now we are building this, so that all the animals can go inside, but actually the construction was only supposed to be that hayloft, so that square thing you saw. (..) you can put them all inside, but is it good for animal welfare to always have those animals penned up?" (P15)*

Regardless of the disdvantages, participants perceived it as **necessary** to keep sheep indoors most of the time, because of the perceived danger the wolves pose to sheep when they are outdoors.

> *"But also, just, yes, at some point yes, you protect yourself too, yes, to avoid seeing that animal suffering all the time." (P15)*

> *"Now because of the wolf, we already bring them inside in the evening, we did that because of bluetongue too, and let them out in the morning, so the danger is a bit lower. But if it gets worse, a kilometer away, rams have already been killed. Yeah, then we have no choice but to keep them completely in the barn." (P14)*

> *"Just because wolves are roaming here, and people think that would be a good idea. But we care about our sheep. And because there are no attacks during the day yet, we keep them inside at night. And if the attacks also happen during the day, then we have to keep them inside during the day too. It's no other way. (..) well apparently it has to be done then. (..)" (P14)*

Subjective norms

Several of the participants mentioned approval of and support for keeping sheep inside from other people, such as family members.

> "*Also talking about it with my wife, of course. And whenever there was another attack, you would feel so disheartened that you had tears in your eyes thinking, damn it, what do we do now? And then you think, well, guys, we just have to do it differently, we'll just keep them inside*." (P3)

> *"What I hear from other people is that animals also crawl underneath (fences). Now we already bring them inside in the evenings because of the wolf, we also did it because of the bluetongue, and then out again in the morning, so the danger is a bit lower. But if it gets even worse, rams have already been bitten to death a kilometer from here. Yes, then we have no choice but to keep them completely in the stable." (P14)*

Subjective norms were that sheep are grazing animals that belong outside in the field, that the sector is not set up for keeping sheep indoors, and that the fun of sheep keeping is gone when keeping them inside due to all the increased labor.

> *"Fully indoors. (laughs) tss, anything is possible. But then the fun is gone. I don't have sheep to keep them inside all year. Then the fun is just gone, no it's not fun anymore. I mean, I have them now, I was already bummed out having them indoors all winter." (P5) "Yeah yeah." (P6) "Considering the work that comes with it too. Because you're not only busy in the morning or evening, or feeding them again at noon, but what about all the bedding, all the manure, you have to clean out the stable more often, at some point the deep litter system also needs to be cleaned out. It costs a lot of extra money too." (P5) "Our sector isn't set up for that." (P6) "And neither are the animals, those animals don't belong indoors." (P5) (..) "Those animals have a perfect life outside, especially in those winter pastures. They have maximum space. Yeah, those animals really thrive, it's just unbelievable." (P6) "Yes." (5)*

> *"But the left greens think that nature is [in a] very bad [state] and is going in the wrong direction, but I don't think so. And they blame it on livestock farming. And of course, when I see a chicken coop with 100,000 chickens, I also think [silence], but of course I am a sheep farmer, you know, I like to see them outside, but, yes, that economy is just how it has been created here." (P3)*

Perceived behavioral control

The costs of keeping sheep inside were perceived as very high, due to the fodder needs and increased labor (cleaning stables, feeding).

> *"Look, we could do it. Um. But indeed, as (name of other sheep keeper) already said, your costs go up tremendously. Because you have to bring all the feed to them, you have to take away the manure, and we need contractors for that. So it costs an enormous amount of money, and also the grass you lose out on, well that's not even the biggest issue, but just purely that you need those contractors twice. And you need everything indoors so you have to greatly expand your stable space and you miss out on the grass that we can almost use for free in the winter and fall period. We can't use it because you then have to collect it mechanically and those machines can no longer go into the fields. (..) You can't use the grass that the farmer still has standing in the fall." (P6)*

Some also would need to build a larger stable, and admitted that the sector was not set up to keep sheep inside most of the time. Some even did not have a night stable yet, so they would have to build one, which also costs money and has legal constraints with gaining a permit for an extra building on the land.

> *"Absolutely, but also what you say, look for us, we are based on a certain number of sheep, and now I don't have that many, but if I have to build new pens, but I'm not going to build new pens, you have to get a permit from the municipalities. I mean, the municipality has now allowed the fence to be 1.20 meters" (P5) "1.50" (P6) "Or 1.50 now, but I think if I start randomly building various stalls, well at some point they'll say eh friend I don't know what you're doing eh but this is not the intention." (P5)*

5. DISCUSSION

The main objective of this study was to investigate the factors influencing sheep keepers' intention to implement livestock protection measures (LPMs) on the Veluwe, Netherlands, guided by the Theory of Planned Behavior (TPB). According to the TPB, an individual's intention to perform a behavior is shaped by three primary components: personal attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). The TPB has been effectively applied in studies examining the drivers behind intervention use among animal keepers, as demonstrated in research conducted in Sweden (Eklund et al., 2020b) and Switzerland (Stauder, 2023). These studies found that TPB could predict LPM use intentions effectively. My results underscore the importance of attitudes, subjective norms, and perceived behavioral control in shaping sheep keepers' intentions and behaviors related to LPM adoption. It seemed like low perceived behavioral control feeds into negative attitudes of sheep keepers towards measures, which are shared and reassured within the social circles of sheep keepers, together driving negative intentions to use measures. By addressing the sub-research questions within the framework of the TPB, this thesis provided valuable insights into the factors influencing sheep keepers' intentions and behaviors related to LPM adoption.

In Eklund's study (Eklund et al., 2020b), the largest variance was explained by subjective norm, followed by perceived behavioral control. Attitude did not have a statistically significant effect on behavioral intention to use interventions. My results, however, suggest that what positively drives LPM use among sheep keepers on the Veluwe, is their beliefs in the necessity and inevitability of livestock protection, at least on the short-term, which is part of the attitude towards livestock protection measures. These beliefs were driven by perceived growing wolf abundance in rural areas, the lack of wolf management, decreasing prey availability, low trust in the government, and feelings of responsibility and care for their sheep. Therefore, my results are more in line with the outcomes of a qualitative study by Stauder (2023) examining intervention use among sheep keepers, who showed that negative attitudes toward LPMs prevailed among her participants because of the perceived technical constraints, excessive workload, and emotional stress. Also in her case, PBC was constrained by a lack of funding for additional costs involved, with the sheer necessity of needing LPMs to continue keeping sheep as the primary motivator to implement measures (Stauder, 2023). My results also highlight that willingness to use LPMs varies across measures and among type of sheep keepers, like Stauder's study.

An interesting contrast between my results and other studies, is the perceived and suggested wildlife permeability of wolf-deterrent fencing. A field study from 2021-2023, funded by a German nature institute, showed that "fencing of the type used in Lower Saxony can provide good protection of livestock from wolves (and of pastures from wild boar) without excluding other wildlife". "The majority of interviewed livestock owners stated that they had not perceived any significant changes in wildlife presence in pastures following the installation of wolf-deterrent fencing." (Schütte et al., 2023). In contrast, most sheep owners I interviewed, expressed their worries about the effects of electric fencing on other wildlife. Wildlife common in rural landscapes in the Netherlands include roe deer, badger, hare, fox, owl. They were appreciated by most sheep keepers I talked to. They cared for their migration throughout the rural landscape, and feared that fences would limit them in their behaviors. They also thought that it was odd that, one the one hand, nature conservationists strive for de-fencing of the Dutch landscape, while the return of wolves and their strictly protected status, kind of force livestock keepers to install more and higher, even electric, fences. As the cited study (Schütte et al., 2023) was funded by a nature institute, and only studied permanent wired fences, in

another place and for a longer period of monitoring, I think a repetition of this study with other types of fences would be necessary to claim that wolf-deterring fences are wildlife permeable.

Despite perceived obstacles and disadvantages, sheep keepers evaluate movable fences better than other available measures, like livestock guarding dogs and keeping sheep inside, due to lower labor requirements and costs. Still, the use formed a significant burden for their livelihoods. Movable fences were associated with significant challenges. The labor-intensive nature of setting up and maintaining these fences, combined with financial constraints and environmental factors, lowers sheep keepers' perceived behavioral control. Low levels of trust in ensuring effectiveness, and negative experiences of others with fences, feed into negative attitudes towards this measure. Beliefs about necessity and feelings of responsibility to protect sheep drove intentions to use movable fences. However, due to the demonstrated challenges with implementation and doubts about long-term effectiveness, sheep keepers hope that this is only a short-term solution, and that ultimately, wolves will be deterred from rural areas. Such efforts are believed to support the sheep keeping community on the Veluwe, decrease fear and anxiety in rural areas, and increase the effectiveness of measures like fences.

Small-scale hobby sheep keepers generally kept animals more extensively than industrial, commercial sheep keepers and shepherds. Less animals per piece of land enabled them to keep the sheep longer in the same pasture. For this group, the best option seemed to be using permanent fences from sheep netting around their pastures to keep the sheep inside. To make this wolf-deterrent, they preferred to add wires with electric current running through on the outside. Advantages included that it could keep wolves out due to the electric current, that a wolf can not jump through the electric wires due to the sheep netting on the inside, that the sheep don't risk to get entangled in the wires when trying to escape, that the sheep keeper can mow under the lowest wire without moving the fence, and that costs were manageable. Many hobby sheep keepers were not aware of available subsidies and considered costs not a big obstacle. Negative associations included perceived effects on wildlife and stress about whether there was enough electric current on it, in turn influencing perceived effectiveness and anxiety. For hobby sheep keepers experiencing lots of emotional stress about the risk of wolf attacks on their sheep, additional methods included using livestock guarding donkeys, beech hedges, bells around necks of sheep, and night stable in period when wolves were active in the area.

For industrial sheep keepers, a limiting factor to use permanent fences was that they generally keep more sheep and therefore often need to move flocks around to different pastures to prevent build-up of worms in the soil. Also, industrial sheep keepers often let their sheep graze on other peoples' lands, who often do not like permanent fencing due to ease of mowing and legal obstacles for migration of other wildlife. This forces them to use movable fences – either five- to six-wire systems or netting with electric current. However, both were associated with a lot of practical challenges, and participants mentioned many ifs and buts for them to work effectively. Movable fences are associated with a lot of extra labor, that requires extra time and money which is often not available. Also, there were concerns about effects on other wildlife. The trust in long-term effectivity of those fences was low, due to the belief that wolves are smart, creative and opportunistic enough to learn how to circumvent those barriers, especially when they availability of natural prey in the area decreases. If there's no electric current running through, the height of the fence becomes irrelevant. Social environments of industrial sheep keepers generally understood and therefore supported it when sheep keepers did not use movable fences, and emotionally supported them when attacks took place, but if a sheep keeper decided to take measures or stop keeping, this was also supported based on shared feelings of responsibility and care. Notwithstanding predominantly negative associations with and norms about movable fences, several participants had quite positive intentions to use them, especially in pastures

close to wolf territories. Main drivers for use were feelings of responsibility and the necessity to do something to protect the sheep from attacks. Other measures were perceived as even more challenging. Factors enabling use of movable fences in this group was the availability of subsidies, although they were perceived as too limited and there was often a lack of awareness about these.

Industrial sheep keepers sooner believed in using donkeys than dogs. To this group of sheep keepers, using dogs was perceived as impossible in their business model, mostly due to the high costs (more sheep = more dogs), perceived danger to humans (passing hikers, cyclists), and the intensive care and training required. Donkeys were perceived as easier to handle. However, their low perceived effectiveness due to stories of sheep that got attacked despite donkeys, and their risk to kill newborn lambs, lowered the intention to use donkeys.

Interpretation and analytical considerations

Potential limitation is that only the results for three types of livestock protection measures were presented due to time restrictions in the report writing phase, with most attention given to movable fences. Implications are that factors influencing the uptake of other potentially promising measures are left out of this report. Another weakness of this study includes the specific regional context of the Veluwe. Future research could expand on these findings by examining longitudinal trends in LPM adoption, conducting comparative studies across different regions, or incorporating additional psychological frameworks to deepen our understanding of human-wildlife interactions. Also due to time restrictions, I did not have time to finish the thematic analysis, obscuring additional background factors that might shape the intention to adopt LPMs. Lastly, this thesis restricted to sheep as livestock species, while there are also other livestock species that suffer from wolf attacks. The differences in animal ecology between horse, sheep, goat etc. might influence the LPM options. Therefore, to help these groups of animal keepers, more research is needed into LPMs that could be practical and feasible for them.

Contextualizing within the field

This thesis focuses on the human factor in promoting coexistence between humans, sheep, and wolves in the Veluwe. One of the objectives was to increase the adoption of livestock protection measures (LPMs) among sheep keepers. However, this approach faced criticism from participants for several reasons. They believed it diverted attention from the root issue: the presence of wolves in rural areas where are deemed out of place. Interestingly, many supported wolf presence in natural areas with ample wild prey but opposed it in rural areas with abundant livestock and concerns for children's safety. This perspective is in line with half-earth theories as developed by biologist Wilson (2016), which advocate for separating humans and wildlife by dedicating half of the Earth's land and sea to nature conservation, which are in turn critically reviewed by social scientists (see for example Büscher et al., 2017; Ellis & Mehrabi, 2019; Kothari, 2021).

The findings of Batavia et al. (2021) emphasize that conservation efforts should aim for nonviolent coexistence. When circumstances force the infliction of harm, it should be approached with a sense of sorrow and recognition of moral compromise, rather than acceptance as a routine or necessary measure. Similarly, this research highlights the importance of minimizing harm in conservation practices, reflecting a shared belief that the destruction of life should never be an easy or default choice. The belief that livestock and people historically belong in the Veluwe area is strong, given that much of the region was shaped by human activity. While a shared future with wolves in the Netherlands is acknowledged, there is a prevailing sense of injustice among sheep keepers who feel they bear the costs of coexistence. Many participants felt that wolf wellbeing was prioritized over their

own and their animals', an issue common in wildlife conservation (Agrawal, 2005). They experienced being framed as the aggressor instead of wolves, when their animals were attacked because they either did not protect them well enough, or because they will in the end slaughter them. In contrast, the results suggest that sheep keepers feel deep care for their animals and that compassionate conservation of wolves is perceived as emotionally charged, for example reflected in giving names to wolves and anthropomorphizing them. As a result of the growing wolf numbers in rural areas of the Veluwe, sheep keepers felt forced to adopt LPMs or quit sheep keeping, despite various concerns and obstacles. The perception that costs of coexistence are unequally shared came forward strongly in my results.

This issue is situated within a broader social science debate. Focusing on changing human behavior can be criticized for 'blaming the victim', as it places the burden on those affected by wolf conservation to manage its consequences. This strategy may foster the creation of environmental subjects who are expected to care for the environment (Agrawal, 2005). Efforts to change human behavior in biodiversity conservation are criticized for the power dynamics they involve. Holmes & Cavanagh (2016) argue that conservation regulations increasingly intrude into the lives of rural people, altering their behavior not just through legal threats but also by appealing to economic rationales[7] and altering values and ideologies (Büscher & Fletcher, 2019). Such interventions can be viewed as a form of ontological politics, promoting a green ideology that values the collective community of beings over individual human interests.

Indeed, LPM adoption behavior turned out to be strongly influenced by legal restrictions and financial possibilities. For example, one can not simply build a night stable to protect sheep. First a permit must be approved for buildings over 1.50 m high, and the costs are not covered by subsidies for livestock protection. Also, deterring wolves is forbidden by European law. This relates to a trend in wildlife conservation, which often entails new, subtler forms of disciplinary power, shaping local people into environmental subjects with conservationist and neoliberal values. This concept, known as environmentality, builds on Foucault's work on governmentality (Agrawal, 2005; Fletcher, 2017b). These dynamics can generate inequalities and conflicts among people with different relationships to nature and wildlife, as conservation efforts can lead to both positive and negative interactions. Human-wildlife conflicts often spark disputes over how to manage these increasing interactions (Madden, 2004). For instance, the rewilding discourse within conservation advocates for the recovery of wildlife populations, including predatory megafauna like wolves, due to their important ecological functions (Linnell et al., 2017). However, the presence of carnivores creates tensions, particularly in rural areas, due to livestock depredation. Rural communities, like sheep keepers on the Veluwe, often feel burdened by the responsibility of taking protective measures, despite not supporting the rewilding or wildlife conservation initiatives in their region (Trouwborst, 2010, p. 350).

[7] This relates to another scientific debate in the context of wildlife conservation. Wildlife conservation is criticized for being influenced by neoliberalisation processes that aim to expand and intensify global capitalism (Büscher et al., 2012; Holmes & Cavanagh, 2016; Madden, 2004; Srinivasan, 2017). Neoliberal conservation can negatively impact nature by commodifying it, leading to its destruction through consumption (McAfee (1999) in Büscher et al., 2012). An example is the promotion of electric fence devices requiring constant high energy consumption for effectiveness. Neoliberal conservation involves closer ties between conservation NGOs and corporations (e.g. Gallagher company and the Gebiedsccommissie Gelderland that gives information to sheep keepers), market mechanisms for preserving biodiversity (e.g. paying for ecosystem services) and reduced state involvement in conservation (decentralization of wolf management to Provinces) (Büscher & Fletcher, 2019; Holmes & Cavanagh, 2016). This approach is characterized by an environmental-economic win-win logic, also referred to as the sustainability episteme (Srinivasan, 2017) or green developmentalism (McAfee, 1999). While some neoliberal conservation interventions benefit involved people, they generally show patterns of negative social impact, such as widening social, economic and political inequalities (Holmes & Cavanagh, 2016).

Most sheep keepers in this study preferred good fencing to dead sheep but emphasized the need for wolf population management at the same time. Main reasons were ensuring long-term effectiveness of measures and safety of people. Most participants perceived livestock protection measures as partial solution and hope for future action on wolf control, e.g. through zonation. Many participants were surprised that often, the absence of measures was seen as the cause of livestock attacks, rather than the presence of wolves in rural areas. This contrasts with urban perspectives, which often attribute the problem to the lack of LPMs. Participants felt their voice were not heard or taken seriously in the policy arena, including their call for better management of wolf presence in rural areas. They felt that the consulted scientists often have a specific view of nature that does not align with their perspectives. For example, scientists may not consider all consequences of wolves for nature, such as the problems wolves can cause for other wildlife like deer, whose movements could be further restricted by fencing. They believed that management of wolf activity could enhance the effectiveness of LPMs, and would not necessarily be in conflict with objectives of nature conservation, which most sheep keepers supported. Some even expected that, in that management scenario, the sheep keeping community would be more tolerant to wolves in the Veluwe area and occasional attacks on livestock.

Literature suggests that perceptions among sheep keepers may differ from those of policymakers due to differences in goals, survival needs, attitudes, values, feelings, levels of empowerment, worldviews and wealth (Madden, 2004). These value differences often follow cultural patterns, and due to globalization, cultural differences now exist not only between nations but also within nations among social groups (Manfredo & Dayer, 2004). In the case of wolves on the Veluwe, different perceptions of about wildlife conservation exist between the rural community and wildlife conservationists. The results underscore one of the main challenges for nature conservation, highlighted by Pascual et al. (2021), that there is a mismatch between how living nature is conceived and valued by the conservation movement on the one hand, and by many different people on the other including marginalized communities. These differences can be grounded in different ways of understanding the world, and result in contrasting cultural perspectives. For example, materialists who prioritize the use of wildlife, may clash with post- materialists, who prioritize wildlife protection. This also relates to different levels of need (Maslow & Lewis, 1987). Religious beliefs could have played a role, as the Veluwe is in an area with many protestant and reformed Christians. Judeo-Christian perspectives often view humans as separate from nature in contrast to for example Hindu and Buddhist beliefs, that see humans as part of nature (Manfredo & Dayer, 2004). Also, differences with human-wolf interactions in other European countries were identified by several sheep keepers. For example, we discussed how LGDs seem to do well in tourist areas in Romania, but that shepherds and people there are very different from those in the Netherlands. Here, people think nature is something to cuddle, so people might think you can come close to dogs, which leads to problems. This indeed indicates the difficulty of universally transferable solutions.

Interventions to mitigate wildlife-conflicts or promote coexistence do not always succeed or turn out as intended (Madden, 2004). Disagreements often arise between stakeholders regarding the appropriate solutions, such as lethal versus non-lethal wildlife population control, and who should bear the responsibility and costs of implementation, such as the payment and installation of electric fences by the government or affected stakeholders. These conflicts between humans about wildlife conservation, referred to in the literature as ‘***human-human conflicts’***, involve individuals with cultural misunderstandings, historical wounds and different socio-economic needs and interests, who lack trust and communication regarding ways to protect wildlife while ensuring human well-being (Madden, 2004). In the Veluwe area, such misunderstandings clearly occur between livestock owners and wolf conservationists and between political parties debating the merits of investing in expensive

conflict prevention or damage compensation measures. Also, evaluations of the value of sheep versus wolves in rural areas in the Veluwe differs across actors according to participants.

Several sheep keepers expressed the belief that sheep play an essential role in the management of grasslands and conservation of dykes in the Netherlands. According to several interviewees, sheep have benefits over other herbivores (e.g. cattle) and machinal mowers. It is for example believed that, by using sheep, you get more variation in the vegetation structure and give various animal species a better chance to survive, due to their 'golden feet'. A well-cited meta-analysis revealed that indeed, grazing had an overall positive effect compared to annual mowing in terms on biodiversity benefits for grassland management (Tälle et al., 2016). The general conclusion from this article is that "grazing seems to give the highest biodiversity benefits in grasslands" (p. 210). However, the effects were modest and varied between sites and grazer species.

This study found concerns about the long-term functional effectiveness of livestock protection measures, even among those already using or intending to use LPMs. Effectiveness was perceived to depend heavily on maintenance, potential wolf adaptation, local wild prey abundance, weather conditions, and the proximity of sheep pastures to wolf territories. This aligns with previous studies that identified a lack of scientific evidence on the functional effectiveness of various LPMs (Eklund et al., 2017; Van Eeden et al., 2018) and empirical examples in the Netherlands have demonstrated that merely using a measure does not necessarily prevent predation (BIJ12, 2024a).

My results support findings from that the local cultural and landscape context is important to consider in the development of strategies for wolf-livestock coexistence in agricultural landscapes (see e.g. a recent study by König et al. (2023)). In the case of the Veluwe area, local landscape context, human population density, wolf abundance and prey abundance shape possibilities for coexistence. Participants acknowledged that LGDs might work well in other contexts, such as in tourist areas in Romania, but that the people there are very different from those in the Netherlands. Here, people think nature is something to cuddle, including the dogs, which could exacerbate problems between people and sheep keepers. In contrast to Romanian people, Dutch people might think you can come close to them. The importance of such background variables were already acknowledged by prof. Harper et al. (2008), Mech et al. (2000) and Bradley and Pletscher (2005), who found that depredations correlated positively with farm size, prey density and other habitat variables.

Recommendations for research and practice

Wolf attacks can inflict significant emotional toll and devastation on sheep and their caretakers. Instances where sheep are left half-dead or severely injured deeply impact those who witness such events, including family members of the caretaker and animal vets. Even those involved in commercial sheep farming showed they deeply care for their animals and their sensitivity and emotional experiences should not be trivialized. If not for the sake of sheep keepers and sheep wellbeing, preventing sheep prey selection by wolves is essential for the support base for and long-term success of wolf conservation. To achieve that, it is crucial to find ways to relief those negatively affected by wolves (e.g. reducing stress and worry) and to identify measures that decrease the perceived disadvantages of taking action (e.g. reducing maintenance).

Given the projected increase in wolf populations, decrease of wild prey populations, and the low probability of short-term change in the root causes of human-wolf conflicts, this thesis calls for immediate action: supporting sheep protection against wolf attacks in the Netherlands.

Recommendations for policymakers and managers

This study's results should inform policymakers and managers in designing more effective strategies to increase people's willingness to adopt livestock protection measures. Key is that policymakers become more in touch with practical realities by spending time on sheep farms to be better informed. Based on the study's findings, recommendations can be made to enhance the adoption of LPMs among sheep keepers on the Veluwe. Strategies could include targeted interventions to 1) improve attitudes towards LPMs by decreasing perceived disadvantages and enhancing perceived effectiveness; and 2) improve perceived behavioral control by increasing the ease of use, providing resources and minimizing obstacles. This can be done by financial relief of labor costs, attracting capable volunteers to help with fence maintenance, providing a wider subsidy scheme (also for building night stables), spreading better awareness of subsidies in the sheep keeping community, and developing clear and practical guidelines for sheep keepers. Further research could explore additional factors influencing intention formation and validate these findings in different contexts or with larger samples.

The results also reveal a need for more scientific evidence for functional effectiveness of LPMs. Based on experiences of participants and based on their perceptions of experiences of others, it became clear that – even when well-implemented – livestock protection measures do not always ensure protection. The objective evidence of a measure's functional effectiveness must remain a foundational prerequisite (Van Eeden et al., 2018). This will prevent the inefficient, or even counterproductive, use of limited resources to protect animals long term. Building on that, I recommend the development and innovation of livestock protection measures and supporting technologies. Ideas that came up in conversations were autonomous lawn mowers (reduce labor for maintenance during the growing season) and shelter trailers or movable stables for in the pasture.

The insights also suggest it would be interesting to further investigate legal and ecologically sound strategies for managing wolf presence in rural environments. Sheep keepers worried that increased uptake of LPMs might make the government more complacent about managing wolves in rural areas, while this was perceived as the root of the problem, and a threat to human safety. A possible research could explore the potential effectiveness, feasibility, side-effects and ethical aspects of wolf translocations from the Veluwe to other areas (e.g. Oostvaardersplassen), of fertility control of wolves on the Veluwe, and of other non-lethal management scenarios. Such research might evaluate in pilots to what extend these strategies decrease livestock depredation in rural areas, increase the legitimacy of wolf conservation, increase tolerance towards wolves, reduce further polarization, and enhance human-wolf coexistence on the Veluwe in general.

I recommend initiating a societal paradigm shift, redefining sheep keepers from mere producers focused on profit to passionate caretakers dedicated to the well-being of their animals. This shift, which emphasizes care and responsibility, aligns with Batavia et al. (2021), who advocate for the integration of emotion, particularly compassion, into conservation ethics. Their work challenges the traditional dismissal of emotion as a valid moral guide, highlighting the need to recognize emotional experiences, such as interdependence and shared vulnerability, as essential in conservation. By acknowledging sheep keepers as caretakers, we embrace a more compassionate and ethically sound approach, resonating with the call for conservationists to prioritize individual beings' welfare alongside broader ecological goals.

The shift from referring to sheep keepers as mere operators to viewing them as sheep caretakers represents a significant reframing of their role. In public space, sheep keepers are perceived primarily as farmers focused on the economic aspects of sheep production. However, this study highlights a deeper dimension: many individuals who manage sheep are deeply emotionally invested in their animals. They exhibit profound care and take personal responsibility for ensuring the welfare and safety of their flocks. By adopting the term "caretaker," we can acknowledge the broader

responsibilities and emotional labor involved in sheep farming. It underscores the commitment to nurturing, protecting, and maintaining the well-being of the animals under their stewardship. This shift not only reflects the sentiments expressed by participants in this study but also aligns with broader societal trends recognizing the ethical and emotional dimensions of animal husbandry. Furthermore, recognizing sheep caretakers as stewards emphasizes their role beyond economic transactions. It positions them as crucial contributors to animal welfare and landscape conservation efforts. Policymakers and stakeholders may find it more compelling to support initiatives that prioritize animal welfare and address the emotional impacts of predator interactions when they recognize sheep caretakers as essential partners in these efforts.

In summary, this study not only provides valuable insights into the emotional dimensions of using protective measures in sheep farming but also calls for a paradigm shift towards recognizing and supporting sheep caretakers. Integrating these findings into policy and practice will better safeguard sheep welfare and support the livelihoods of those dedicated to their care.

Conclusion

The main objective of this study was to investigate the factors influencing sheep keepers' intention to implement livestock protection measures (LPMs) on the Veluwe, Netherlands, guided by the Theory of Planned Behavior (TPB). My results underscore the importance of attitudes, subjective norms, and perceived behavioral control in shaping sheep keepers' intentions and behaviors related to LPM adoption. This study found that beliefs regarding the necessity and inevitability of LPM use among sheep keepers on the Veluwe drive intention to use LPMs. These beliefs were driven by perceived growing wolf abundance in rural areas, the lack of wolf management, decreasing prey availability, low trust in the government, and feelings of responsibility and care for their sheep. By addressing the sub-research questions within the framework of the TPB, this thesis provided valuable insights into the factors influencing sheep keepers' intentions and behaviors related to LPM adoption.

Despite variation across measures and type of sheep keepers, participants were generally skeptical about the outcomes of using measures, with negative consequences dominating the perceptions of and experiences with the use of measures. Influence of others on intentions to use measures seemed low as many sheep keepers generally said to be driven by what they think is best for their sheep. Colleagues and people of importance to the person generally supported and approved any decision, grounded in an understanding of the challenging task of taking measures. Other peoples' knowledge, perceptions and experiences regarding LPMs influenced sheep keepers' beliefs about disadvantages and ineffectiveness, resulting in predominantly negative performance and outcome expectancies. Sheep keepers ability to use measures was impeded by several factors. Barriers included perceptions about the difficulty, labor-intensiveness and costs of using, the amount and type of land and amount of sheep, susceptibility of parasites and worms, and dependence of measures effectiveness on weather events. In this way, it seems like low perceived behavioral control feeds into negative attitudes, which are shared and reassured within the social circles of sheep keepers, together driving negative intentions to use measures.

This study contributed to the field of human dimensions of wildlife conservation by underscoring the importance of attitudes, subjective norms, and perceived behavioral control in shaping sheep keepers' intentions and behaviors related to LPM adoption, and by emphasizing the emotional dimensions of implementing protective measures against wolf attacks among sheep keepers. Unlike traditional frameworks such as the Theory of Planned Behavior, which predominantly focus on rational decision-making processes, this research highlights the profound emotional impact experienced by sheep keepers. It reveals that feelings of anxiety, frustration, and helplessness significantly influence their

perceptions and behaviors regarding wolf-deterring measures. By illuminating these emotional aspects, this study provided a more comprehensive understanding of the challenges faced by sheep keepers in rural environments, enriching existing literature that often overlooks such emotional dimensions.

This study emphasizes the urgent need to support sheep protection against wolf attacks in the Netherlands. The emotional toll on sheep caretakers, as evidenced by this research, underscores the importance of enhancing LPMs and providing adequate support to those affected. The recommendations for policymakers to develop effective strategies for increasing LPM adoption and addressing perceived barriers are pivotal. By promoting supportive social norms and fostering positive attitudes towards LPMs, policymakers can create an environment where sheep caretakers feel valued and supported in their efforts to protect their animals. Moreover, advocating for more rigorous scientific evidence on the functional effectiveness of LPMs and promoting innovation in protection technologies are crucial steps towards sustainable and effective measures. This evidence-based approach will prevent the inefficient allocation of resources and contribute to long-term solutions for managing human-wildlife conflicts.

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Painting: Jean-Baptiste Oudry - Le loup et l'agneau (Paris, 1686 - Beauvais, 1755)

APPENDICES

A. Characteristics of participants

Participants were selected from the entire Veluwe region, a known wolf territory in Gelderland and an administrative sub-division commonly used for statistical and research purposes. The specific research locations were determined by the places where participants keep their animals. Due to the need for anonymity, exact research locations cannot be disclosed as they might reveal the identities of the participants. However, the list below indicates the general geographical locations within the Veluwe, and shows some background information about the people that participated in the interviews.

Participant	**Date**	**Gender**	**Age**	**Geographic region and local wolf abundance (BIJ12, 2024b)**	**Type of sheep keeper**	**LPM use** *including potential risks for effectiveness in preventing predation in cursive*
P0 (pilot)	7-3	F	50-60	South-East Veluwe 1 settled wolf pack	Volunteer shepherd	(1) Shepherd guarding during daytime.
P1	19-3	M	50-60	North Veluwe 1 settled wolf pack, 6 pups in 2023	Professional breeder 20-30 sheep	(1) Movable flexinets (120 cm). Around whole pasture (6,000 volt). (2) Daily fence check.
P2	21-3	M	60-70	West Veluwe 1 settled wolf pack	Hobby breeder 10-15 sheep	(1) Ditch around pasture with one electric wire on top. (2) Movable flexinets (*90 cm* electric sheep net. (3) Stable.
P3	21-3	M	40-50	West Veluwe 1 settled wolf pack	Professional meat producer > 800 sheep	(1) Movable flexinets (120 cm). 500m *in straight line on one side of 1 pasture* (not closed circle). (2) *Leaving dead sheep in field*..
P4	25-3	M	60-70	Mid Veluwe 1 settled wolf pack	Professional shepherd 150-200 sheep Nature management	(1) Livestock guarding dogs. (2) Keeping sheep inside stable at nighttime. (3) Keeping sheep in small night corral of movable flexinets (120 cm) on the heather. (4) Permanent electric fencing around stable. (5) Shepherd guarding during daytime.
P5	28-3	M	40-50	North East Veluwe 1 settled wolf pack, 5 pups in 2023	Hobby breeder 10-20 sheep	(1) Movable flexinets (120 cm) (temporarily, borrowed from the Province).

P6	28-3	M	40-50	North East Veluwe 1 settled wolf pack, 5 pups in 2023	Professional breeder > 800 sheep	None.
P7	29-3	F	30-40	South Veluwe 1 settled wolf pack, 4 pups in 2023	Hobby wool producer < 5 sheep	(1) Movable flexinets (120 cm). 500 m around pasture (8,000 volt). (2) Daily fence check.
P8	9-4	M	40-50	Mid Veluwe 1 settled wolf pack	Professional grazing > 800 sheep	(1) Movable flexinets (120 cm), *only in pastures in wolf territory*.
P9	9-4	M	60-70	South West Veluwe 1 settled wolf pack, 7 pups in 2023	Professional shepherd 150-200 sheep Nature management	(1) Electric permanent fencing around stable.
P10	9-4	M	40-50	West Veluwe 1 settled wolf pack	Professional meat producer > 800 sheep	None.
P11	9-4	M	18-20	West Veluwe 1 settled wolf pack	Professional meat producer > 800 sheep	None.
P12	23-4	M	90+	Mid Veluwe 1 settled wolf pack	Hobby breeder 5-10 sheep	(1) At night in stable.
P13	4-5	M	50-60	North East Veluwe 1 settled wolf pack, 5 pups in 2023	Hobby breeder 10-20 sheep	(1) Electric permanent fencing around pasture next to home.
P14	8-5	F	60-70	West Veluwe 1 settled wolf pack	Hobby breeder 20-30 sheep	(1) Keeping sheep indoors at night.
P15	14-5	F	40-50	Mid Veluwe 1 settled wolf pack	Hobby breeder 10-20 sheep	(1) Livestock guarding donkeys. (2) 2 flexinets on top of each other as permanent fencing around pasture next to home. (3) Night stable. (4) Natural fence from beech hedge. (5) Bells around sheep necks.

B. Background information on the study area: the Veluwe

Veluwe as administrative sub-region in Gelderland

Gelderland, which comprises 51 municipalities, is divided into four COROP regions for research purposes: the Veluwe, South West Gelderland, Achterhoek and Arnhem & Nijmegen (CBS, 2019) (see Map 3 and 4 in Appendix B). The Veluwe region covers the majority of the wolf territory in Gelderland

(compare Map 4, 5, 6 and 8 in Appendix B)[8] and includes sixteen municipalities: Apeldoorn, Barneveld, Ede, Elburg, Epe, Ermelo, Harderwijk, Hattem, Heerde, Nijkerk, Nunspeet, Oldebroek, Putten, Scherpenzeel, Voorst and Wageningen (CBS, 2019), with Apeldoorn (168,200), Ede (123,532) and Barneveld (63,000) among the largest municipalities.

History of human activity, wolves and sheep keeping the Veluwe

The Veluwe region in the Netherlands has a rich and varied history, deeply intertwined with the natural landscape and human activities. Archaeological evidence suggests that the Veluwe has been inhabited since prehistoric times, with stone tools and burial mounds from the Neolithic period indicating early human activity (Butler & van der Waals, 1967; Fontijn et al, 2011). Wolves also used to exist throughout the whole of Europe. In prehistory, people hunted wolves due to their competition with prey but also admired them for their efficient hunting behavior (de Rijk, 1987; De Rijk, 1985; Govaerts, 2022). During the Roman era, the Veluwe was on the northern edge of the Roman Empire. While there were no major Roman settlements in the Veluwe, the influence of Roman culture and trade reached the area (Canon van Nederland, n.d.). Wolves had positive associations for many Germanic and Roman people, as a protector, sacred animal and warrior in popular myths and legends, despite the threat to both people and livestock (Govaerts, 2022; Rissanen, 2014).

In the Middle Ages, the Veluwe became more settled, characterized by small agricultural communities and villages. Over centuries, deforestation occurred due to major agricultural expansion, grazing, and fuel needs (Neefjes, 2019). To increase productivity of the sandy landscape, agriculturalists started keeping animals, that also produced wool, meat, milk and skins. Sheep started dominating the livestock in the Veluwe, because heather fields were less suitable for cattle (Neefjes, 2019). Heathland farming was common, where heath sods and sheep dung were used to fertilize the soil (Webb, 1998). In the evenings, farmers would herd their sheep into special barns called 'potstallen'. The floors of the barns were covered with litter, which farmers had gathered from the forest or heathland. This litter absorbed manure and urine. After a season, farmers would empty the barns and spread the mixture over their fields to fertilize it. Under the growing influence of the Church in this period, the wolf became a symbol of pure evil, danger, greed, and destructiveness due to metaphors in the Bible and fairytales depicting wolves as 'The Big Bad Wolf' (Govaerts, 2022). In addition, wolves increasingly caused damage to game and livestock, and sometimes attacked or killed humans, which led to widespread intolerance and institutionalized eradication schemes (Govaerts, 2022).

In the sixteenth century, the sheep flocks in the Veluwe further elaborated due to the increasing demand from Flemish and Dutch cloth towns for wool (Elbertsen et al., 2003). Halfway the sixteenth century, there were already about 111,000 sheep on the Veluwe, and due to the increasing nuisance caused by wolves, (poor) rural people were encouraged to take part in wolf hunts through policies (including fines for refusal and premiums for culled wolves) (Neefjes, 2019). However, due to the emergence of extensive heathlands and sand drifts due to the deforestation for the iron industry, and the intensive agriculture by the poor population that included burning heather to increase fertility, the soil got increasingly exposed to wind erosion (Witte, 2016). Around 1850, about a third of the Veluwe was covered with drift-sand (now approximately 1%). As a result of that, and also because of diseases and wars (Eighty Years' War from 1566/1568-1648) that afflicted the region, the human population on the Veluwe decreased (Neefjes, 2019).

[8] In addition to Gelderland, wolves have settled in Drenthe, Utrecht, and the border areas of Friesland and Overijssel, with indications of wandering wolves in Friesland, Noord-Brabant and Overijssel. Nonetheless, the highest wolf density is in the Veluwe (BIJ12, 2024b) (See Map 6 in Appendix B).

As the Renaissance gave way to the modern era, the Veluwe saw significant changes. The region was part of various feudal estates, with large tracts of land owned by nobility and monasteries (Neefjes, 2019). By the 17th century, wealthy merchants and nobility had established grand estates and hunting lodges on the Veluwe, contributing to its abundance of wildlife and current patchwork of forests, heathlands, and farmland (Storms-Smeets, 2021). From the nineteenth century, the Veluwe was also discovered by rich people from the Western part of the country, including prosperous industrialists, bankers, merchants and traders, and former officers that returned from colonies (Neefjes, 2019). During this time, there were hundreds to thousands of individual wolves in the Netherlands, and dozens of wolf hunts were organized by the government. Sometimes thousands of people took part in these hunts that spanned several provinces and could endure several days (De Jonge, 2020; Van Heugten, 2023). Despite the intense persecution, wolves did not totally disappear until the 19th century. The last wild wolf that lived in the Netherlands was presumably shot in 1845, but wandering wolves from Belgium and France presumably continued to visit the Netherlands (Drenthen, 2015; De Rijk, 1985).

In the late 19th and early 20th centuries, there was growing awareness of the need to conserve the Veluwe's unique landscape (Neefjes, 2019). Elites were interested in reforestation of heather fields for wood production and increasing the hunting possibilities. Wildlife like red deer and wild boar were imported from other European countries to the Veluwe for hunting purposes (Neefjes, 2019). Also, the mine sector in Limburg increased the demand for pine trees. This led to large-scale reforestation efforts and the establishment of protected areas. In 1930, National Park Veluwezoom was established as the first national park in the Netherlands. Five years later, National Park De Hoge Veluwe was established, where a flock of mouflon sheep was successfully imported. These parks and other natural areas in the region still protect significant portions of the Veluwe's natural environment (Neefjes, 2019).

During World War II, soldiers used the vast and uninhabited landscapes of the Veluwe, still visible in countless remains of trenches, foxholes, shooting ranges, bomb craters and military buildings (Neefjes, 2019). After World War II, there was a renewed focus on conservation and tourism, and the Veluwe became a popular destination for nature enthusiasts, hikers, and cyclists (Neefjes, 2019). Throughout the 20th century, human attitudes toward the natural environment changed, leading to the restoration of natural areas and the protected status of wolves and other species in Europe. Today, the Veluwe is renowned for its natural beauty and biodiversity. It is one of the largest continuous nature reserves in the Netherlands (approximately 88.000 hectares of Natura-2000 area), offering a mosaic of forests, heathlands, and sand dunes. The region is an important ecological corridor, supporting a wide range of species, including the returned wolf populations. The Veluwe also holds cultural significance, with historic estates, castles, and museums, such as the Kröller-Müller Museum, which houses an extensive collection of Vincent van Gogh's works (Neefjes, 2019). The interplay of natural and cultural history makes the Veluwe a unique and valuable area for both conservation and research.

In recent years, in the early 21st century, wolves began naturally recolonizing the Veluwe from neighboring countries leading to new conservation challenges and opportunities. These wolves are European lowland wolves (Canis Lupus), originating from Poland and Eastern Germany, that walked several hundreds of kilometers using human made infrastructures such as highways. As wolf populations are growing in Germany, and the cubs will try to find their own territories in the near future, such interactions with their negative consequences are expected to increase. At the time of writing (July 2024), the wolf population in the Veluwe region is divided into the following sub-areas: North Veluwe (1 settled wolf pack, 6 pups in 2023), North-East Veluwe (1 settled wolf pack, 5 pups in 2023), North-West Veluwe (1 settled wolf pack, 4 pups in 2023), Mid-Veluwe (1 settled wolf pack),

South-Eastern Veluwe (1 settled wolf pack, 4 pups in 2023), National Park Hoge Veluwe and surroundings (1 settled wolf pack, unknown how many pups in 2023) and South-Western Veluwe (1 settled wolf pack, 7 pups in 2023).

Socio-demographic information

The economy in the Veluwe region is diverse, with agriculture, tourism, and forestry being dominant sectors. Agriculture includes dairy farming, horticulture, and arable farming, and is still a vital component of the regional economy. Tourism is another important economic driver in the Veluwe region. The region's natural beauty, extensive forests, heathlands and cultural heritage sites attract millions of visitors annually (Provincie Gelderland, 2022) (see Illustration 1). Popular tourist activities include hiking, cycling, wildlife watching and visiting historical estates and castles. National Park de Hoge Veluwe draws both domestic and international tourists. The tourism sector provides direct employment opportunities in hospitality, recreation and transportation and stimulates growth in related industries such as retail and services (Provincie Gelderland, n.d.a).

In terms of religion, the Veluwe is predominantly a Protestant region. There is a noticeable division: the northern and western parts of the Veluwe are predominantly Reformed, while the eastern and southern parts are mostly moderate to non-religious. The northern and western areas of the Veluwe are part of the Bible Belt, which stretches form northern Overijssel to Zeeland (Wikipedia, n.d.c). The Veluwe is well-connected by a network of roads and public transportation, which supports the local population, tourists and various industries. Major highways such as the A1, A50 and A28 traverse the region, linking it to other parts of the Netherlands (NOS, 2019).

The Veluwe has different terrain managers or owners. Large parts are managed by the organizations Kroondomein het Loo, Staatsbosbeheer, Natuurmonumenten and Geldersch Landschap en Kasteelen. Some areas belong to municipalities, private owners and estates. Other influential entities that shape the decision-making in the Veluwe area, are the Province of Gelderland, Natura 2000-legislation, and European Union policies (Wikipedia, n.d.c).

Climate and vegetation

The climate of the Veluwe is classified as temperate maritime, characterized by mild winters and cool summers. The region experiences relatively high levels of precipitation throughout the year, with the heaviest rainfall occurring in the autumn and winter months. This climate supports the growth of diverse vegetation types, from dense forests to open heathlands (Klimaatinfo, n.d.). As can be seen in Map 7, the Province of Gelderland indeed has a relatively large share of natural area. The dark green part in the left map overlaps with the Veluwe region, presented in Map 8. The vegetation of the Veluwe is varied, comprising forests (approximately 73.000 ha), expansive heathlands, and sand dunes (approximately 1.400 ha), each hosting different plant species adapted to their specific habitats (Natura 2000, n.d.). The deciduous forests (approximately a quarter of the Veluwe's forests) are mainly composed of oak (Quercus robur), beech (Fagus sylvatica), and birch (Betula pendula), and provide a rich understory of shrubs, ferns and wildflowers. Coniferous forests (approximately three quarters of the Veluwe's forests), primarily consisting of Scots pine (Pinus sylvestris) were planted extensively during the 19th and 20th centuries for timber production. The heather lands (approximately 14.000 ha) are a defining feature of the Veluwe, characterized by low-growing shrubs such as heather (Calluna vulgaris) and grasses (Festuca ovina subsp. Hirtula). (Natura 2000, n.d.)

In addition to the natural vegetation, a variety of crops are cultivated in the agricultural zones of the Veluwe (approximately 54.000 ha) (CBS, 2023a). The main types of vegetation found in the agricultural fields of the Veluwe include arable crops (cereals such as wheat, barley and rye), root crops (potatoes

and sugar beets), vegetables (carrots, onions and cabbages) and forage crops (grasslands and pastures for livestock grazing and hay production) (CBS, 2023a). These agricultural activities contribute to the local economy and play a significant role in the rural landscape of the Veluwe.

Environmental challenges

Anno 2024, the Veluwe faces several environmental challenges. Among these issues are fragmentation, pollution, nitrogen deposition, and climate change, each of which poses significant threats to the region's ecosystems and wildlife. Habitats of animals have been fragmented by the construction of roads and buildings. As a result, they cannot breed with animals from other areas and live in isolation (Provincie Gelderland, n.d.b). Pollution in the Veluwe primarily stems from agricultural activities, industrial operations, and transportation. Agricultural runoff, containing pesticides and fertilizers, can contaminate soil and water bodies, affecting both terrestrial and aquatic ecosystems. Industrial activities contribute to air and water pollution through the release of chemicals and waste products. Additionally, the high volume of traffic on major highways crossing the Veluwe contributes to air pollution, which can have adverse effects on both human health and the environment (NOS, 2019).

One of the most critical environmental issues in the Veluwe is nitrogen deposition. Excessive nitrogen from agricultural sources, particularly livestock farming and fertilizer use, as well as from vehicle emissions, has led to nutrient imbalances in the soil. This can cause a decline in plant species that thrive in low-nitrogen conditions, leading to a loss of biodiversity. Heathlands, which are a characteristic habitat of the Veluwe, are particularly vulnerable to nitrogen deposition. To combat this, various measures have been implemented, including stricter regulations on agricultural practices, efforts to reduce vehicle emissions, and restoration projects aimed at mitigating the effects of nitrogen on sensitive habitats (Provincie Gelderland, n.d.b).

Climate change also poses significant challenges for the Veluwe. Rising temperatures and changing precipitation patterns can alter the composition of ecosystems, affect water availability, and increase the frequency and intensity of extreme weather events. For instance, prolonged droughts can stress vegetation, making forests more susceptible to pests and diseases. The Veluwe is situated on a high plateau, resulting in a lower groundwater level. This makes the area particularly susceptible to issues such as drought. At the same time, heavy rainfall as a result of climate change can lead to soil erosion and flooding (Provincie Gelderland, n.d.b).

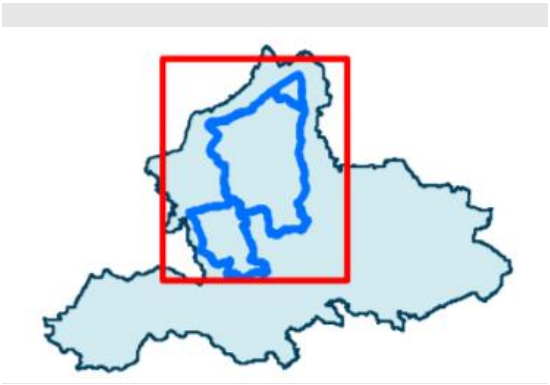
Maps to provide visual context:

Map 1: Location of the Province of Gelderland

Map 2: Detailed map of Gelderland (Wikipedia, n.d.b)

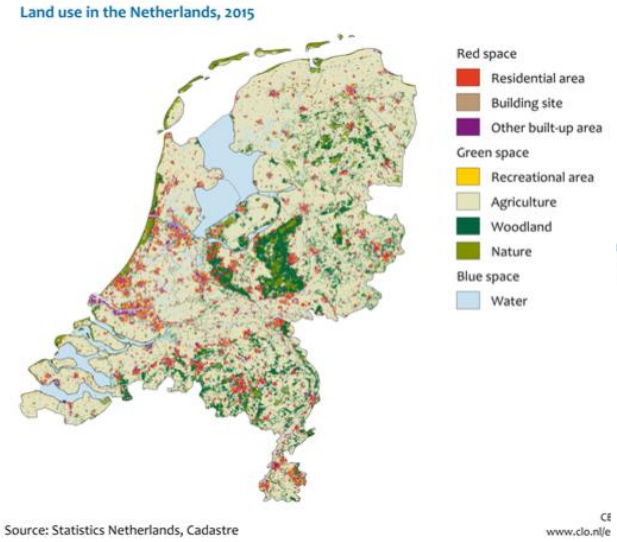
Map 3: Administrative subdivisions in the Netherlands (Wikipedia, n.d.a)

Map 4: Veluwe sub-region in Gelderland (Wikipedia, n.d.c)



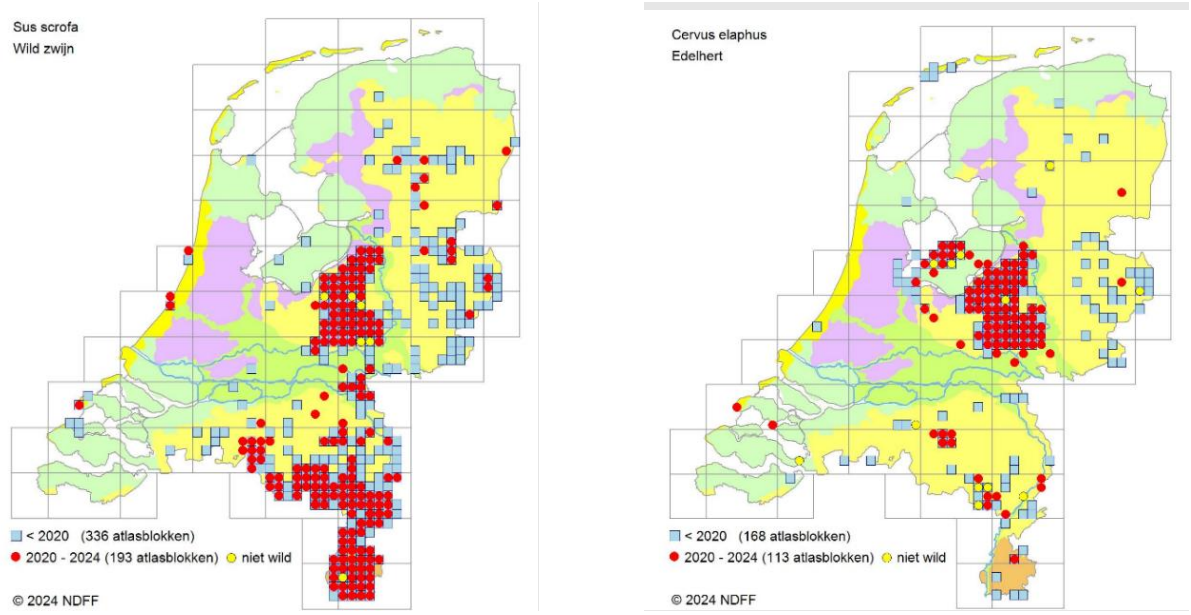
Map 5: Living area of wolves in Gelderland (Provincie Gelderland, 2021)

Map 6: Latest wolf activity in Gelderland (BIJ12, 2024b)

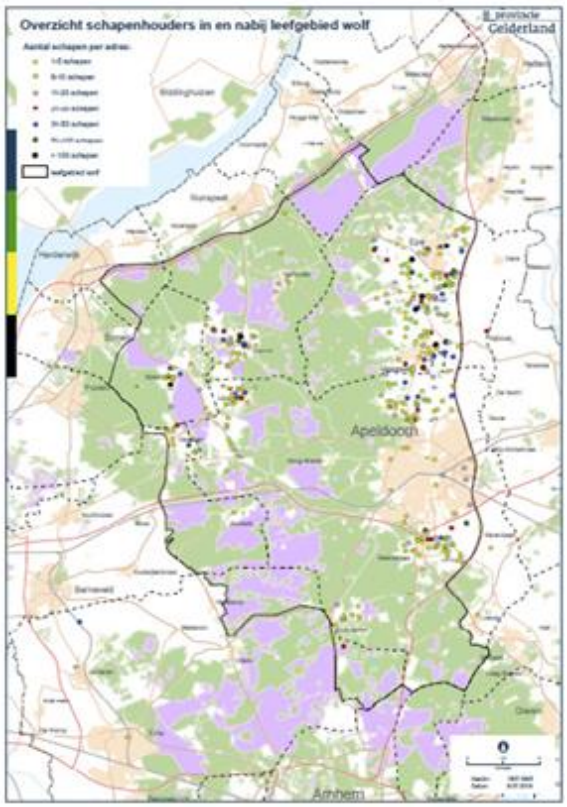


Map 7: Land use in the Netherlands (CBS, 2015)

Map 8: Natural areas of the Veluwe (Veluwefonds, n.d.)



Map 9: Distribution of wild boar (left) and red deer (right) in the Netherlands (NDFF, 2024)



Map 10: Locations where sheep and goats are kept in the Veluwe region (Gebiedscommissie Gelderland, 2020)

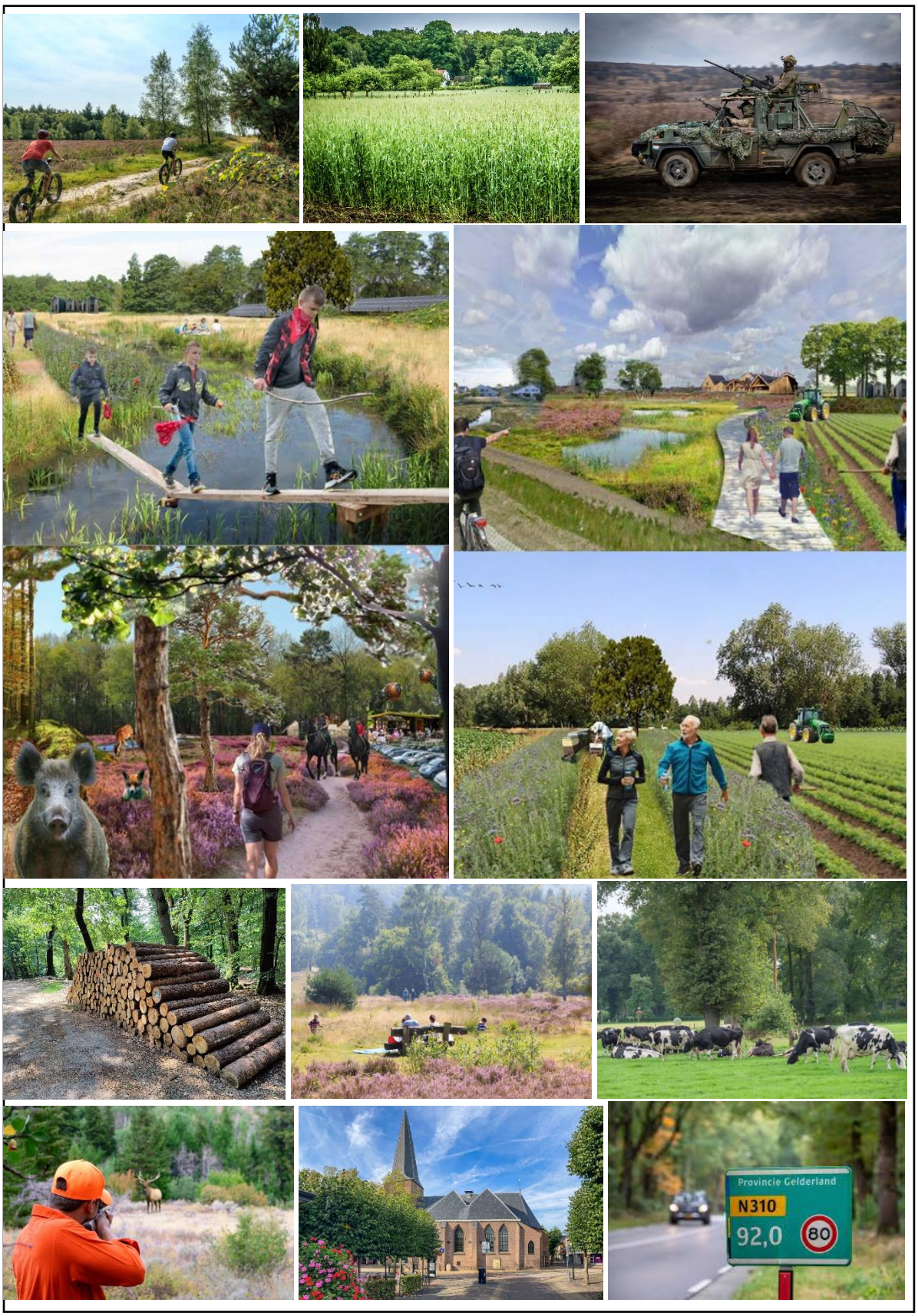


Figure 3: Impression of common human activities in the Veluwe region, including recreation and tourism (cycling, spotting wildlife, picnicking, horse riding, nature photography), hunting, military trainings, beekeeping, crop production, urban living areas (cities and villages), transport, and animal husbandry. Source: Gemeente Apeldoorn (2022)

C. Interview guide (Dutch)

Kennismaking

Kunt u me allereerst wat vertellen over uw werk als schaaphouder?

- Waarom bent u schapen gaan houden? Houdt u hobbymatig of bedrijfsmatig schapen?
- Heeft u naast schapenhouderij nog ander werk?
- Hoe lang werkt u al met schapen?
- Waar houdt u schapen?
- Hoe ziet een werkdag er voor u uit?

Kunt u me wat meer vertellen over de schapen?

- Hoeveel schapen heeft u?
- Kunt u iets vertellen over het ras van de schapen? Waarom dit ras?
- Zijn de schapen van u?

Vragen over gebruik van wolfwerende maatregelen in het algemeen

Sinds een aantal jaren wonen er wolven op de Veluwe. Inmiddels leven er zo'n 7 roedels verspreid over de Veluwe. Er zijn mensen die wolfwerende maatregelen hebben genomen die ervoor zouden moeten zorgen dat wolven minder makkelijk bij schapen kunnen komen.

1. Welke maatregelen kent u allemaal? Van welke maatregelen heeft u allemaal gehoord? Kunt u een aantal **voorbeelden** van zulke maatregelen opnoemen?
2. Heeft u **eerder** wolfwerende maatregelen gebruikt? Welke? Kunt u redenen geven voor deze beslissing?
3. Gebruikt u **nu** wolfwerende maatregelen? Kunt u redenen geven voor deze beslissing? (Zo ja, welke?)

Persoonlijke houding en evaluatie van wolfwerende maatregelen

De volgende vragen gaan over uw houding ten opzichte van het gebruik van wolfwerende maatregelen. Ik ben benieuwd naar uw opvattingen over het gebruiken van maatregelen, en naar uw opvattingen over het niet gebruiken van maatregelen. Ik ben benieuwd naar uw eerlijke mening, er zijn geen goede of foute antwoorden.

4. Wat vindt u van het gebruik van wolfwerende maatregelen in uw schapenhouderij? *Probes*:
    a. Denkt u dat wolfwerende maatregelen **effectief** zijn in het beschermen van uw schapen tegen wolven? **Gelooft** u dat zulke maatregelen wolven echt bij schapen uit de buurt kunnen houden?
    b. Hoe **noodzakelijk** vindt u het om wolfwerende maatregelen te gebruiken?
    c. Hoe **belangrijk** vindt u het om wolfwerende maatregelen te nemen?
5. Kunt u **ervaringen of ontmoetingen uit het verleden** beschrijven die uw houding ten opzichte van de implementatie van maatregelen hebben beïnvloed?
6. Wat is uw **gevoel** bij het nemen van wolfwerende maatregelen?
7. En welk **gevoel** roept het **niet nemen van maatregelen** bij u op?
8. Welke **voordelen** ervaart u/ziet u in het gebruiken van [X]? Wat zijn de **goede kanten** aan het nemen van beschermende maatregelen?
    a. Zijn er **zorgen of nadelen** die u associeert met het gebruik van deze maatregelen? Wat zijn de niet zo goede of slechte dingen van beschermende maatregelen?
        - Heeft [X] nog **nadelen of neveneffecten**? Zo ja, welke?

- (Note to self) Afhankelijk van het antwoord, kan de deelnemer gevraagd worden na te denken over consequenties van preventieve maatregelen **voor jezelf, voor je vee, voor je**

gemeenschap en de omgeving. Ze kunnen denken aan zowel positieve als negatieve gevolgen.

- (Note to self) Afhankelijk van het antwoord, kan de deelnemer eraan herinnerd worden om te denken aan zowel aan financiële als niet-financiële kosten en baten van het gebruiken van preventieve maatregelen. Financiële nadelen zijn bijvoorbeeld dat ze je uiteindelijk meer geld kosten dan als je ze niet gebruikt, bijv. door oplopende onderhoudskosten; niet-financiële kosten kunnen zijn dat je meer stress en zorg hebt vanwege het onderhoud; financiële voordelen zijn bijvoorbeeld dat je in aanmerking komt voor schade compensatie in geval van een aanval; niet-financiële voordelen kunnen zijn dat je minder stress en zorg hebt vanwege aanvallen

9. Wat zijn de **voor- en nadelen** van het **niet** gebruiken van [X]?
10. Roept het gebruiken van [X] bepaalde **emoties** of **sterke gevoelens** bij u op?

Waargenomen subjectieve normen en normatieve overtuigingen

De volgende vragen gaan over hoe **uw omgeving** denkt over het nemen en niet nemen van maatregelen. Ik ben benieuwd naar de verwachtingen en normen die heersen in uw sociale omgeving wat betreft beschermende maatregelen, en of u sociale druk voelt om juist wel of juist geen maatregelen te nemen.

11. Zijn er in uw omgeving al beschermende maatregelen genomen? Welke? Wat zijn de **ervaringen van anderen** met deze maatregelen?
12. Wat vindt u van **schapenhouders die géén beschermende maatregelen nemen**?
13. **Wie of wat beïnvloedt uw besluit** om wel of geen maatregelen te nemen?
14. Kunt u de **meningen of verwachtingen van anderen** beschrijven, zoals collega-schapenhouders, autoriteiten of leden van de gemeenschap, met betrekking tot het gebruik van maatregelen ter bescherming van schapen? Hoe denk je dat **anderen** denken over het nemen van wolfwerende maatregelen? Vinden ze dat u ze moet gebruiken? Staan ze achter het gebruik van maatregelen? Vinden ze het belangrijk / noodzakelijk? Zouden ze het goedkeuren? Waarom denk je dat?
    a. Waarom stoppen anderen?
    b. (Note to self) Wacht op het antwoord. Als een van onderstaande groepen niet genoemd wordt, stel dan dezelfde vraag over deze groep mensen:
        - Mensen die belangrijk voor u zijn / uw naaste sociale omgeving (familie, vrienden)
        - Mensen van wie u de mening waardeert
        - Schapenhouders zoals u (bijv. online schapenhouders vereniging)
        - Andere dierhouders in de omgeving / buren
        - Buurtbewoners
        - Lokale overheid (gemeente / Provincie)
        - Organisaties, bijvoorbeeld landbouworganisaties, verenigingen van schapenhouders/-fokkers (LTO Schapensector, Ketenorganisatie Schapenhouderij), vakbladen (Het Schaap), online gemeenschap (Facebook pagina Schapen)
15. Wat denk je dat **anderen** denken over het **niet** nemen van wolfwerende maatregelen?
16. Zijn er **andere individuen of groepen die het goed- of afkeuren** als u maatregelen zou gebruiken? Zijn er andere individuen of groepen die vinden dat u wel of niet maatregelen moet gebruiken?
17. Hoe ervaart u de eventuele **sociale druk** om wel of juist geen maatregelen te nemen?
18. Zijn de meningen van anderen over preventieve maatregelen **belangrijk** voor u? Hoeveel **waarde hecht u aan hun mening**? Is hun mening belangrijk voor u? Waarom (niet)?
19. Zouden anderen het goedkeuren of afkeuren als u [X] zou gebruiken? Waarom?
20. Hoe kijken **schapenhouders zoals u** aan tegen [X]? Zullen zij [X] gebruiken? Waarom (niet)?

21. Ondersteunen de **andere veehouders in uw omgeving** het gebruik van preventieve maatregelen? Zouden zij het goedkeuren als u [X] zou gebruiken? Vinden andere dierhouders uit de buurt dat u wel of geen preventieve maatregelen moet nemen? Waarom (niet)? Hoeveel waarde hecht u aan hun mening? Is hun mening belangrijk voor u?

Gedragscontrole, gemak, middelen en obstakels

De volgende vragen gaan over de mate waarin u denkt ook daadwerkelijk maatregelen te kunnen nemen. Ik ben benieuwd wat het voor u lastig of makkelijk maakt. Dit gaat zowel om uw eigen vaardigheden als om omgevingsfactoren die het nemen van maatregelen bevorderen of belemmeren.

22. Wat maakt het **makkelijk of mogelijk** voor jou om beschermende maatregelen te nemen? Hoe kan dat zo blijven?
23. Kunt u alle factoren of omstandigheden opnoemen die het **makkelijker zouden maken** voor u, of **u in staat stellen**, om maatregelen te nemen.
24. Wat maakt het moeilijk voor jou om beschermende maatregelen te nemen? Welke **uitdagingen of obstakels** verwacht/ervaart u bij de uitvoering van maatregelen ter bescherming van de schapen? (Bijv.: andere wetgeving en regels, bijv. m.b.t. maximale hoogte van omheining).
    a. Hoe zou je deze obstakels aan kunnen pakken?
    b. Vraag door naar barrières (kennis, financieel) / limiterende omstandigheden / randvoorwaarden voor verandering.
25. Kunt u **ervaringen uit het verleden** beschrijven waarbij u moeilijkheden ondervond bij het gebruik van deze maatregelen?
26. Hoeveel **vertrouwen** heeft u in uw vermogen om [X] effectief te implementeren?
27. Welke **middelen** heeft u momenteel ter beschikking om [X] te gaan gebruiken?
    - Heeft u voldoende **kennis/informatie** over het nemen van deze maatregel? Of mist u bepaalde informatie en kennis?
    - Heeft u voldoende **vaardigheden** om [X] te gebruiken?
    - Heeft u voldoende **tijd** om [X] te gebruiken?
    - En de **fysieke gesteldheid**?
28. Hoe ervaart u de **beschikbaarheid van middelen of ondersteuningssystemen om te helpen bij de implementatie** van maatregelen ter bescherming van schapen?
    - Is er **gekwalificeerde technische ondersteuning** beschikbaar?
    - Stel dat u wolfwerende maatregelen wilt nemen, is er **geld** beschikbaar om ze te betalen? Denkt u dat de subsidie gelden voldoende zijn om alle kosten te dekken? Waarom wel/niet?

Intentie om maatregelen te gaan of te blijven gebruiken

29. Bent u van plan om in de **toekomst schapen te blijven houden**? Waarom (niet)?
30. Bent u van plan om (andere) maatregelen te **blijven/gaan** gebruiken? Kunt u redenen geven voor deze beslissing?
    a. Zo ja, hoe zelfverzekerd ben je dat je het kan volhouden?
    b. Zo niet, zou het mogelijk voor je blijven om schapen te houden wanneer preventieve maatregelen een noodzaak worden, bijv. omdat ze een **voorwaarde zijn om in aanmerking te komen voor compensatie** of door veelvuldige wolvenaanvallen?

Algemene vragen

31. Hoe ziet u de **rol van beschermende maatregelen in het naast elkaar bestaan van schapenhouderij en natuurbehoud** op de Veluwe?

32. Is er **nog iets dat u wilt delen** met betrekking tot uw perspectief op wolfwerende maatregelen en het houden van schapen in deze regio?
Tot slot 33. Bedankt voor uw deelname aan dit interview. **Heeft u nog iets toe te voegen of heeft u vragen** voor mij?

D. Information and consent form used in interviews (Dutch)

This form was sent by email or WhatsApp to participants before the interviews took place. They were asked to read it through carefully before the interview. During the interview meeting, I asked if they had read it and understood everything, and asked them to sign it. After signing the informed consent form and giving permission for recording, I proceeded with the questions (Appendix C).

Informatie- en toestemmingsformulier voor interviews

Titel onderzoekstudie

"Het gebruik van beschermende maatregelen tegen wolvenaanvallen onder schapenhouders op de Veluwe"

Naam onderzoeker

Julia Noorlander, student aan de Wageningen University, Master Forest and Nature Conservation – specialisatie Policy & Society

Naam supervisor

dr. Sabrina Dressel, Wageningen University & Research, Forest and Nature Conservation Policy Group

U wordt gevraagd om deel te nemen aan een interview vanwege **uw kennis van en ervaring met het houden van schapen dichtbij wolvengebied op de Veluwe**. Het kan afgerond worden in **30 minuten**, maar als u tijd heeft mag het ook langer duren. Lees u alstublieft dit formulier door voordat u ondertekent en stel eventuele vragen.

Beschrijving van de studie

U bent gevraagd om deel te nemen aan een onderzoek dat plaatsvindt van februari tot juli 2024. Het wordt uitgevoerd door Julia Noorlander als afstudeeropdracht. Het gaat over het gebruik van beschermende maatregelen tegen wolvenaanvallen op de Veluwe. De Veluwe is een belangrijk leefgebied van de wolf en de populatie is sterk gegroeid in de afgelopen jaren. Daarmee zijn ook de aanvallen van wolven op schapen en ander vee in aantal gegroeid, over de hele Veluwe verspreid. Dit raakt mij, maar ook de toenemende spanning tussen groepen mensen, en daarom heb ik gekozen voor dit onderwerp. Met dit onderzoek hoop ik meer begrip te creëren voor de uitdagingen en perspectieven van verschillende soorten schapenhouders.

Natuurorganisaties en beleidsmakers moedigen schapenhouders aan om preventieve maatregelen te nemen om wolvenaanvallen te voorkomen. Toch blijft het gebruik ervan laag. Mensen verschillen van persoon tot persoon in hoeverre ze maatregelen willen en kunnen nemen. Sommige mensen willen het liefst dat er geen of minder wolven zijn op de Veluwe. Anderen plaatsen bijvoorbeeld flex-netten of zetten dieren vaker op stal. Ik wil graag beter begrijpen welke factoren deze verschillende

strategieën verklaren. Het ligt voor de hand dat afstand tot leefgebied van wolven, eerdere ervaringen met wolvenaanvallen en de mening van anderen meespelen. Ik ben daarom benieuwd naar uw ervaringen met en echte meningen over beschermende maatregelen tegen wolven op de Veluwe.

Risico's en voordelen van deelname aan het onderzoek
Dit onderzoek brengt weinig risico voor u met zich mee. U kunt op elk moment stoppen met deelname en het beantwoorden van de vragen. Er zijn voor u geen directe voordelen verbonden aan deelname aan het onderzoek. Jouw inbreng zal belangrijk zijn voor het vergroten van inzicht in de verschillende houdingen die mensen hebben ten opzichte van de beschermende maatregelen tegen wolven aanvallen op de Veluwe. Uw inbreng is belangrijk voor gesprekken omtrent hoe het huidige beleid verbetert zou kunnen worden, in het voordeel van schapenhouders. De informatie uit dit project wordt gedeeld met de deelnemers. De ervaringen van 15 schapenhouders (hobbymatig, bedrijfsmatig, en natuurbegrazing) zal ik bundelen in een verslag dat ook met u gedeeld zal worden via een e-mail.

Vertrouwelijkheid
• De gegevens uit dit onderzoek worden gebruikt in het eindverslag van Julia Noorlander, dat wordt opgeslagen in een database met alle eindverslagen van Masterstudenten van Wageningen Universiteit (link: https://library.wur.nl/WebQuery/theses). U wordt niet persoonlijk geïdentificeerd. Namen worden niet gebruikt, en ook aantal schapen en locatie wordt niet genoemd in het verslag, zodat persoonlijke identificatie niet mogelijk is.
• Ik zal de interviews niet op video opnemen. Ik zal geen foto's maken zonder toestemming. Voor gebruik van foto's wordt ook eerst uw toestemming gevraagd. Ik zal de interviews als u dat goed vindt opnemen met een audio-recorder zodat ik makkelijk aantekeningen kan maken naderhand. Deze opname zal niet worden gedeeld met anderen en na aantekeningen maken daarna direct worden verwijderd.

Vrijwillig karakter van de studie
Ik dank u hartelijk voor uw deelname. Uw beslissing om deel te nemen is geheel vrijwillig. U kunt er op elk moment voor kiezen om niet aan het onderzoek deel te nemen of uw deelname stop te zetten, zonder enige boete voor u.

Recht op verwijdering
Ik begrijp dat ik het recht heb om de bovengenoemde informatie op mijn verzoek te laten vernietigen, zowel tijdens het onderzoek als tijdens de opslag, in overeenstemming met het recht op verwijdering van de AVG.

Contacten en vragen
Als u vragen of opmerkingen heeft, kunt u contact opnemen met Julia Noorlander (tel. +31 6 1165 1229, mail: julia.noorlander@wur.nl). Heeft u aanvullende vragen over uw rechten als onderzoek deelnemer, neem dan contact op met de Commissie Wetenschappelijke Integriteit Wageningen Universiteit en Wetenschappelijk Onderzoek via cwi@wur.nl.

_____ Ja, ik wil graag meedoen aan het onderzoek.

_____ Nee, ik wil niet meedoen aan het onderzoek

Gelieve uw naam af te drukken:

_____

Datum:

_____

Handtekening:

_____

Opnametoestemming

Er is mij verteld dat er audio-opnamen en foto's kunnen worden gemaakt tijdens mijn deelname, maar dat deze opnames in geen enkel formaat mogen worden gepubliceerd. Ik heb vernomen dat ik op elk moment kan vragen de opname uit te zetten.

Ik ga ermee akkoord dat audio wordt opgenomen en er foto's gemaakt kunnen worden tijdens mijn deelname onder de bovengenoemde voorwaarden.

☐ Ja
☐ Nee

_____
HANDTEKENING

In te vullen door de onderzoeker die toestemming registreert:

Datum: _____

Handtekening: _____

E. Tangible contributions of the study to society

Contacting supplier of wolf-deterring fences to update information on subsidies on their website

“De subsidieregeling voor wolfwerende hekken in Gelderland is verbreed. Sinds 11 april 2024 kunnen álle Gelderse houders van weidedieren een subsidie aanvragen bij provincie Gelderland voor wolfwerende rasters. Naast uitbreiding van de diersoorten, breidt de provincie ook het gebied uit. De subsidieregeling geldt voor heel Gelderland.

Voer dit alstublieft door op de website, zodat dierhouders hier niet door in de war raken. Dit zal de verkoop vergroten. #Win-win!

https://www.gelderland.nl/nieuws/nieuwe-subsidie-wolvenrasters-voor-meer-dieren-en-heel-gelderland

https://www.gallagher.eu/nl_nl/advies-inspiratie/elektrische-afrastering/afrastering-voor-wild-en-ongedierte/wolven/wolf-subsidie

Contributing to a blogpost about four student theses about the wolf for the FNP website

“The Latin phrase "Auribus teneo lupum," meaning "holding a wolf by its ears," aptly describes the predicament of sheep keepers on the Veluwe. They face significant challenges, whether they implement protective measures against wolves or not. Sheep keepers I interviewed (n=15) acknowledged that wolves belong in natural areas with abundant prey, such as deer and boar, and that protective measures can in theory reduce wolf attacks on sheep. However, the implementation of these measures is fraught with difficulties and actual or perceived negative outcomes: electric fences require constant monitoring and maintenance, which is labor-intensive, and participants worried about potentially disruptive effects on the migration of other wildlife like deer, foxes, and badgers. Guarding dogs require daily care and can get into conflict with rural inhabitants and visitors. Keeping sheep indoors is not only expensive (due to extra fodder, straw, and labor), it can harm their welfare and reduce their vital role in managing grassland, cultural landscapes, dykes and heather ecosystems. My results include many more examples of challenges.

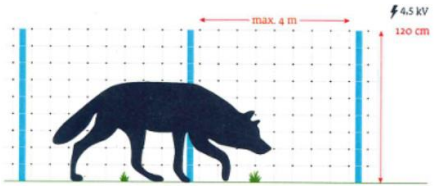
Contrary to misconceptions, sheep keepers on the Veluwe are not opposed to protective measures. They feel a deep responsibility for their sheep and are driven by a passion for animal care rather than profit. However, the difficulty of implementing these measures and the expected increase of wolf populations in rural areas on the Veluwe, makes their situation particularly challenging. To ensure the co-existence of sheep keeping and nature conservation on the Veluwe, several steps should be taken. My results call for innovative solutions and collaborative efforts. By providing financial support, developing practical protection measures, and fostering cooperation, we can create a sustainable environment where both livestock and wildlife thrive. My results therefore call for innovation of livestock protection measures and a more equitable division of costs by increasing support to animal keepers in their efforts to protect their animals. The intention to use livestock protection measures might increase if they were more practical and feasible in implementation, remained effective in reducing attacks on the long term, and minimized negative side-effects on animal welfare and other wildlife.”

F. Timeline of research project

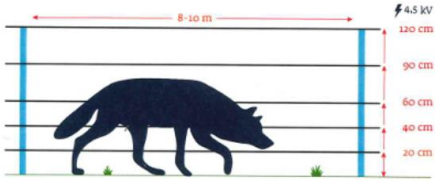
The timeline of this research project is presented below as a chart, with horizontal time bars for all main research project activities. Total time spent on project: 5 months.

Main activities	Start	End	**Week** (week 1 starts Monday 1 Feb., 2024)																					
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Writing the proposal	05.02.24	18.02.24																						
Doing literature research	19.02.24	03.03.24																						
Preparing and taking interviews	04.03.24	31.03.24																						
Processing empirical data	01.04.24	21.04.24																						
Writing the theory chapters	22.04.24	12.05.24																						
Writing the empirical chapters	13.05.24	26.05.24																						
Finalize draft version	27.05.24	16.06.24																						
Finalize final version	17.06.24	30.06.24																						
Present and oral examination	01.07.24	10.07.24																						

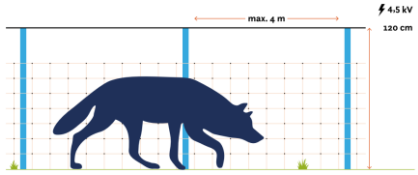
G. Illustrations of different livestock protection measures



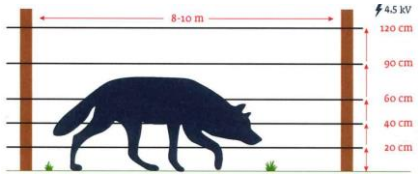
Movable fence (1): netting (120 cm high, poles every 4 meters, 4,5 kV, high power voltage device)



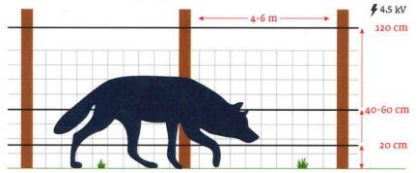
Movable fence (2): wires (120 cm high, poles every 8-10 meters; 4,5 kV, high power voltage device)



Movable fence (3): netting with wire on top (120 cm high, poles every 4 meters, 4,5 kV, high power voltage device)



Permanent fence (1): Wires (120 cm high, poles every 8-10 meters, 4,5 kV, high power voltage device)



Permanent fence (2): netting + wires (120 cm high, poles every 4-6 meters, 4,5 kV, high power voltage device, max. 20 cm holes in netting)

Keeping sheep inside (1) permanently, or (2) only at night and bringing them to pasture outside during the day

Livestock guarding animals: dogs or donkeys

Figure 4: Illustrations of different livestock protection measures. Sources: Gallagher, (n.d.) Gebiedscommissie Gelderland (2020), Shutterstock (n.d.) Wolf Fencing, (n.d.).

H. E-mail sent to network of sheep keepers

Message to members of a Dutch sheep breeding organization (Dutch and shortened version)

Beste lezer,

Ik ben Julia, en voor mijn afstuderen schrijf ik een verslag over de uitdagingen van schaaphouders dichtbij het wolvengebied op de Veluwe. Houdt u schapen dichtbij het wolvengebied op de Veluwe? Dan praat ik graag met u over uw ervaring met en eerlijke mening over het nemen van bepaalde maatregelen. Wilt u uw visie op het nemen van maatregelen met mij delen in een gesprek van ongeveer een halfuur? Dit kan telefonisch wanneer het u uitkomt, maar ik kan ook langskomen (in maart of april).

Achtergrond en doel van het onderzoek: Er is in de media en politiek weinig aandacht voor alles wat komt kijken bij het nemen van "preventieve maatregelen".. Er is meer erkenning nodig voor de ervaringen en perspectieven van schapenhouders over de verschillende preventieve maatregelen (hek, draden, bewakingshonden, etc.). Ik heb 20 vragen voorbereid, maar u hoeft deze natuurlijk niet allemaal te beantwoorden. Uw antwoorden worden geanonimiseerd, u bent dus op geen enkele manier persoonlijk identificeerbaar. De resultaten worden gebundeld in een rapport en eventueel een kort krantenartikel. Zo komt er meer aandacht voor de uitdagingen waarmee schapenhouders in wolvengebied momenteel worden geconfronteerd.

Bedankt alvast, en vriendelijke groeten, Julia Noorlander. Voor vragen, neemt contact met mij op via: Julia@noorlander.nl / 06 1165 1229.