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Operationalizing payments for ecosystem services for pastoralists in rangeland settings

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Science for Better Livelihoods in Dry Areas

CGIAR is a global partnership that unites organizations engaged in research for a food-secure future. The CGIAR Research Program on Livestock provides research-based solutions to help smallholder farmers, pastoralists and agro-pastoralists transition to sustainable, resilient livelihoods and to productive enterprises that will help feed future generations. It aims to increase the productivity and profitability of livestock agri-food systems in sustainable ways, making meat, milk and eggs more available and affordable across the developing world. The Program brings together five core partners: the International Livestock Research Institute (ILRI) with a mandate on livestock; the International Center for Tropical Agriculture (CIAT), which works on forages; the International Center for Research in the Dry Areas (ICARDA), which works on small ruminants and dryland systems; the Swedish University of Agricultural Sciences (SLU) with expertise particularly in animal health and genetics and the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) which connects research into development and innovation and scaling processes

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Abstract

Payments for ecosystem services (PES) schemes are gaining popularity as an environmental and development policy tool. Spurred by environmental motives, different financial and non-financial incentive schemes are designed to create positive social and environmental impact. Although the experience of PES implementation is relatively significant in the agricultural, forestry and to a certain degree marine sector, the application of PES for pastoralists in rangeland settings is limited. Furthermore, there is very little focus in the existing literature on the challenges of *operationalizing* PES for pastoralists.

This study aims to jump from the theory of PES implementation to practice by examining the trade-offs, barriers and opportunities that can be expected when operationalizing PES schemes for pastoralists in rangeland settings.

The study follows a framework that encompasses the complexities of pastoral systems—the political, legal, institutional, social, environmental and financial aspects that determine PES scheme design—and allows a critical examination of these factors.

While PES schemes may offer an opportunity to bridge pastoral livelihood systems with sustainable rangeland ecosystem service provision, the variability of its impact as an effective tool calls for scrupulous context-specific assessments. An outcome of this study has been a preliminary *scoping protocol*, designed to guide practitioners to comprehensively unearth and evaluate the risks and opportunities of operationalizing PES schemes in different pastoral contexts. This study is particularly interesting for practitioners as it views PES implementation from a practical angle and offers resources, case-study examples, tools and complementary solutions to help overcome some of the PES implementation challenges.

Executive summary

The CGIAR Research Program on Livestock, led by the International Livestock Research Institute (ILRI) in partnership with the International Center for Agricultural Research in the Dry Areas (ICARDA) provides research-based solutions to help smallholder farmers, pastoralists and agro-pastoralists transition to sustainable, resilient livelihoods. Within the research program, its flagship program on Livestock and Environment seeks to foster an enabling environment for the environmental management of livestock production systems. This includes supporting the development of viable payments for ecosystem services (PES) in livestock systems.

The study seeks to focus on the practicalities of operationalizing PES in pastoralist and agro-pastoralist rangeland production systems in developing countries. The emphasis is on what aspects must be assessed and what practical steps might be needed to move PES systems from theoretical proposals to effective functioning systems. Two key outputs of this study are this report and a preliminary scoping protocol—a guided assessment of the risks and opportunities of PES operationalization in developing country rangeland settings.

The following framework is used to guide the structure of this report. **Policy and regulation, legal frameworks, customary natural resource governance and land tenure regimes, governance and institutions and the knowledge base** have been identified as the most important determining factors for operationalizing PES in rangeland settings. These factors influence the **PES structure (buyers, sellers, intermediaries and knowledge providers),** which in turn affect the three dimensions used to evaluate PES effectiveness **(environmental, cost and social effectiveness).** Determining aspects such as the **monitoring and evaluation** plan, **cost** assessments, **cultural** factors or **equity** concerns are also assessed. To integrate opportunities and overcome challenges through innovation, **complementary solutions** to PES are explored in the final discussion section. A summary of key messages is reported at the end of each section, illustrative case study examples are summarized in boxes throughout and useful resources and reading materials are reported at the end of the study.

A major conclusion is that given the multiple challenges inherent to pastoral contexts, it is unlikely that market-based PES schemes alone will change behaviour or maintain practices that produce favourable rangeland ecosystem outcomes. The key question is: **What is the role of incentives in changing or maintaining sustainable rangeland management behaviour?**

The following key findings suggest that multiple factors need to be considered to help answer the above question:

- When discussing about the future of PES, Ferraro (2011) warns that the use of **PES is unwarranted unless further evidence can show the link between incentives and ecosystem service provision** (Ferraro 2011). The analysis of the practicalities of PES implementation conducted for this report, supported by the little (but increasing) empirical evidence, extensive literature review and Tunisia's case-study confirm Ferraro's alarming observations.
- **Assessing PES implementation in pastoral contexts requires a holistic approach with a strong political-ecology dimension.** For example, the major challenges identified for PES implementation in pastoral systems are: the lack of legal recognition of pastoral rights, the historical marginalization of pastoralists, transparency and access

to information for pastoralists, political instability and conflict. In such cases **PES for pastoralists is likely to be seen as a secondary priority** in the development agenda (compared to agriculture and forestry for example), therefore securing financing becomes more challenging.

- **Domestic policy and regulation alone may not provide the necessary supporting structure to design effective nation-wide PES schemes.** These tend to be notoriously weak for pastoral-related issues. The importance of **using small-scaled local PES schemes to showcase impact** should, therefore, not be underestimated as they **can trigger the development of PES relevant policies and laws at the national/ regional level.**

- **Weaving-in PES schemes with customary laws is likely to get more traction at local level.** The challenge is to reconcile PES implementation with customary systems, ensuring the intrinsic governance flexibility that rangeland management requires is maintained.

- With private or state defined property regimes, the implementation of PES schemes for pastoral and rangeland management may not be challenging. However, **innovative approaches that recognize collective land-tenure governance practices, non-property (open access) and mobility** become imperative if solutions seek to honour the informal and flexible nature of pastoral land governance practices. In particular PES solutions for pastoralists operating in open-access regimes must still be piloted more thoroughly.

- The potential for divergence in understanding between herders, landowners, the scientific community and policymakers challenges the design of effective incentive schemes. **The absence of robust knowledge** and the highly context specific and variable nature of biophysical interactions in rangelands **could in fact be seen as an opportunity as it compels engagement between different knowledge systems.**

- Monitoring and evaluation of rangelands in developing countries is challenging because the relative **cost of collecting data** may be prohibitive due to the isolation of pastoral areas. **Further research is required in assessing the practicalities of socio-ecologic monitoring tools for rangelands.**

- **Modalities of payments are important factors affecting the take-up of PES schemes for pastoralists.** The various characteristics of payment contracts to consider include: duration of the contract, requirements and punishments if not fulfilled, cost of participating, compensation in cash and/or in-kind payments and whether payments should be made individually or collectively.

- **Participatory processes and "human-centred" PES design may not be enough to ensure a sustainable rangeland and livestock management behaviour. External factors** such as livestock markets and the cultural values attached to the commodification of livestock must be taken into consideration.

- **At present, the beneficiaries of payments derived from most PES schemes are landowners** who can enter into contractual agreements with institutions making the payments. In this respect, **PES schemes are often inappropriate mechanisms for the landless—a reality for many pastoralists in the developing world.**

- **In some pastoral societies women are beginning to play a greater role,** partly by default as men look for work elsewhere or as young people abandon herding livelihoods. **There is scope for further research in gender considerations in PES implementation.**

- **Identifying and legitimizing the sellers of ecosystem services** and, therefore, recipients of PES incentives, **is particularly challenging in pastoralist communities.** Three sources of identified challenges are: heterogeneity of relationships, dichotomization of herd management and ownership and informal governance systems.

- Major critiques of PES as a tool for pastoral systems highlight the need to treat the root cause of unsustainable rangeland management and not the symptoms, paying particular attention to concepts of permanence and perverse incentives, considering whether the objective is to restore or maintain baseline rangeland health and using alternative analytical frameworks to develop and design PES schemes.

- One of the main recommendations offered is that, if long term sustainability and permanence are core objectives, **PES schemes should be viewed as an initial stimulation for process change, which should then lead to ecosystem provision without the need of incentives.** Creative pathways can be used to direct such process

changes and overcome some of the challenges highlighted. Examples of **complementary solutions** discussed in the study include: the use of non-financial incentives, designing landscape-based and community-wide PES schemes, linking PES schemes with extractive industries (through biodiversity offset programs), to community-based natural resource management practices (grazing reserves, fodder banks), indigenous breed conservation (biocultural community protocols and niche markets) or nature conservation programs.

Acknowledgements and disclaimer

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1. Introduction

As will be evident throughout the report, systems of payments for ecosystem services (PES) alone cannot be a solution for sustainable rangeland management. Experience from other PES and PES-like projects and indeed this report's case-example country Tunisia, reveal that an extremely critical and creative approach is needed when planning PES programs. The aim of this report is to understand what factors need to be taken into consideration prior to operationalizing PES for pastoralists in rangeland settings. It serves as background to a scoping protocol developed by the CGIAR Research Program on Livestock[1], which is designed to provide a practical guide when scoping for opportunities for operationalizing PES in different pastoral contexts.

There are three dimensions which must be assessed when evaluating the opportunities and challenges of operationalizing incentive schemes in general and PES for pastoralists in particular. These are environmental, cost and social effectiveness.

To be environmentally effective a project must deliver the desired level of environmental services. This is perhaps the hardest of the three objectives to obtain, given the complexity in monitoring and evaluation of environmental variables and establishing biophysical links between rangeland management practices and ecosystem service outputs.

To be cost-effective, a policy must achieve the desired environmental outcome at a lower cost than other possible policies. The costs of a PES scheme include the transactions costs (negotiating contracts, scientific baseline studies and monitoring and enforcement of the program) and the costs of forgone alternative productive uses of the resource. It is important to note the distinction between cost effectiveness and economic efficiency or financial sustainability. The criterion of cost effectiveness takes as given a particular ecosystem service goal and looks at how cheaply the PES scheme reaches the goal. Financial sustainability, on the other hand, compares benefits to costs and assesses the long-term effectiveness of the policy (net benefits).

Social effectiveness takes into consideration the impact of a PES policy on equity. Equity attributes include access, distribution and participation. This means looking at local perceptions on equity, the relationships between different groups (youth, gender, landless and the poor) and how distribution of wealth will affect these dynamics.

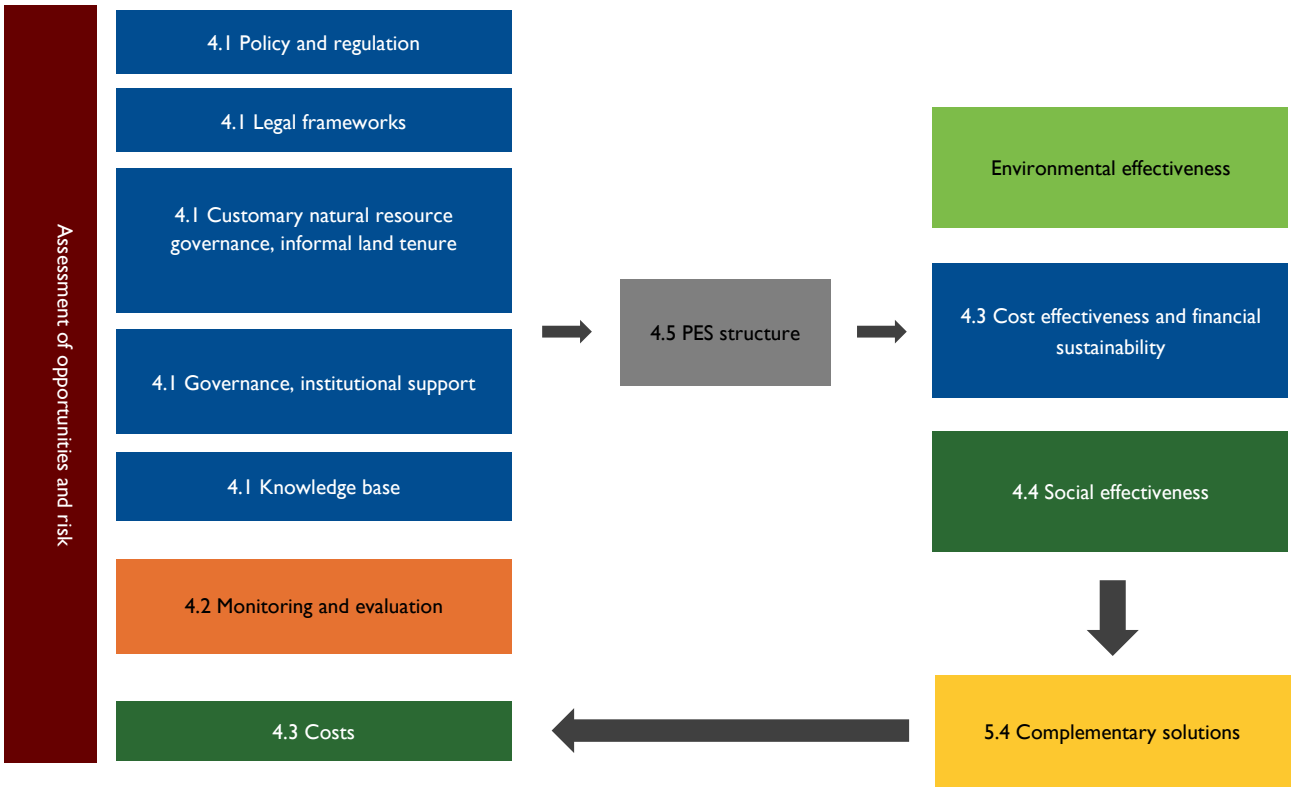
This report aims to explore various aspects of these objectives, with an understanding that it is likely that trade-offs will occur, and with the intention of contributing to new approaches for PES implementation and the search for innovative solutions that maximize opportunities and minimize risks in specific pastoral/rangeland contexts—or, in other words, solutions that increase *additionality* through changes in program design.

The following diagram depicts the framework used to develop the report. On the left hand-side are the cross-sectional factors which are particularly important for an assessment of opportunities and risks of establishing PES in pastoral rangeland contexts. These factors will influence the PES-structure, which in turn affect the three key dimensions (environmental, cost and social effectiveness) which are discussed throughout the report and explore

1. Pappagallo, L. et al. 2017. Scoping protocol for operationalizing payment for ecosystem services for pastoralist rangelands. Nairobi, Kenya: CGIAR Research Program on Livestock. URL. See 'summary of protocol' in the discussion section.

further in the protocol. One way to integrate opportunities and overcome challenges that arise from the context is to innovate. This means finding complementary solutions to PES, which are also discussed at the end of the report.

Figure 1: Schematic representation of framework and themes discussed in the study. Numbering refers to sections in this report



2. Methods

The methods employed in this study include the integration of findings from i) a review of 100 plus scientific and grey literature, including project and program documents that reflect global PES-related activities; ii) an examination of different case-studies which are used throughout the report to exemplify real-life and practical issues for the different topics; iii) the design of a *protocol*, whose aim is to guide facilitators in the scoping process for operationalizing PES for pastoralists in different contexts; iv) the partial application of the protocol in Tunisia as a case-study country. This included desk-research augmented by seven key informant interviews in partnership with ICARDA.

3. Background

Payments for ecosystem service (PES) schemes are gaining popularity in the development field as a new framework where incentives are used to create positive social and environmental impact spurred by ecosystem motives.

In a widely cited definition, PES are: '(1) a **voluntary** transaction in which (2) a **well-defined environmental service** (or land use likely to generate that service) (3) is "bought" by a (minimum of one) **buyer** (4) from a (minimum of one) **provider** (5) if and only if the provider continuously secures the provision of the service (conditionality)' (Wunder 2005). Further concepts incorporated in PES schemes are: **additionality,** the measure of behavioural and ecological outcomes in relation to *what would have occurred in the absence of incentives* and **permanence,** ecosystem functions from incentives are provided over extended timeframes.

As will be evident in this report, in practice, very few PES schemes conform to this narrow definition and vary widely in terms of scope and structure, to the point that in some cases it might be debatable whether they should be even called PES, but are instead just another form of conditional subsidies (Silvestri et al. 2012).

It is important to note that perhaps "compensation" rather than "payment" would be more appropriate term to reflect the idea that a non-monetary incentive could be used. Throughout this report, the phrase "payment for ecosystem services" is used to refer to both payment and non-monetary compensation initiatives.

Furthermore, the report looks at operationalizing PES for pastoralists in grazing lands, defined as lands used for animal production such as natural or semi-natural grasslands, open woodlands, improved or planted pastures (WOCAT 2018). Therefore, grazing lands can include rangelands, croplands and forestlands, each with varying livestock-keeping systems and can include pastoralism, agro-pastoralism and mixed crop-livestock systems. In this report both terms "rangelands" and "grazing lands" are used interchangeably even though the subtle difference in definition is key. The reason for this fluidity in terminology-use is because much of the existing literature and policy examples reported focus on rangelands, while operationalizing PES for pastoralists should target grazing lands more generally to include other land-types which are key for pastoralists. The report uses the term "pastoralists" to broadly include the entire spectrum of pastoralist practices from mobile pastoralism to mixed pastoral systems.

Unlike the agriculture, forestry and to a certain degree marine sector, PES has not been widely implemented in rangelands. For example, the review only found three reports Silvestri et al. (2012), ADB (2014) and Wilkes, Solymosi and Tennigkeit (2012) (summarized in Annexe 1) that look at PES implementation for pastoralism and rangelands. These, however, focus on existing PES literature in other sectors and, some case examples, with little attention paid to the challenges of *operationalizing* PES for pastoralists.

3.1 Why do we need to look into PES systems as a solution for rangelands and pastoralists?

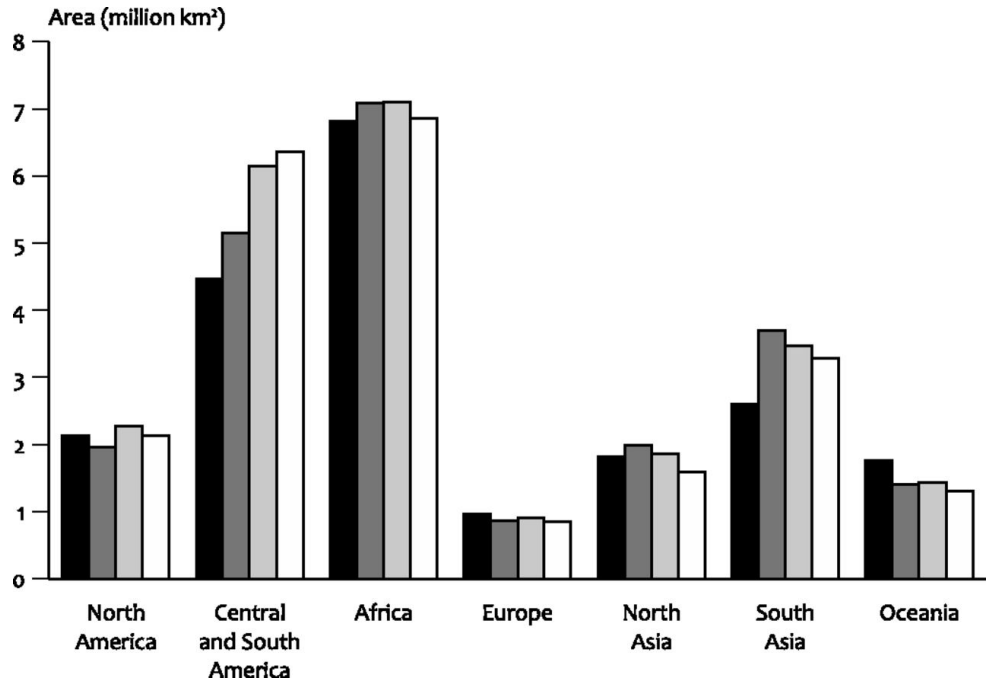
The importance of global grazing lands

More than half of the world's land surface is grazed and just under one third (31%) is grassland (including grasslands, shrublands and savannah) (Follett and Reed 2010). These include dry-season grazing areas, pastures reserved for times of drought, dryland forests and seasonal rivers. Grazing lands represent a huge stock of carbon, not because of the concentration of carbon, which is relatively low per unit area, but because of the vast area they occupy. Most of this carbon stock is held in the soil and can be influenced by environmental factors and management. It is argued that there is, therefore, scope for grazing lands to sequester carbon from the atmosphere (Gerber et al. 2013). It has been estimated that grazing lands account for a quarter of potential carbon sequestration in world soils (Follett and Reed 2010) and provide key ecosystem services such as the provision of fodder, water and nutrient cycling. Despite this, grazing lands are relatively neglected in climate mitigation strategies.

Grazing lands, form important 'lifelines' for local communities and are often managed under systems of multiple resource use. However, as the typical discourse reveals across different contexts, changing policies (affecting access to resources), continuing biodiversity loss, population growth, accelerating climate change, exposure to pest and disease outbreaks, has impacted traditional pastoral resource management practices, resulting in the mismanagement of critical ecosystem services (FAO 2009; Jenet et al. 2016).

The degradation of global grazing areas, or their conversion into other uses, affects the "lifelines" of marginalized pastoralists, which are estimated to be around 200 million globally[2]. The area of rangeland under livestock grazing has expanded in the past and, according to Alkemade et al. (2013), will continue to increase, albeit at a moderate pace, in some regions of the world, especially in Central and South America. In the rest of the world, the area of land under grazing management is expected to remain stable or even decrease (Figure 2).

Figure 2: Extent of grazed rangeland in each world region according to the high-AKST scenario in 1970 (solid bars), 2000 (bars with light shading), 2030 (bars with dark shading) and 2050 (open bars) (Alkemade et al. 2013)



2. Estimates on the number of pastoralists globally and the extent of rangelands are highly variable. See Jenet et al. (2016) for a more detailed analysis on numbers.

The scale of socio-ecologic impact and, more importantly, the marginality and vulnerability of those being impacted, explains why healthy grazing lands are vital globally.

Pastoralism as a central livelihood system in drylands and marginal economies

Just as grazing lands provide "lifelines" for pastoralists, pastoralists also play an important role in the flow of ecosystem goods and services in grazing areas.

The following points highlight the main reasons why pastoral livelihood systems are central in certain contexts:

1. Sustainable rangeland management practices such as the seasonal movements to optimize the use of scarce vegetation, limiting the duration of grazing to short periods and certain times of the year and allowing vegetation to regrow, prevents overgrazing. Furthermore, adequate livestock grazing influences the fertility, distribution and diversity of plants. The vegetation maintained through grazing activities in turn captures carbon, reduces erosion, maintains soils, facilitates water holding capacity and provides habitat for wildlife (Convention on Biological Diversity 2010)

2. Pastoralists contribute considerably to food security in marginal areas and arid regions because, in principle, pastoralism is a means of extracting value from uncultivable land and generating food without competing for cereals (Hoffman 2010).

3. Pastoralism contributes significantly to the gross domestic product (GDP) of many developing country economies: for example, approximately 8.5% in Uganda, 9% in Ethiopia and 10% in Mali. In Central Asian countries, these numbers are higher on average, where pastoralism represents about 20% of GDP, like in Kyrgyzstan (Rodriguez 2008). In Mongolia, pastoral livestock are responsible for around one third of GDP and are the second largest source of export earnings (32%) (UNDP 2003).

4. In Morocco, contribution of rangelands to *agricultural* GDP has been estimated at 25%, while in Kazakhstan, the livestock sector, which is predominantly found in the drylands, provides 42% of agricultural GDP (Hatfield and Davies 2006).

This report uses the term "pastoralists" to include a range of pastoral[3] systems with varying degrees of mobility, market-engagement and scale. These systems may be typified by different flexibilities in grazing management practices, adoption of mixed farming systems which may or may not be sedentary (agro-pastoralists, silvo-pastoralists) and objectives (self-sufficiency, or profit maximization). While there are herding communities found in high income countries, the focus is on pastoralists in developing countries.

3.2 From theory to practice

The main distinction between PES and other forms of incentives is that PES schemes are *conditional upon ecosystem service delivery*, or particular land uses that are likely to deliver ecosystem services.

In principle PES involves incentives to those who manage an ecosystem in proportion to the approximate value of the ecosystem services generated. Very few PES schemes reflect this conceptualization in practice and often diverge from its market-based understanding. For example, the "suppliers" of environmental services are often not free-market actors and many PES schemes are not "voluntary" as they have, in fact, been imposed through legislation and other forms of government or community action (Vatn 2010). Many schemes are not "conditional upon ecosystem service delivery" because they are based on assumptions about unclear relationships between management practices and environmental service outputs (Smith et al. 2013). Furthermore, increasingly stakeholders expect PES schemes to support poverty alleviation, rather than just environmental objectives (Wunder 2008).

3. The definition of pastoralism most commonly used in the development literature is that of Swift (1988), which reads in its essentials: 'pastoral production systems are those in which 50% of gross household revenue (i.e. the total value of marketed production plus the estimated value of subsistence production consumed within the household) comes from livestock or livestock-related activities'.

This has led to alternative conceptualizations of PES schemes[4]. Given that using PES schemes to target pastoralists and rangelands is a relatively new concept, with very few practical examples to date, there is plenty of space for innovation. It is debatable whether these innovations (see complementary solutions sections) could be called PES schemes in the strictest sense. However, I also argue that in practice, a strictly market-based PES scheme cannot sufficiently assimilate complex rangeland and pastoral dynamics.

The jump from theory to practice comes with an understanding of the trade-offs and opportunities in operationalizing PES schemes, which is the focus of this report.

For example, how can PES schemes be designed when land tenure regimes are based on tacit understandings rather than a codified law? How can mobile pastoralists be targeted? What checks and balances can be used to ensure that pastoral practices are in fact providing a measurable ecosystem impact? Are monetary or non-monetary incentives more effective at changing behaviour in a particular cultural context? Should livestock owners or herders be targeted to ensure maximum ecosystem service output goals are reached?

Throughout this report I attempt to address these and other necessary questions when thinking of operationalizing PES schemes for pastoral livelihood systems.

4. See: Muradian, R., Corbera, E., Pascual, U., Kosoy, N. and May P.H. 2010. Reconciling theory and practice: An alternative conceptual framework for understanding payments for environmental services.

4. Operationalizing PES in (agro) pastoralist systems

This is the main section of the report and it provides an overview of key features that need to be considered for the operationalization of PES schemes in (agro) pastoralist systems.

An assessment of opportunities and risk looks at **policy and regulation, legal frameworks, customary natural resource governance and land tenure regimes, governance and institutions and the knowledge base** as the most important determining factors for operationalizing PES in rangeland settings.

Section 4.2 considers **monitoring and evaluation** of incentive schemes is an undervalued, but a key feature of effective PES implementation. This section discusses the various options and challenges related to monitoring and evaluation of PES schemes for pastoralists in rangeland settings.

The sustainability of PES schemes is very much influenced by the long-term availability of finances. Section 4.3 considers **costs** related to PES implementation such as transaction costs, and discusses options for ensuring financial sustainability of PES schemes and ways of assessing pricing and the mode of payment.

From the review I find that one of the key, but underestimated, features of successful PES schemes in pastoral societies is a deep understanding of **cultural** factors (which also affect governance, relationship building with different stakeholders and institutional barriers) and how these impact incentives and behaviour. Section 4.4 discusses "cultural" factors and assesses expected **equity** impacts of incentive schemes to the most marginal groups in pastoral societies (the poor, landless, youth and women).

Finally (Section 4.5) ends by exploring the **structure of PES** schemes, composed of buyers, sellers, intermediaries and knowledge providers, related to pastoral and rangeland settings.

4.1 Opportunities and risk assessment

This section identifies the key factors that hinder or enable the operationalization of PES schemes in pastoralist and agropastoralist systems to be policy and regulation, customary natural resource management and land tenure regimes, formal governance and institutional support and the knowledge-base. A more practical, step by step, guide to investigate these opportunities and risks is covered in the *protocol*.

Policy and regulation

Understanding how domestic policy and regulation impacts land tenure, agro-pastoral management practices and compensation/incentives schemes is crucial in designing PES schemes.

Generally legal and policy frameworks for environmental and resource management in developing countries are fragmented, outdated or lack cohesion. A study assessing existing PES deals in Kenya, Madagascar, Malawi, South Africa, Tanzania and Uganda has found that although the current legal and policy frameworks have not prevented piloting PES projects, it is likely that they will limit scale up (Ruhweza and Waage 2007). Factors limiting the scalability of PES schemes include: transparency and access to information; poor legal documentation of customary rights (conflicting information and bureaucratic chaos); accountability; and the rule of law (for example unclear access to legal remedies and enforceability of contracts) particularly if PES is not recognized at national level or understood at local level (The Katoomba Group 2011).

The opinion held widely across the literature, that pastoralists lack fundamental rights on accessing and managing resources and are marginalized, is unfortunately a widespread reality still today (Rugadya 2005). Given this reality, key challenges for implementing PES for pastoralists include the following:

- **A lack of legal recognition of pastoral rights:** According to *The path to greener pastures. Pastoralism, the backbone of the world's drylands* (Jenet et al. 2016), policies supporting pastoralism are more common in North and West Africa and West Asia, while East Africa and other parts of Asia tend to have few pro-pastoralist policies. The international PES experiences suggest however that it is the absence of *enforced* legal frameworks (Greiber 2009) for land use, biodiversity protection and pastoral organization that hampers effective PES implementation for rangeland management. Furthermore, it may not only be the lack or enforced legislation but also the intention of legislations which may challenge the impacts of PES schemes. For example, in Tunisia the current Forest Code, which covers rangeland-related legislation, explicitly limits local populations in accessing and managing natural resources, thus limiting community-based natural resource management and associated activities that incentivize sustainable natural resource management. In Costa Rica, although domestic policy and legislation may appear as supportive of PES schemes, national law forbade using public funds to pay landowners who lacked formal title. This emerged as an issue for Costa Rica's Pago por Servicios Ambientales (PSA) program, as not only it prevented many of the poor from participating, as they were more likely to lack titles than better-off farmers, but it also impeded the effective functioning of the program by restricting participation in several important areas (Pagiola 2002).
- Policies that limit the rights of pastoralists or that fail to recognize pastoral rights essentially equates to a devaluation of pastoral livelihood systems. As such with no supporting systems that recognize the importance of pastoral groups, incentive schemes that seek to "give value" to pastoral livelihood systems are eroded at the onset.
- Historical marginalization of pastoralists: A review of current pastoral-related news in countries such as Ghana[5], Burkina Faso[6], Namibia, Somalia[7] and Nigeria[8] reveals that although pastoralist issues are gaining traction in domestic policy; governance and legislation are usually geared towards improvements of livestock productivity and sedentarization of pastoralists to "limit conflict with the agricultural sector". In Nigeria, a planned implementation of the Open Grazing Prohibition and Ranches Establishment Law[9] for example would severely reduce pastoral grazing rights.

5. The Ghana cattle ranching project committee was recently set up in March 2017 by the Ministries of Food and Agriculture and National Security, tasked to "find a lasting solution to the perennial challenges of herdsmen-crop farmers' conflict". The project is "expected to develop well-tested strategies to improve domestic ranching in the country by harnessing the expertise of Fulani herdsmen". The idea of forming a committee on Fulani herdsmen feeds into government's Planting for Food and Jobs program. (see: http://allafrica.com/stories/201707310777.html and https://www.ghanaweb.com/GhanaHomePage/NewsArchive/Fulani-herdsmen-allies-not-enemies-Government-563273)

6. As part of the project "Voice for change", the Association for the Promotion of Livestock in the Sahel and Savannah (APESS) and the Platform of Actions to Secure Pastoral Households initiated a comparative study of the main laws that have a major impact on pastoral farming (see http://lefaso.net/spip.php?article78554)

7. In Somalia a cash-dispersal program run by Concern aims to prevent displacement, several water and livelihood diversification projects look to change pastoralists livelihood in drought affected areas: https://www.csmonitor.com/World/Africa/2017/0727/Amid-persistent-drought-a-nation-of-herders-plots-a-new-course

8. The Nigerian Incentives Based Risk Sharing System for Agricultural Lending (NIRSAL) trained herdsmen on modern feed finishing for cattle, herders were urged to "drop the practice of moving from one place to the other". The representative of The National Secretary of the Miyetti Allah Cattle Breeders Association of Nigeria (MACBAN) hopes that a national grazing bill would help curb conflict between herdsmen and farmers (see: https://www.dailytrust.com.ng/news/general/macban-seeks-national-grazing-bill/207680.html)

9. See: http://dailypost.ng/2017/08/08/fulani-herdsmen-drag-benue-state-government-court-anti-open-grazing-law/?ct=t(Weekly_news_review)

- In some areas, a generalized sense of neglect and frustration vis-à-vis an institutional environment historically geared to serve the interests of crop-farming and urban investors, can be easily exploited by particular groups for political or personal interest[10].
- Sentiments of animosity between pastoral groups and governments may create scepticism, particularly if PES schemes are associated with a governmental intervention. This is in fact quite common and can reduce the voluntary uptake of the PES program by pastoralist groups.
- **Transparency and access to information for pastoralists**: Unclear access to legal remedies limits the enforceability of contracts, particularly if neither PES nor pastoral livelihood systems are recognized at national level. This can be a disincentive for contracts to be forged between buyers and sellers. Furthermore, conflicting information and bureaucratic chaos increases the time, energy and costs associated with simple transactions. This can be a disincentive for uptake for both sellers and buyers and it is particularly relevant to pastoralists since they tend to live far away from bureaucratic centres.
- **Political instability and conflict:** Insecurity and localized conflict, in the drylands as elsewhere, are often interwoven with processes of redistribution of assets and competition over the same resources. Internal relations between pastoralists, governmental bodies and other stakeholders (farmers, urban dwellers) complicated by political instability and conflict can limit the long-term sustainability of a PES program. For example, contract negotiations become more complex and costly, PES policy becomes a secondary priority in the political agenda therefore securing financing and implementing projects becomes more challenging. All in all, the relative cost effectiveness of PES implementation may be compromised.

This highlights that there is a strong political-ecology dimension to pastoralism. The legacy of conflict requires a holistic vision in understanding how and whether PES schemes could be operationalized. Since the late 1990s, especially in Africa, it has become clear that the security situation in many pastoral areas is, in fact, deteriorating. Disputes over pastoral land rights can also be exploited by non-pastoralists to obtain support in regional or international conflicts. This linking of local conflicts involving pastoralists to wider political, ideological or commercial agendas is especially problematic in Central Asia (Pakistan and Afghanistan) and East Africa (Somalia, Sudan, Kenya and the Ethiopian-Somali borderlands) (USAID 2016). These political-ecology dimensions are likely to play an important role in the operationalization of PES schemes, particularly if incentives are monetary.

Domestic policy and regulation alone may, therefore, not provide the necessary structure to design effective PES schemes. In the likely case of lacking enforceable and "healthy" regulation; stakeholder dialogue should take priority in framing PES schemes for agro pastoralists. These PES schemes are likely to be smaller-scale and private rather that public or trading PES, which require increasing complexity of legal and institutional regimes (Greiber 2011). The relative importance of the legal framework depends on the nature of PES schemes. Private PES schemes, where both the buyers and sellers of environmental services are private entities such as private companies, individuals, or groups of individuals, do not necessarily require a specific legal framework beyond the basic law of contract. However, as Greiber notes "such private PES schemes that are developed without a specific PES vision and legal regime are usually limited to the local scale where they only address specific environmental problems or undertake individual, stand-alone activities. Thus, their objective is not to have an impact at a greater, national, regional or global level. Yet, they have the potential to contribute to the conservation or provision of ecosystem services at larger scale, if a nested approach is being applied which will connect the different local activities. Such a nested approach, again, requires an enabling framework comparable with public PES and trading schemes." (Greiber 2011, p. 209).

The effort placed on using stakeholder dialogue to fill in the gaps of missing "healthy", enforced regulation, offers a great opportunity for innovation. For example, contextual answers to how to incorporate informal and flexible land governance regimes in PES schemes can be found.

10. On insecurity and conflict in relation to pastoral systems and development see Nori et al. (2005).

The stakeholder dialogue process may not be sufficient in the case where PES schemes are to be scaled up or if they aim to include strong market-based concepts which may require a specific policy and legal framework[11]. In such cases where regulation becomes essential for the operationalization of PES schemes, capacity should be first built on the actualization of PES-relevant domestic policy and regulations. Legal intervention in PES can also provide certainty and clarity for PES participants, encouraging participation. It has been argued that in the absence of appropriate frameworks, market and policy failures are amplified and intensify environmental pressures. Efforts taken to integrate ecosystem services in national decision making can also be an indication of the receptivity of PES schemes; on the other hand, PES laws can increase bureaucracy and transaction costs. The Project for ecosystem services (see Box 1) is an example of a project looking at integrating such development frameworks into local governance.

Box 1: Examples of efforts that integrate ecosystem service provision in policymaking

The Project for ecosystem services—ProEcoServ, is a global project with pilots in Chile, Vietnam, Trinidad and Tobago, South Africa and Lesotho, seeks to integrate the sustainable use of biological resources and ecosystem services into national decision making and development approaches. The project is developing tools for policy development and implementation, enhancing the policy science interface level to increase the relevance of ecosystem services in policymaking and promoting innovative international mechanisms for non-carbon-based ecosystem services. The GEF has invested USD6.2 million and leveraged an additional USD14 million in co-financing for this project (GEF 2014).

Legal frameworks supporting pastoralists and rangeland management

Perhaps more than any other livelihood system, pastoralism faces most contention in land tenure and resource management. Furthermore, the different rangeland contexts within a country introduce additional legal complexities owing to both the spatial and temporal dynamism of ecological changes and, therefore, natural resource management, particularly in semi-arid systems (Dougill et al. 2012).

PES "should be understood as part of a broader process of local institutional transformation, rather than a market-based alternative for allegedly ineffective government" (Van Hecken and Bastiaensen 2010).

These are central issues in evaluating the role of law with respect to PES. When thinking about the opportunities and risks of operationalizing PES schemes for particular pastoralist contexts, an analysis of how country-wide legal frameworks shape PES development, design and implementation and link PES to broader institutions and policies for resource management becomes essential.

Three broad categories of legal frameworks should be assessed: i) "Establishing" legal frameworks that create state-run PES schemes; ii) "Regulating" legal frameworks for decentralized PES; and iii) "Enabling" legal frameworks that stimulate PES without a PES-specific law (Greiber 2011).

"Establishing" legal frameworks

"Establishing legal frameworks", refers to legislation, policies and other mechanisms which establish the scheme, determine the ecosystem services targeted and who is eligible to participate. Generally, a centralized fund is established and a designated government agency allocates payments according to prescribed criteria. State-run PES schemes are often described as "public" PES, distinguished from private or market-based PES where buyers and sellers of ecosystem services negotiate directly with each other. Establishing legal frameworks for PES schemes may provide an entry-point for institutions to manage state-designed PES schemes on the ground.

11. For more information see: Greiber, T. 2009. Payments for ecosystem services: legal and institutional frameworks and Costenbader, J. 2010. Legal Frameworks for Payment for Ecosystem Services Schemes

National PES schemes are particularly prevalent in Latin America, beginning with the introduction of Costa Rica's PES program (see case-example II at the end of the report). Other examples include Vietnam's Pilot policy on payment for forest environmental services (the first of its kind in Southeast Asia) or The sloping land conversion program—initiated by the Chinese central government in 1999.

"Regulating" legal frameworks

"Regulating" legal frameworks for PES schemes is a relatively recent and novel development in environmental law. Peru and Colombia have become leading jurisdictions in this field, with legislation that allows for PES schemes to be operated and funded by various parties but with established regulatory oversight of the schemes, including a national registry. The law authorizes and promotes voluntary decentralized development of PES within regulatory limits, supports monitoring and enforcement, and provides legal certainty for the parties involved. The main objective of government intervention is to ensure coordination and consistency of PES with national strategies and state duties to manage natural resources.

"Enabling" legal frameworks

"Enabling" legal frameworks for PES implementation can be found in a range of frameworks: from the constitution to indirectly relevant laws.

- **Constitution:** While there is no need for constitutional regulation of PES, the constitution must not prevent the development of PES schemes. Most modern constitutions contain separate chapters, or at least provisions, regarding the environment; although rare some provisions could refer to ecosystem services. On the other hand, the strong role of the state in managing ecosystem services might be interpreted as prohibiting any private engagement through PES. In Tunisia for example, the new constitution (2014) provides an opportunity for PES-like projects since it calls for the integration of environmental and climate factors in natural resource management and for more participatory development models involving all stakeholders.
- **Specific PES laws:** Such laws have the potential to anchor PES cross-sectorally into national or provincial legislation.
- **Sectoral environmental legislation:** An alternative to the development of a specific PES law is sector-wide legislation. (e.g. water laws, forest laws, protected areas laws and biodiversity laws). Even if ecosystem services are not explicitly mentioned, these laws are the most relevant for governing ecosystem services. An example is the generically termed "land conservation agreements" (LCAs). These place long-term restrictions on the use or management of a parcel of land. Most LCA's come from developed countries and, thus, may not be relevant to PES operationalization in developing contexts. However, if there exists, sectorial environmental legislation provides the opportunity for PES-relevant provisions to be inserted through amendments.
- **Indirectly relevant laws:** PES programs can work in synergy with legal requirements, acting as a quid pro quo for legal restrictions[12] (Smith et al. 2013). For example, laws which require extractives industry to investment in projects that restore or limit ecosystem impacts could provide a potential source of funding for PES projects. Other examples of legal requirements in which PES schemes could be inserted include: legislation on planning and data collection (such as environmental impact assessments—see Box 2 for example) which provides the basis for the informed development of instruments for the governance of ecosystem services; and legislation regarding the ownership and use rights over land and its natural resources, which can influence the access to ecosystem services. Laws on public participation also play a role in decision-making processes regarding ecosystem services.

12. The Costa Rica's PSA program found that without the PES carrot, opposition to the legal restrictions on clearing might have been much higher. Studies found that recipients of incentives had higher forest cover than non-recipients (Pagiola 2002). For example, recipients in northern Costa Rica had 61% of their farm under forest, compared to only 21% for non-recipients (Zbinden and Lee 2005).

Box 2: Examples of leveraging domestic legal frameworks to insert PES schemes

Uganda's environmental impact assessment law provides a supporting framework for compensation schemes, which could be applied to pastoral systems. The Uganda Wildlife Authority (UWA) is in the early stage of developing a biodiversity offset policy and is also investigating voluntary offsets with oil companies to catalyse national law for offsets in the future (Madsen et al. 2010).

Niger's *code rural:* The past decade has seen a promising shift by several governments to recognize and regulate access and tenure rights over pastoral resources—first with Niger's *rural code* (1993) and then with the pastoral laws passed in Guinea (1995), Mauritania (2000), Mali (2001), Burkina Faso (2002) and Eritrea (2009). Although the approaches taken by legislators vary considerably across countries, this pastoral legislation tends to recognize mobility as the key strategy for pastoral resource management. The tools used range from the delimitation of pastoral lands to innovative legal concepts like the *terroir d'attache* in Niger. Pastoral laws also regulate multiple and sequential use of resources by different actors (e.g. herders' access to cultivated fields after harvest) and determine the role which pastoral people can play in local conflict management. While these laws constitute a major step forward, on which PES schemes can be built, pastoral legislation has yet to be implemented. Furthermore, "although some laws now recognize pastoralism as a legitimate form of productive land use (*mise en valeur*, a prior condition for protection of land rights), the pastoral application of the concept (*mise en valeur pastorale*) remains ill-defined and generally involves investments in infrastructure (wells, fences, etc.)" (Cotula et al. 2004).

- Other "enabling" frameworks include **customary or informal laws** which are key enablers of sustainable resource management practices at local level. While sometimes referred to as "fuzzy"—overlapping and subject to change—pastoralist rights, which range from access to pastures, watering points, movement corridors between seasonal grazing areas, encampments and markets, are often embedded in informal arrangements based on customary systems.

The challenge is to reconcile PES implementation with such customary systems, ensuring the intrinsic flexibility pastoralism requires is maintained[13].

The *Agdal* in Morocco is one such existing informal framework which has shown to have positive socio-ecological impacts[14]. It can be defined as a seasonal prohibition that, like *Hima* in the Mashreq, forbids access to an agro/silvo/pastoral resource to allow the pastures a resting period during the most sensitive period of growth. The dates, resources and spaces affected by this prohibition are established by customary law or yearly by the tribal assembly (*jmaa*) according to its own history, territorial heritage, political structure and economic strategies (Suleiman et al. 2013). For the *Hima* in Jordan the legal foundations are the Jordanian civil law containing traditional clauses like the *Al-Mukayada*[15] barter contract (Section 552 (barter)) and *Al-Musakatu* contract (Section 736) which may be used to draft private PES schemes.

Weaving in PES schemes with customary laws, such as the *Agdal* tenure system or the *Hima's* traditional clauses, could get more traction at the level. Furthermore, an increasing number of agencies such as the IUCN and GEF are supporting and funding such systems for conservation and biodiversity objectives. This also provides an entry-point for operationalizing PES schemes.

Because of the importance of customary governance systems in pastoral areas, these will be further discussed in the section below.

13. It has been found that capacities for collective action, through informal legal frameworks, are likely to dominate potential benefits of changing land management practices (Roncoli et al. 2007).

14. For example, analyses of aerial and satellite photographs have shown higher and increasing vegetation since 1964 in areas subjected to *Agdal* regulations compared to non-*Agdal* areas where natural resources are freely harvested (Hammi et al. 2007). For more information read: Patrimony for Resilience: Evidence from the Forest *Agdal* in the Moroccan High Atlas Mountains, (Auclair et al. 2011)

15. *Al-Mukayada* derived from Islamic sharia law speaks of the importance of protecting the earth sustainably.

Customary natural resource governance and informal land tenure regimes

Complex tenure rights and overlapping tenure systems linked to the different livelihoods are some of the greatest challenges in the development of PES initiatives for pastoralists.

Unlike agriculture and forestry, a larger percentage of pastoral livelihood systems in developing countries operate through collective land tenure regimes, or "undefined" land tenure systems (Jenet et al. 2016). For example, estimates suggest that nearly 70% of the households in the arid, semi-arid and sub-humid regions of India graze livestock on the commons and 45% of their fodder requirements are met from the commons alone (Global Agenda for Sustainable Livestock 2016).

Within common property regimes, there are different typologies of rangeland governance systems as summarized in the following table taken from *Collective action and property rights for sustainable rangeland management* (Collective Action and Property Rights Initiative 2005).

Table 1: Types of common property rangeland governance systems

Types of common property rangeland governance	Description
Common use rights for pastoral communities	Some governments provide tacit recognition of pastoral communities' use rights and their potential for informally operating grazing networks. This tacit recognition, however, gives pastoralists only a limited role in management and investment decisions and an even smaller role in deciding on the evolution of property rights. Often users do not have the right to reallocate common land to alternative activities like cropping or reserves, a situation that limits the capacity of pastoralists to respond to local conditions. By appropriating pastoral resources and limiting the role of local level pastoral institutions, state ownership has often fostered land use conflicts and the breakdown of collective action within and across pastoral groups. In particular, where the state claimed ownership but expended limited resources to manage rangelands or relied on bureaucrats to implement management schemes without knowledge of local resources and institutions, many land use conflicts have arisen and resources have become degraded.
Common use rights for pastoral organizations	Theoretically, state and local organizations could work together to create and enforce use rules and investment activities. But in practice, the costs of negotiating such rules have often been prohibitive. Numerous projects have attempted to reorganize pastoralists into cooperatives with the aim of improving rangeland resources and promoting collective action, but the cooperatives have rarely been effective managers of rangelands.
Grazing licenses	To reverse rangeland degradation, government-managed grazing reserves grant licenses determined by a well-defined and well-funded investment strategy. These areas are then opened for grazing during specific periods of the year and any herder can buy a license, whether or not he or she is a member of the tribe or community with traditional claim to the reserve area. Since pastoral communities contribute little to the management of these reserves, the main collective action of community members has often been to hinder state licensing policies. With high costs of fencing and guarding reserves, community participation in improving and managing these reserves has been lacking.
Pastoral cooperatives	In most West Asian countries, pastoral cooperatives have mainly been involved in distributing subsidized feeds. In Jordan, however, the new herder-driven cooperatives, which have management rights granted by the state on their traditional pastures, are getting better range productivity results than state-managed reserves, without requiring expensive fencing and guarding. This type of cooperative fosters collective action because members are certain to reap the benefits of their investments and control access to improved pastures. There remain, however, concerns about potential conflicts between cooperative members and non-members.
Individual leaseholds	The practice of granting long-term individual leaseholds on range resources remains limited. In some cases, such as Botswana, individual leaseholds have contributed to increasing livestock production and improving rangeland conditions. However, some issues that arise with individual leaseholds are: The policy has been strongly criticized on equity grounds. People with previous claims to resources have been dispossessed or denied further access without compensation leading to additional pressures on the now smaller common pool resource base, increasing range degradation and conflicts between large and small herd owners. Widespread individual leaseholds increase the vulnerability of pastoral communities during droughts by limiting their capacity to move and negotiate access to neighbouring pastures. There is very little collective action under this system.

Types of common property rangeland governance	Description
Individual ownership	In pastoral areas of central Tunisia, individual private property rights fostered the transformation of pastoral and nomadic systems into agro-pastoralist systems. Privatization led to the wide-scale adoption of fodder crop production, including cacti and shrubs. The efficiency of this option depends on the performance of land, purchased input, credit and output markets and legal and institutional provisions to reduce land fragmentation. Some concerns that arise with individual ownership include: There is potential for misappropriation of land by the politically-powerful, thus raising equity concerns. This system is likely to reduce herd size, mobility and collective action within and between pastoral groups and consequently pastoralist households may become more vulnerable to drought.
Common property	Common property rights for communities make tenure more secure, but the communities must bear all costs of making, monitoring and enforcing rules regarding rangeland management. Managing access to and use of resources can be difficult, particularly when benefits and costs are not equally distributed among community members. In this system, local institutions may keep their traditional roles of managing the resources, deciding how to allocate resources between pastures and croplands and deciding on the nature of the rights to be allocated to members and non-members. These opportunities may empower local institutions and provide them with the capacity to mobilize collection action and sustain the livelihoods of their communities. Because land-owning communities may have difficulties mobilizing financial resources and technical expertise, they may enter contractual arrangements for improving their resources. Under such contracts, as in central Tunisia and Morocco, state institutions, generally forest services, are entrusted with the responsibility for improving and managing the resource. After the improvement of the resource, rights holders purchase grazing or cutting licenses and the revenues generated from the licenses are used to pay off improvement costs. Theoretically, these ranges will revert to communities once improvement costs are recuperated; in practice, however, such transfers have often not taken place. Since common property rights are generally granted to a fixed and well-defined group for rangelands with well-defined boundaries, it can lead to limiting flexibility and herd mobility (McCarthy et al. 2000; Ngaido et al. 2002)

While agriculture and forestry management practices are bounded geographically and defined by state or private property regimes, pastoral livelihoods, as well as artisanal scale fishing, often operate within "unbounded" spaces, are governed by informal common property or non-property (open-access) frameworks that change through time[16].

For example, the inland delta of the Niger river in Mali provides a valuable insight into how non-static overlapping and nested rights work (see Box 3).

Box 3: Nested and flexible pastoral rights

The inland delta of the Niger river in Mali hosts particularly valuable natural resources which have created complex systems of un-static overlapping rights. Competing claims are governed through arrangements like the Dina system. Though the boundaries of customary pastoral territory claimed as its home base are relatively fixed and identifiable by landscape features. Each clan, subclan or fraction has an annual grazing area through which it moves seasonally and the geographical boundary of this grazing area is extremely fluid from year to year. In many sites (particularly areas of relatively high value), each annual grazing area is intended to be self-sufficient. However, in times of need, access by other clans or factions is agreed through negotiation (Niamir-Fuller 2009).

The Gabra pastoralists of northern Kenya practice a form of mobile pastoralism which contributes to biodiversity conservation of dry and sub-humid lands. The pastoralism strategies being used include herd splitting, species diversification and traditional customary practices. For example, grazing is managed based on traditional local structures and the definition of set grazing areas and taboos on the cutting of culturally important trees and conserve sacred areas have contributed to the conservation of biodiversity in the arid lands ecosystems (Ganya et al. 2004).

16. For example, pastoralists may have user-rights established by lineage or given by village authorities, which can change over time. Targeting sellers of ecosystem services is therefore more complex in these cases where user-rights change through time (Silvestri et al. 2012).

Though the specifics of traditional pastoral land holding systems may vary, rights are generally vested in the entire communities or in multiple users via hierarchies of overlapping rights. The aim of these types of governance systems is to ensure flexibility and mobility, which are particularly essential for pastoralists in arid and semi-arid regions.

However, it is important to bear in mind that tenure and access in most pastoral regions are hampered by the deterioration of customary leadership and a shift to private property, which has resulted in localized tensions. For example, the view that grazing lands are "abandoned" has resulted in the occupation of grazing land for oil drilling, mining exploration, urbanization, agricultural expansion and nature conservancies, resulting in a legacy of tensions between pastoralists and private/public stakeholders.

Conflict as a result of tenure and access raises important questions for PES implementation:

When land may be cultivated during the farming season by one person, be governed as common property during the off-season and ultimately "belong" to the community—who should be the recipient of a PES? Given the lack of property rights, should PES be implemented on rangelands that have a high risk of being contested by other stakeholders? (Robinson and Venema 2006)

All of these factors further complicate the targeted implementation of PES schemes.

To exemplify: the following table describes five "types" of property rights. It is evident that landowners may have all of the five rights to access, extract, manage, exclude and sell. A renter may not have the right to sell the land however and, therefore, would need to negotiate and obtain authorization from the landowner before selling ecosystem services.

Table 2: Different types of property-rights regimes taken from Schlager and Ostrom (1992)

Access	Right to access without extracting resources	Cumulative rights ↓	Authorized use
Extraction	Right to extract natural resources		Renter
Management	Right to use and transform resources		
Exclusion	Right to determine who can access and extract resources and ways in which benefits can be transferred to others		
Sale	Right to transfer property rights		Owner

It has been suggested that to avoid conflict that can hamper PES implementation, it is important to create legal certainty by clarifying the rights over ecosystem services (Greiber 2011). Greiber uses Peru as an example, where while the Forestry law clarifies that the holder of a timber concession can include PES activities in his management plan so that he can sell the forest-related ecosystem services, it lacks such clarity with regard to other types of concessions. As a consequence, the holder of an ecotourism concession, for instance, does not have the explicit right to sell the carbon-related ecosystem services provided by the forest which is subject to his concession. This hinders such concession holders from bundling services and participating in PES. On the other hand, care must be taken that defined entitlements are not a requirement for participation, since this risks intensifying tensions between competing land use claims and diverse stakeholders.

The potential for conflict between prescribed practices, that are assumed to have positive ecosystem impacts and the need for adaptive management, is a key issue. Furthermore, the intertwining of customary norms and actual land use in pastoralist communities also results in greater nuance and flexibility; communities typically differentiate rights to land, distinguishing, for example, between primary ownership and secondary access rights, which may be necessary to regulate seasonal access among and by pastoralists. For example, pastoralists in East Africa and the Sahel generally pattern their land rights and access in more complicated ways than hunter-gatherers or cultivators. A typical pattern is for the clan or other social group to own a home domain, respected as its land by other pastoralists (although with periodic disputes). The group may co-own a second area or resource—often water—with several other groups. Mobile pastoralists typically also acquire seasonal access rights to lands belonging to another—often settled—community or cluster of communities. Pastoralists also establish transit, watering and pasturing rights along their migration routes to these domains (Wily 2011). If PES project protocols fail to incorporate such flexible livestock and rangeland management patterns, there is a risk of eroding important survival practices that are responsive to changing climatic and social conditions.

The literature review reveals that solutions that honour the informal and flexible nature of pastoral land governance practices must still be piloted more thoroughly. Although case examples can be found showing that static collective land tenure does not prevent the establishment of ecosystem service transactions, there are few attempts of piloting PES solutions for pastoralists operating in open-access regimes. Given that very little is known about how to handle such situations when implementing PES schemes, it may be helpful to engage with grassroots organizations which have considerable on the ground experience with land-rights dynamics and conflict.

Customary natural resource management systems that have been proven to have positive ecosystem outcomes may require further incentives to attract participation. Hinging on these pre-existing structures is an opportunity for PES schemes; however, negotiations of benefit sharing agreements through such systems may be challenging, particularly if customary governance systems are not *formally* organized. Without structured and active local governance systems, the introduction of PES scheme may create conflict and raises questions on who receives payment and how effectively, fairly and transparently payments can be managed. This calls for significant engagement, before implementation, to ensure that self-organization is able to engage with PES schemes effectively. If not, it may indicate that capacity-building, taking care not to significantly restructure existing systems, may be required.

Governance and institutional support

Even with clear land tenure regimes or laws that might support improved rangeland management and pastoral, their weak implementation and enforcement—due to weak institutions—essentially fails to recognize pastoralists as a collective entity and poses a risk to the operationalization of PES schemes (Silvestri et al. 2012; Badola, Chandola Barthwal and Ainul Hussain 2013).

It may be helpful to identify strong institutions that support PES implementation, for example institutions that aid the development of community-based rangeland or natural resource management or local pastoral governance frameworks such as pastoral units (PU) in Senegal or Groupements de Développement Agricole (GDA) in Tunisia (see Box 4).

Box 4: Examples of local pastoral governance frameworks

Pastoralist units have been promoted in Senegal by several organizations, including Agronomes et Vétérinaires Sans Frontières. These works as a dialogue framework involving all the stakeholders: village representatives, transhumant livestock keepers, local farmers and livestock keepers, management committees of each of the local common infrastructures and equipment (water, forage stocks and shops, vaccination parks, etc.) and the local authorities. The creation of pastoral units, based on transparency and equity, allows for better planning and management of pastoral territories and resources through the appropriation of the territory by all stakeholders.

The GDA was created with the intention of replacing and formalizing remaining local natural resource governance institutions in Tunisia. The role of the GDA according to the legislative texts is to protect and manage natural resources in the territory of the collectivity. GDAs are dedicated to collective rangelands, intervene in agricultural and pastoral areas and therefore—in theory—play a central role in the participative management of collective pathways. GDAs for example are central to the Programme for agro-pastoral development and promotion of local initiatives in the south-east (PRODESUD, incentive schemes), funded by the International Fund for Agricultural Development (IFAD), for rangeland restoration in southern Tunisia (see Tunisia case study section).

The institutional framework for the governance of ecosystem services has vertical and horizontal dimensions. In the vertical dimension, institutions are differentiated by a hierarchy of international, national, regional and local levels. The horizontal dimension distinguishes institutions by different sectors, which include environment, agriculture, water, energy, economy and finance (Greiber and Sciele 2011). Furthermore, there are different types of institutions, encompassing the broad spectrum of actors from the governmental, inter-governmental, nongovernmental and private sectors as well as civil society.

Assessing laws, institutions and governance frameworks in a cross-cutting manner allows for a comprehensive and creative assessment of the opportunities for operationalizing PES. This is especially important for PES targeted at (agro) pastoralists given that the rangeland management and pastoralism in developing countries generally lack a cohesive long-term governance plan and, therefore, solutions to operationalizing PES might be found in seemingly unrelated sectors.

A further dimension is identifying the **active and sustained**[17] presence of such initiatives. This is an indication of the institutional conditions within which PES projects will operate in and, therefore, it is a litmus test of the long-term sustainability of partnerships.

Knowledge base

Scientific knowledge on the effects of agriculture, forest and fishing management on biophysical processes can inform the design of PES schemes by guiding assumptions. For example, knowledge on biophysical processes in rangeland settings can guide assumptions on the link between livestock management practices, rangeland conditions (e.g. grass species composition and density) and ecosystem outputs (e.g. groundwater quality and quantity, soil health through organic matter indicators). In reality, it is often difficult to demonstrate the biophysical link between land uses promoted and the environmental service outcomes.

Impact evaluations and other kinds of formal research that assesses the livestock-pastoralist-rangeland nexus in developing countries are extremely scant and, due to logistical and cost difficulties, the methodologies used and rigorousness of the studies are extremely variable. This limits the extrapolations that can be made to inform PES assumptions, in addition to the fact that the nature of bio-physical interactions in rangelands is extremely context-specific. The absence of robust knowledge and the highly context specific and variable nature of biophysical interactions in rangelands could in fact be seen as an asset as it compels engagement with different knowledge systems in order try to build a context-specific picture of the impacts of livestock management practices on rangeland ecosystems.

Of all sources and types of knowledge that may be relevant, the indigenous, practice-based knowledge of pastoralists themselves stands out as essential. Land users may base their decisions on tradition, direct observations and intergenerational rules of thumb in ways that may appear, to some, to be unscientific. For these and other reasons, indigenous knowledge is largely ignored or misunderstood by other knowledge systems, so the potential for divergence in understanding between herders, landowners, the scientific community and policymakers challenges the design of incentive schemes. In reality, though, this indigenous knowledge is based on empirical experience and is highly valuable. Indigenous pastoralist knowledge offers a context-specific picture on the impacts of livestock management practices on rangeland ecosystems. Pastoralists have a deep knowledge and understanding of their environment and have developed grazing practices and adaptation strategies which are consistent with their environment and socio-cultural context[18] (Basupi et al. 2017). However, the official discourse stressing the effects of overgrazing, for example, may not reflect herders' perceptions of the major challenges affecting livestock management.

Integrating these knowledge systems can effectively improve ecological impact and help monitor impact, while increasing participation. For example, integrating sustainable practices such as those used by the Turkana[19] of northwest Kenya can help protect keystone species in arid lands (IUCN 2007). Another example is integrating women's observations on rangeland vegetation changes, given that in many contexts women are typically tasked with firewood collection and thus they have had almost daily contact with vegetation patterns of rangelands.

17. There are, however, also documented cases where collective institutions remain dependent on donor finance and fail to function when donors withdraw (ADB 2014)

18. See IUCN. 2007. ***Pastoralist's species and ecosystems knowledge as the basis for land management*** for more information.

19. The Turkana of northwest Kenya manage specific trees under a tenure system called ekwar which is associated particularly with ownership of Acacia tortilis that are found in riparian areas and provide seed pods that are a critical dry season fodder resource. Acacias are also considered to be keystone species as they, along with the activity of termites, provide the only inputs and process for nutrient cycling (IUCN 2007).

Key messages:

Policy and regulation

- Factors limiting the scalability of PES schemes include: transparency and access to information; poor legal documentation of customary rights (conflicting information and bureaucratic chaos); accountability; and the rule of law (for example unclear access to legal remedies and enforceability of contracts) particularly if PES is not recognized at national level or understood at local level.
- The strong political-ecology dimension of pastoralism and legacy of conflict, requires a holistic vision in understanding how and whether PES schemes could be operationalized. In particular; the lack of legal recognition of pastoral rights, the historical marginalization of pastoralists, transparency and access to information for pastoralists and political instability and conflict are major challenges for pastoral livelihoods that need to be evaluated when thinking of implementing PES. For example, for countries that are transitioning politically (Tunisia), or instable, PES policy is a secondary priority in the agenda therefore securing financing and implementing projects becomes more challenging.
- Domestic policy and regulation alone may not provide the necessary supporting structure to design effective PES schemes. Furthermore, since PES schemes targeted at pastoralists and agropastoralists are in their infancy, in most national settings enforceable regulations will often be lacking. Stakeholder dialogue should take priority in framing PES schemes for pastoralists, which are likely to be smaller-scale and private rather that public or trading PES, which require increasing complexity of legal and institutional regimes.
- Such local, private PES schemes generally require less legal guidance from the outset as they are usually focused on very specific problems. However, one should not under-estimate the potential of local PES schemes, since if successful and perhaps nested with other projects creating a network, they can trigger the development of policies and laws at the national/ regional level (Greiber 2011).
- In the case where PES schemes are to be scaled up or if they aim to include strong market-based concepts, more specific policy and legal frameworks will be required. In such cases where regulation becomes essential for the operationalization of PES schemes, capacity should be first built on the actualization of PES-relevant domestic policy and regulations.

Legal frameworks

- Three broad categories of legal frameworks should be assessed: i) "Establishing" legal frameworks that create state-run PES schemes; ii) "Regulating" legal frameworks for decentralized PES; and iii) "Enabling" legal frameworks that stimulate PES without a PES-specific law.
- Weaving in PES schemes with customary laws is likely to get more traction at local level. Furthermore, an increasing number of agencies such as the IUCN and GEF are supporting and funding such systems for conservation and biodiversity objectives. This also provides an entry-point for operationalizing PES schemes for pastoralists in rangelands.
- The challenge is to reconcile PES implementation with customary systems, ensuring the intrinsic flexibility pastoralism requires is maintained.

Customary natural resource governance and informal land tenure

- Pastoral livelihoods, in particular the livelihoods of the most mobile pastoralists, often operate within "unbounded" spaces and are governed by informal common property or non-property (open-access) frameworks that change through time.
- Private or state property regimes may not necessarily be essential for the implementation of PES schemes for pastoral and rangeland management, instead innovative approaches that recognize collective land-tenure governance practices, non-property (open access) and mobility become more important for pastoralists.
- Solutions that honour the informal and flexible nature of pastoral land governance practices must still be piloted more thoroughly, in particular piloting PES solutions for pastoralists operating in open-access regimes.

- Conflict as a result of access to natural resources and tenure regimes in rangelands is a sensitive issue. It has been suggested that to avoid conflict and avoid the hampering of PES implementation, it is important to create legal certainty by clarifying the rights over ecosystem services (Greiber 2011). However, care must be taken that defined entitlements are not a requirement for participation, since this risks intensifying tensions between competing land use claims and diverse stakeholders.
- If not informed by a sophisticated analysis of land tenure arrangements and power relations, PES policies are likely to contribute to elite capture of resources and a shift from communal tenure to private property.
- The potential for conflict between prescribed practices, that are assumed to have positive ecosystem impacts and the need for adaptive management, is a key issue. If PES project protocols do not allow land users sufficient flexibility to manage livestock and rangeland resources in response to changing conditions, there is a risk of eroding important survival practices.

Governance and institutions

- Customary natural resource management systems that have been proven to have positive ecosystem outcomes may require further incentives to attract participation. This is an opportunity for PES schemes to hinge on pre-existing structures, thus minimizing implementation challenges.
- Negotiations of benefit-sharing agreements through customary governance systems may be challenging, particularly if they are not *formally* organized. This calls for significant engagement, pre-implementation, to ensure that self-organization is able to engage with PES schemes effectively. If not, it may indicate that capacity building, taking care not to significantly restructure existing systems, may be required.
- It may be helpful to identify strong institutions that support PES implementation, for example institutions that aid the development of community-based rangeland or natural resource management or local pastoral governance frameworks such as pastoral units.

Knowledge base

- Data collection efforts and impact evaluation projects that assess the livestock-pastoral-rangeland nexus in developing countries are extremely scant and, due to logistical and cost difficulties, the methodologies used and rigorousness of the studies are extremely variable.
- The absence of robust knowledge and the highly context specific and variable nature of biophysical interactions in rangelands could in fact be seen as an asset as it compels engagement between different knowledge systems.
- The potential for divergence in understanding between herders, landowners, the scientific community and policymakers challenges the design of incentive schemes.
- In some contexts, it may be that extension support to adaptive management can have a significant impact irrespective of financial incentives through PES schemes (ADB 2014).

4.2 Monitoring and evaluation

The lack of empirical studies and dearth of evidence on the linkage between incentives and socio-ecologic impact is especially pertinent for dryland rangeland ecosystems. For instance, very little is known about the participation of mobile pastoral communities in PES programs, let alone about the social and ecological impacts of PES. It is useful to remember that markets for many environmental services have not developed because of the difficulty and costs of monitoring them. Designing a monitoring and evaluation (M&E) plan for ecosystem service provision is thus considered to be relatively complex.

Monitoring of PES effectiveness should be undertaken at three levels (Pagiola et al. 2005):

i. to check if the land users undertake the contracted resource management practice;

ii. to establish if the practices generate the desired ecosystem services; and

iii. to ascertain the social impact of PES on participants.

Apart from carbon sequestration schemes, few PES programs have clear, explicit frameworks for monitoring and evaluating their impacts (Wunder 2007).

Monitoring PES schemes in rangelands encounters several challenges. First, many environmental services are intangible and thus difficult and costly to measure, hence most PES programs rely on observable proxies as indicators of environmental service. Second, it is often difficult to demonstrate the biophysical link between land uses promoted and the environmental service outcomes as a result; many current PES programs are based on assumptions that are not scientifically proven. Third, it requires consistent M&E, this is important because rangelands have been shown to exhibit non-linear threshold effects, which means that their marginal environmental benefits (and therefore payments) are not constant.

Among the few systematic evaluations that have been conducted on the impacts of management on rangeland condition[20], these tend to rely on the wealth of academic research results that usually builds up as large-scale programs are implemented. These are typically available in developed countries such as the United States and Australia[21]. In the absence of knowledge base, institutional alliances with local land planning agencies, national information systems, local municipalities, universities and environmental monitoring agencies could significantly lower the cost of monitoring and evaluation as well as improve the quantity of data available.

The PES sector and the conservation sector face similar challenges in terms of cost effectively monitoring and evaluating impacts. Given that M&E in the conservation field is relatively more established; it can offer some guiding notions applicable to the PES sector.

Monitoring and evaluation efforts in conservation can be divided into three broad categories: status assessment, management effectiveness and performance measurement and impact evaluation[22]. Each of these have different associated costs, produce different data outputs and require different data collection frequencies (see Table 3).

Table 3: Categories of monitoring and evaluation goals for PES

M&E categories	Description	Data collection frequency	Costs (per seller or site)	Suggested tools	Type of environmental data collected
Status assessment	Any monitoring activity which documents indicators of social or environmental condition over time and includes both scientific and participatory monitoring	Medium	Medium	Observation, indigenous knowledge, environmental monitoring stations, field data collection	Monitoring is usually based on observations of key areas and key vegetation attributes carefully selected to meet the objectives of the program. For example, species composition, density, fodder quality, vegetation cover, water quality

20. See for example Spaeth et al. 2013. *Rangeland conservation effects assessment project (CEAP): An assessment of natural resources conservation service practices.*

21. An example is the Conservation effects assessment project of the US Natural Resources Conservation Service, which recently completed a review of the impacts of various incentive schemes in grazing lands found that even in the United States of America, where there is relatively more research available, analysis of available evidence was unable to accurately quantify the environmental benefits of incentive programs, see Briske 2011. *Conservation benefits of rangeland practices: Assessment, recommendations and knowledge gaps.*

22. For more detailed analysis of monitoring and evaluation in conservation see: Mascia, P. et al. 2014. Commonalities and complementarities among approaches to conservation monitoring and evaluation; where five approaches to conservation M&E are proposed.

M&E categories	Description	Data collection frequency	Costs (per seller or site)	Suggested tools	Type of environmental data collected
Management effectiveness and performance measurement	focused on documenting the capacity for and effectiveness of, management activities in achieving outcomes. In effect, management effectiveness and performance measurement are designed to detect 'implementation failure', rather than 'logic failure'	High	Low	Grievance mechanisms, polling questionnaires through mobile technology, or focus groups on management effectiveness	Monitoring environmental-related opinions and grievances resulting from PES implementation.
Impact evaluation (baseline and endline)	Measures the intended or unintended changes in social or environmental variables that can be attributed to a particular intervention (Gertler et al. 2011).	Low	High	Field data collection, in-person surveys, behavioural games, rangeland data collection methodologies	Vegetation types, range sites, range condition, carrying capacity, soil types, utilization patterns, topography, streams, habitat assessments for wildlife

Status assessment (medium frequency)

Collecting social and environmental *baseline data* is crucial as it establishes the current levels of ecosystem service provision and helps estimate how (quantitatively and qualitatively) these might evolve in the absence of the PES scheme (the level of additionality being delivered). A lack of clarity regarding additionality may result in paying for practices that would have been adopted without the payment, leading to financial inefficiency (Engel et al. 2008). Furthermore, demonstrating the level of additionality[23] is important in attracting funds, reassessing project impact and viability.

The valuation of baseline rangeland ecosystem service provision and flow of future ecosystem services helps reflect the marginal value of sustainable livestock and rangeland management—and therefore incentive levels.

Given the non-equilibrium behaviour of rangeland ecosystems, the size and nature of incentives in a PES scheme must be constantly revisited (Robinson and Venema 2006). Repeated valuations enable differentiated payments to be made, based on ecosystem "hotspots" but also on social and governance dimensions—which change over time.

However, valuing rangelands in developing countries is challenging. The cost of collecting data from pastoralist areas is often prohibitive, given distances, conditions and movement and given the highly informal nature of socio-economic activities[24]. Given these challenges further research is required in assessing the practicalities of operationalizing various monitoring tools.

23. Additionality depends on the nature of the baseline, which can be 'static', 'deteriorating' or 'improving' (Wunder 2005). Since environmental services are provided over time, one would need to have some understanding of what would hypothetically happen without the PES program (i.e. construct some counterfactual service baseline.

24. Some common challenges in valuing pastoral systems in developing countries include (Hatfield and Davies 2006):
- The knowledge gaps are generally larger than the available knowledge;
- Current valuation tools concentrate on per-animal productivity and commercial off take;
- Record keeping tends to exclude informal markets, where most transactions occur;
- Data on the pastoralist sector is not disaggregated from the wider livestock or agricultural sectors;
- Backward and forward linkages to the wider economy are often overlooked;
- Valuations tend to ignore the social role of pastoralism in terms of number of people employed and supported;
- Livelihoods are not neatly compartmentalized and many pastoral people diversify into off farm activities;
- Climate and price fluctuations mean that any detailed analysis needs to work over long enough period (of several years) in order to obtain representative figures; and
- It is necessary to work at different geographical scales and national data have to be refined by microeconomic survey.

One approach to collect systematic ecological data is based on the *ecological site description approach* that has been adopted in Mongolia by the environmental monitoring agency (described in Box 5). This approach can be used both as an ex-ante or ex-post monitoring tool. As an ex ante targeting tool, an ecological site description may provide information on the potential responses of a site to changes in management and, thus, provide information on the potential environmental benefits of adopting the related management practices in a particular ecological site. As an ex post monitoring tool, repeated collection of data using the field methodology may provide information on actual changes in ecosystem characteristics in response to changes in management. As the method is more widely applied and over time, a database will help describe the responses of ecological site types to different management practices.

Box 5: Example of rangeland monitoring in Mongolia

Mongolia's National Agency for Meteorology, Hydrology and Environment Monitoring has recently adopted a new rangeland health assessment method based on the ecological site descriptions method which is widely applied in the United States. This method is used to collect field data that can be used to describe the ecological potential and ecosystem dynamics of areas of rangeland. Monitoring of the implementation of district land management plans across the country is complemented by systematic collection of land users' observations of the effects of change in management practice on environmental variables (Asian Development Bank 2013).

Management effectiveness and performance measurement (high frequency)

In theory for PES programs to be effective, their design should account for monitoring how implementation strategies impact ecosystem service benefits. This requires frequent monitoring of effectiveness and performance of PES schemes and evaluation of the necessary system changes through grievance mechanisms, polls or focus group discussions.

The relative "mobility" of pastoralist systems and the "uncertainty" attached to such livelihoods means the scale and scope of impact from incentives can vary widely over time and space. Pastoralist systems are relatively more "sensitive" to project, governance and economic impacts than other livelihood sectors. This means that even greater heterogeneity in terms of impacts is to be expected.

In such "sensitive" and heterogeneous dynamics, a PES program should aim to install continuous valuation systems following a few key social and ecological indicators. Continuous valuation may of course not be cost-effective, especially for pastoral communities.

One solution is to adopt relatively cost-effective and simple real-time data collection though mobile technology. For example, simple polling questionnaires can be administered through SMS and interactive voice response (IVR) for the illiterate. Similarly, anonymous grievance mechanisms can be used to monitor challenges in implementing PES schemes. The effectiveness of this type of data collection for pastoralists would have to be assessed based on the context, as it depends on mobile penetration rates and network availability among other things. Also, the reliability of self-reported data will have to be verified.

Mobile technology can also be used to innovatively connect buyers and sellers of ecosystem services directly, negotiation and monetary transfer can occur through mobile technology, assuming a verification system is in place to ensure that sellers have managed rangelands appropriately. *Safaricom*, a mobile-phone company that offers money transfer and other banking services through its m-PESA scheme, finds that its service is in high demand in pastoralist areas of East Africa (Jenet et al. 2016).

Impact evaluation (low frequency)

Impact evaluations can help identify the opportunities for improvements PES efficiency and assess derived effects by including non-PES participants in the sample.

Although impact evaluations are a relatively new tool in the environment sector, lessons can be learned on how to apply impact evaluations to PES schemes. Experiences of impact evaluations in the field of conservation can offer insights into the scope of its application for measuring socio-ecological impacts of PES schemes (Glew 2012). Similar conceptual and methodological challenges[25] are faced in both the conservation and PES field.

For example, in conservation the causal links between biodiversity and poverty are contestable, similarly the debate over the efficacy of incentive-based approaches to enhance biodiversity has emerged (Kelsey et al. 2007). While it is debatable whether any M&E tool will be able to fully capture the complex dynamics between conservation / biodiversity and poverty alleviation or PES incentives and socio-ecological impact, impact evaluations can offer an in-depth and comprehensive overview of all the possible impacts, both direct and derived (Macia et al. 2014).

Very few impact evaluations through randomized control trials have been implemented to measure socio-ecological impacts of rangeland and livestock management or PES. Two case-study examples in Namibia (rangeland and livestock management projects) and Bolivia (PES) are presented as sources of inspiration for M&E options in the field of PES for pastoralists (see Box 6).

Box 6: CBRLM impact evaluation in Namibia

One of the most comprehensive social and environmental impact evaluations of livestock and rangeland management practices available to date is the GOPA-implemented Community-based Rangeland and Livestock Management (CMRLM) project in Namibia. This study is an exception given its data extensive collection efforts but it is an important one given that grazing land account for 98% of total agricultural lands and 54% of the total population lives on livestock production in semi-arid rangeland areas (Dong et al. 2016).

Methodology: The evaluation employed a randomized controlled trial (RCT) framework.

Behavioural measures were collected to quantitatively assess whether CBRLM was effective at improving community-based management practices. Subsequently physical measures were also collected to assess changes in cattle health and wealth, rangeland productivity and resilience and household well-being.

Nine indices were constructed to reflect the core behavioural categories targeted by the CBRLM project. These indices were also deemed important in generating physical outcomes in cattle, rangeland and household well-being.

These indices are: Grazing planning, grazing plan adherence, optimal rangeland management, collective action, labour relations, livestock management, livestock productivity and marketing, water management and social cohesion.

In addition to the behavioural measures, cattle and rangeland status were assessed.

Sample: At the beginning of the CBRLM program, GOPA identified 41 rangeland intervention areas (RIAs) across northern Namibia, which were then randomly divided between CBRLM and non-CBRLM groups.

A sample of 51 grazing areas (GA) in CBRLM RIAs and 72 GAs in non-CBRLM RIAs were selected so that they were statistically comparable on a range of ecological, socio-economic and demographic variables.

For the behavioural component of the evaluation, 1,244 kraal managers were interviewed.

25. Progress toward evidence-based conservation had been constrained by assertions that impact evaluation methodologies are not feasible for 'real-world' conservation interventions because conservation actions are non-random and result in systematic differences between conserved and non-conserved regions, which may confound estimates of ecological or social impact (Ferraro and Pattanayak 2006).

Outstanding questions:

- Are the behavioural changes accurate? While IPA found substantial changes in self-reported behaviours and corroborated some behaviours (such as combined herding) with direct observation, it remains unclear whether self-reported behaviours translate to physical results.
- Are the behavioural changes sufficient? While CBRLM's success at generating behavioural change is encouraging, it is not clear whether the level of behavioural change is enough to reverse rangeland degradation, improve cattle health and improve household well-being.
- Are the behavioural changes effective? The behavioural results do not prove that the behaviours advocated by GOPA, including planned grazing, combined herding and the introduction of larger bulls, were the right behaviours for improving rangeland and livestock outcomes.
- Are the behavioural changes sustainable? Positive behavioural impacts were found five months past the conclusion of CBRLM, but it is not sure whether the behaviours will continue years beyond the conclusion of the program.
- What are the barriers to improving livestock productivity and marketing? CBRLM's failure to induce herd restructuring and livestock marketing mirrors a long history of livestock programs in the NCAs that struggled to translate improved livestock management into economic outcome as framed by the development sector.

For more information the evaluation report on CBRLM in Namibia (GOPA 2014) see: *CBRLM internal GA performance evaluation outcomes & results* and IPA 2016. *Community based rangeland and livestock management program.*

Bolivia randomized control trial PES evaluation

Another comprehensive RCT study has been carried out to evaluate the impact of PES on water quality, biodiversity, forest cover and socioeconomic welfare in Bolivia's farming communities.

Natura Bolivia, Harvard University and Vrije University Amsterdam have implemented controlled tests of Natura Bolivia's reciprocal watershed agreements—small-scale, locally-managed PES initiatives that have been implemented since 2003.

The NGO has worked with local governments and water cooperatives to explain to communities that cattle-grazing in forests along streams contaminates water supplies and exacerbates droughts for downstream farmers. Water users and providers then negotiate in-kind payments—such as beehives—so that landowners can preserve the upstream wooded watersheds while gaining steady income from them.

The impact evaluation was carried out as follows:

- To establish a baseline, researchers surveyed the area's 2,700 families on their socioeconomic situation, perceptions about the environment and local institutions. Natura Bolivia's staff also measured water quality, vegetation cover and the abundance and diversity of beetles, amphibians and aquatic macro-invertebrates.
- Using an Ecosystem Services for Poverty Alleviation (ESPA)[26] grant, Natural Bolivia launched the PES scheme. All 130 communities received information about the threats to watersheds and better cattle-grazing practices. Half the villages, chosen randomly, enrolled in the payment schemes, while half did not.
- Follow-up data measures on whether forest conservation and watershed management is more effective where compensation is paid versus where compensation is not paid, as well as the effects of payments on local livelihoods.

For more information see: Case example III in the Annex.

26. The ESPA research program funds high-quality, cutting edge research to improve our understanding of the way ecosystems function, the services they provide and how they can contribute to poverty alleviation and enhanced well-being. This provides the evidence and tools to enable decision makers to manage ecosystems sustainably and in a way that helps improve the lives of the world's poorest people.

Quantifying the intended and unintended impact of incentives across a broad suite of ecosystem indicators and documenting fine-scale variation in impact represents only the first step toward evidence-based PES implementation. The second is using such data to establish relationships between PES intervention and socio-ecological impacts in rangeland settings. Just like in the conservation sector, considerable variation in outcomes will be expected. And these may not result in definitive policy answers. For example, the silvopastoral project in Costa Rica (RISEMP) finds that the extent of benefits can vary widely from one land use to another (see: Case-example I at the end of the report). To verify that the desired ecosystem services are being generated, biodiversity and carbon sequestration are being monitored in all land uses. In this regard, the silvopastoral project differs from most other PES programs, which have generally assumed generating the desired ecosystem service outputs.

It is important to note, however, that quasi-experimental impact evaluation is data intensive, making it prohibitively expensive for the majority of interventions. However, impact evaluations can be strategic. For example, learning from early efforts to evaluate the impact of conservation, one of the strategies to abate costs has been to focus on 'low-hanging fruit', where time-series secondary data, often remotely-sensed metrics of vegetation through GIS, can be usefully applied to inform a particular policy debate.

Key messages:

- Monitoring and evaluation of rangelands in developing countries is challenging because the relative *cost of collecting data* may be prohibitive due to the isolation of pastoralist areas. *Further research is required in assessing the practicalities of socio-ecologic monitoring tools* for rangelands.
- Monitoring and evaluation of PES schemes in rangelands requires *consistent data collection*. This is important for two reasons: i) rangelands have been shown to exhibit non-linear threshold effects, which means that their marginal environmental benefits (and therefore payments) are not constant; and ii) pastoralist livelihood systems and rangeland management are characterized by "sensitive" and heterogeneous dynamics. *One solution is to adopt relatively cost-effective and simple real-time data collection though mobile technology*—this must be piloted.
- Collecting *social and environmental baseline data* is crucial as it establishes the current levels of ecosystem service provision and helps estimate how (quantitatively and qualitatively) these might evolve in the absence of the PES scheme (the level of additionality being delivered).
- *A lack of data measuring the level of "additionality"* may result in paying for practices that would have been adopted without the payment, leading to financial inefficiency. Furthermore, demonstrating the level of additionality is important in attracting funds, reassessing project impact and viability.
- Monitoring and evaluation efforts can be divided into three broad categories: status assessment, management effectiveness and performance measurement and impact evaluation. Each of these has different associated costs, produce different data outputs and require different data collection frequencies.
- Impact evaluations can help identify opportunities for improvements in PES efficiency and assess derived effects by including non-PES participants in the sample.
- Very few impact evaluations through randomized control trials have been implemented to measure socio-ecological impacts of rangeland and livestock management or PES.

4.3 Assessing costs

Transaction costs

The experience with PES implementation shows that transaction costs are extremely varied and increase substantially when: many smallholders and multiple actors are involved; institutions and property rights are weak; and costs of social and environmental data collection are high (Wunder 2007). For example, transaction costs for PES schemes targeting carbon sequestration in Mozambique were estimated at 66% of the total costs, in contrast to transaction costs in the US which were estimated at 1% (Alston et al. 2013).

In theory, incentives plus associated costs should be less than or equal to the ecosystem value. However, depending on the context, transaction costs may be so high making PES scheme provision unsustainable—this is a major risk that needs to be assessed prior to implementation.

Transaction costs include the costs of negotiation, and monitoring and enforcement. In Costa Rica, the overall cost of managing the PES was roughly 7% of the total annual budget (Pagiola et al. 2005). To reduce transaction costs buyers of ecosystem services typically prefer not to negotiate with many individual smallholders and, therefore, may specifically exclude small independent farmers from participation.

A solution to abating transaction costs is the use of group contracts or bundling ecosystem services. For pastoralists this may mean targeting households that combine herding for example, however impacts on equity should be taken into consideration.

Financial sustainability

PES programs can suffer from financial inefficiencies when: i) transaction and fixed costs for the implementation schemes are too high; ii) sustainable practices would have continued or been adopted anyway without incentives; and iii) when incentives do not result in the intended changes in practices or ecosystem outcomes. These situations essentially mean that less environmental service is generated per dollar spent.

The financial sustainability of a PES program thus depends on the evidence that incentives serve as a multiplier effect in ecosystem provision. Assuming that this is the case, how can PES programs ensure permanence and, therefore, long-term sustainability?

Currently most PES schemes rely on funding from governments or large international organizations such as the Global Environmental Facility (GEF) [27]. GEF investments in PES projects have been significant: over USD70 million have been invested in 14 projects where PES is central to the project's design and an additional USD395 million in co-financing have been leveraged (GEF 2014).

As exemplified by Costa Rica's experience, sourcing funding from multiple streams has been the norm (see Box 7). Efforts to create self-financing systems for example by charging user-fees to stakeholders that indirectly benefit from ecosystem services have not been successful to-date.

User-fee payments link the benefits from ecosystem services to the buyer, for example, by leveraging complementary relationships between pastoralists and other stakeholders. An example of complementary relationship between agricultural farmers and pastoralists is the synchronization of grazing patterns with staple harvesting of agriculturalists. A form of non-monetary user-rights incentives (bags of millet, flour etc.) are then given to pastoralists by agricultural farmers for the provision of ecosystem services (fertilization of cropland and regeneration of soil through trampling and cleaning fields from crops to avoid the spreading of crop diseases).

27. The GEF's Biodiversity focal area strategy makes explicit reference to PES as a mechanism to help achieve two of its objectives: 1) the sustainable financing of protected area systems at national level and 2) the fostering of markets for biodiversity goods and services. In these two strategic programs, the GEF supports the design and implementation of PES schemes to support biodiversity conservation in protected areas and to compensate resource managers for ecosystem benefits associated with biodiversity conservation.

Box 7: Sourcing from multiple funding streams

Costa Rica's program has financed the bulk of its PES program by allocating to FONAFIFO 3.5% of the revenues from a fossil fuel sales tax (about USD10 million a year) (Pagiola 2002). From 2001 to 2006, the PSA program was supported by a loan from the World Bank and a grant from GEF, through the Ecomarkets project. The Ecomarkets project included a USD8 million grant from GEF, which can be considered a payment from the global community for the biodiversity services provided by Costa Rica's forests. Five million USD of this grant were used to make payments in biodiversity priority areas and the balance for institutional strengthening. Another GEF grant, for the Costa Rica component of the Regional integrated silvopastoral ecosystem management project, is also channelled through the PSA program. This project aims to generate both biodiversity conservation and carbon sequestration benefits by using a PES mechanism to encourage the conversion of extensive pastures to silvopastoral land uses.

A new project, Mainstreaming market based instruments for environmental management (MMBIEM), continued supporting the program from 2007 onwards. MMBIEM includes a further USD10 million grant from GEF. Conservation International (CI) is also paying for biodiversity conservation through the PSA program, by providing USD0.5 million to pay 50% of the cost of agroforestry contracts in the Osa and Amistad Pacifico conservation areas; and by paying 50% of the costs of planting up to 80,000 trees under agroforestry contracts in the buffer zone of Chirripó National Park.

Efforts have also been made to finance the PES program from service users, for example through the new water tariff. Although this latter payment is not voluntary, it has features which help it retain some of the desirable characteristics of voluntary payments. Efforts to generate financing from the local tourism industry to conserve the indirect benefits of natural ecosystems have not yet borne fruit. This creates a challenge for funding long-term payments to service providers in areas where neither water nor carbon payments are available (Pagiola et al. 2006).

Alternative sources of finances include, tapping into government subsidies, climate finance or revolving funds.

Subsidy schemes: It is argued that the opportunity cost of subsidies is the availability of funds for PES. An assessment[28] of the investment opportunities in Jordanian rangelands highlights that the total cost to the government of fodder subsidies to herders is substantial and amounts to JOD13.5 million per year (IUCN 2015). Louhaichi et al. (2016) advise the use of a cross-compliance schemes, where scarce resources dedicated to unconditional fodder subsidies are instead partially diverted to promoting sustainable rangeland management. For example, pastoral communities practicing water harvesting and grazing protocols could become eligible to receive feed subsidies (see Case example VI at the end of the report).

Climate finance: By tapping into climate finance PES can support the transition from current to improved management practices in grasslands. Where protection or restoration of grasslands provides quantifiable climate change mitigation services, payments for climate change mitigation services may complement other sources of finance and other policy tools for delivering grassland and livestock sector policy objectives (Wilkes et al. 2012). Table 4, taken from Options for support to grassland restoration in the context of climate change mitigation, summarizes the strength, weaknesses, opportunities and threats on using climate policy and finance as an entry point for grassland restoration.

28. The Jordan Ministry of Agriculture supported by the IUCN's Regional Office for West Asia (ROWA) is studying the prospects for large-scale and sustainable investments in the vast rangeland areas in the Jordan Badia and in the Jordan mountains. This study on investment options in the Jordan rangelands builds on recent Rangeland strategy of the Ministry of Agriculture (2013) and further elaborates on the Aligned national action plan to combat desertification (2020–2015) as developed with the Ministry of Environment (2015) see: MOA–IUCN 2015. Sustainably investing in rangelands–Jordan.

Table 4: SWOT analysis to use climate policy and climate finance as an entry point for a global agenda to restore value to grasslands

Strengths:	Weaknesses:
Restoring grasslands can provide food security, climate resilience and mitigation and biodiversity benefits at the same time	Low cost economic mitigation is limited according to IPCCC. The estimate is based on a single study and may not reflect true potential
Biodiversity value is exceptional i.e. 35 of the WWF "Global 200" ecoregions are grassland	Limited documentation of grassland restoration and its impact on livelihoods and the environment
	Economics of grassland restoration unclear for many ecoregions
	Many grassland areas are in non-equilibrium eco-zones where management will not determine soil carbon exchange
Opportunities:	Threats:
Low productive and unsustainably managed grasslands are a major driver of deforestation and will receive attention	Pastoral areas have diverse cultural heritage and indigenous land use rights are complex
Value adding through the adoption of sustainable intensification measures, value chain development activities and PES	Real potential to close the efficiency gap unclear
Climate finance can support the transition to more sustainable grassland management systems	

Revolving funds: Osano (2013) proposes a form of revenue sharing (RS) scheme implemented through a PES model. PES schemes can consider the establishment of a conservation or environmental trust fund (C/ETF) as a mechanism to ensure long term financial sustainability. CTF is a central pool of ecosystem finance that is centrally managed by an independent entity. CTF may be managed as one of three different types of funds: Endowments invest principal capital in perpetuity and only investment income or interest on the endowment is spent; Sinking funds spend a portion of the principal investment along with the investment income; and Revolving funds are maintained by earmarked revenue generated through taxes and fees among others (see Box 8 for example).

Box 8: Revolving fund—The Marine Legacy Fund

An example of a revolving fund is the Marine Legacy Fund (MLF) established by the Republic of Tanzania that derives revenues from commercial fishing licenses within Tanzania's exclusive economic zone, revenue sharing from coastal/marine ecotourism and taxation of the oil and gas industry. In turn, the MLF pays coastal communities to protect key habitats, as well as manage their own use of the coastal/ marine environment and finance operational expenses of key marine sectors (Ruitenbeek, J. et al. (eds.) 2005).

Assessing pricing and mode of payment

Whether incentives directly target ecosystem service provision (output-based payments) or are simply conditional on implementation of intervention (input-based payments) will depend on data collection costs, the type of ecosystem targeted and user preferences.

As already discussed above, in practice the high cost of directly monitoring ecosystem service output, the influence of natural variations on ecosystem impacts in rangeland settings and the difficulties in attributing changes in provision to individual sellers, most PES schemes either rely on observable proxies for output-based payments or simply rely on input-based payments (Smith et al. 2013). Basing PES payments on input-based payments or observable proxies rather than quantitative changes in ecosystem service provision can be problematic as it reduces the incentive to innovate. Notwithstanding the sub-optimal nature of such proxy management payment methods, they might represent a sensible, 'precautionary' strategy for dealing with uncertainty and incomplete information. For example, in Mongolia payments tend not to be ex-post or results-based, rather, they are typically made to enable performance. In some cases, support is linked to process-related conditions, for example the condition that there is an annual pasture management plan, that beneficiaries contribute 5% of the cost, or that collective institutions for range management are established (ADB 2014).

Pricing and mode of payment must also reflect the incentive preferences of sellers of ecosystem services. For example, some pastoralists (especially mobile and silvo-pastoralists) may prefer short-term income-generating activities rather than long-term investments with low initial returns (Dougill et al. 2012). Assessing the modality of payment will largely depend on contextual factors that ensure widespread participation and the sustainability of the PES program. In the process of deciding whether to participate in ecosystem services contracts, "sellers" of ecosystem services (pastoralists) take into consideration various characteristics of the contract. These include duration of the contract, requirements and punishments if not fulfilled, cost of participating, compensation in cash and/or in-kind payments[29] and whether payments should be made individually or collectively.

Ideally, payments are proportional to the level of services provided. Although this is tricky, it is not impossible as the silvo-pastoral project in Nicaragua demonstrates. To provide payments that are closely correlated to levels of service provision, they developed indices of biodiversity conservation and carbon sequestration under different land uses, then aggregated them into a single 'environmental services index' (ESI). Participating landowners enter into contracts under which they receive annual payments, over a four-year period, based on their net increase in ESI points (computed over the entire farm) relative to the baseline for their farm. Payments are made after land use changes have been monitored in the field (Pagiola et al. 2007).

Another option is the use of differentiated payments which can significantly enhance PES cost effectiveness (Smith et al. 2013). Overall, the OECD has argued that the degree to which ecosystem service payments are spatially targeted is the main determinant of the cost effectiveness of PES schemes. In particular, "the greater the spatial heterogeneity in costs and benefits of ecosystem service provision, the larger the gains that can be reaped by targeting and differentiating payments accordingly" (OECD 2010). Differentiated payments attempt to reveal the "true value" of the ecosystem provision, typically through reverse auction. A reverse (or inverse) auction is a competitive bidding process whereby sellers nominate particular actions or services that they can provide and the price at which they are willing to sell them. The competitive bidding process reveals the landowner's costs, allowing buyers to select the most cost-effective projects and thereby eliminating the risk of overpayment for ecosystem services which can occur in fixed-rate schemes. Funding is allocated in the order of the bidders providing the greatest service provision at the lowest cost, with the selection of bidders continuing until the available funds run out.

Reverse auctions may be well suited to situations in which there is one buyer and many sellers. Reverse auctions are popular in developed countries such as Australia, where they are found to be more cost-effective (see box). Questions have been raised over whether reverse auctions can maintain the improvements in cost effectiveness over the long term since repeated auctions allow bidders to adjust their prices over time. Another potential disadvantage of reverse auctions is the necessity for a large pool of bidders in order to induce competitive pressures and to reduce the risk of sellers colluding to influence prices.

BushTender, Australia[30]—using reverse auctions

Vegetation clearance on private land in Australia is high (in some areas as high as 80%). In order to protect and restore native vegetation on private land, the Victorian state government trialled the BushTender scheme in 2001. The scheme pays landowners to undertake conservation activities through a reverse auction process.

Landowners competitively tender for contracts by nominating conservation activities and their costs. Bids are ranked using a **biodiversity benefits index** and contracts are awarded to the projects which secure the greatest conservation benefits for the least cost. Successful landowners receive periodic payments for their management actions.

29. For detailed assessment of factors that need to be considered when deciding between direct financial payments and in-kind payments see pp. 10 and 11, Ellis-Jones et al. (2009).

30. See: Department of Sustainability and Environment (2008) *BushTender: Rethinking Investment for native vegetation outcomes. The application of auctions for securing private land management agreements*

The scheme has been very successful at securing ecosystem services on a transparent and cost-effective basis. So far, around 26,000 hectares of native vegetation has been managed and protected and the auction process has been estimated to be 700% more cost-effective than a fixed-rate scheme.

Experience on differentiated payments is largely concentrated in OECD countries and on private land, where setting up market-based incentives is easier; furthermore, there are no experiences of applying this in pastoral contexts.

The features of pastoralist systems may make this option unfeasible, however some innovations can be learned from past experiences.

Key messages:

Transaction costs

- The experience with PES implementation shows that transaction costs are extremely varied and increase substantially when many smallholders and multiple actors are involved, when institutions and property rights are weak and when costs of social and environmental data collection are high (Wunder 2007; Jack et al. 2008).
- A solution to abating transaction costs is the use of group contracts. For pastoralists this may mean targeting households that combine herding.

Financial sustainability:

- The financial sustainability of a PES program depends on the evidence that incentives serve as a multiplier effect in ecosystem provision.
- PES programs can suffer from financial inefficiencies when: transaction and fixed costs for the implementation schemes are too high; sustainable practices would have continued or been adopted anyway without incentives; or when paying incentives does not result in the intended changes in practices or ecosystem outcomes. These situations essentially mean that less environmental service is generated per dollar spent.
- User-fee payments link the benefits from ecosystem services to the buyer, for example by leveraging complementary relationships between pastoralists and other stakeholders.
- Efforts to create self-financing systems, for example, by charging user-fees to stakeholders that indirectly benefit from ecosystem services have not been successful to-date.
- Alternative sources of finances include tapping into government subsidies or revolving funds.

Assessing pricing and mode of payment

- Assessing pricing will largely depend on policy factors that target socio-ecologic impacts. For example, whether the incentive is directly targeting ecosystem service provision (output-based payments) or simply implementing the intervention (input-based payments).
- Pricing must reflect the tendency for pastoralists (especially mobile) to prefer short-term income-generating activities rather than long-term investments with low initial returns.
- Basing PES payments on input-based payments or observable proxies rather than quantitative changes in ecosystem service provision reduces the incentive to innovate.
- Modalities of payments are important factors affecting the take-up of PES schemes. The various characteristics of the contract to consider include: duration of the contract; requirements and punishments if not fulfilled; cost of participating; compensation in cash and/or in-kind payments; and whether payments should be made individually or collectively. Choice experiments will help reveal preferences on modality of payment.

4.4 Evaluating cultural and equity concerns

Incentives and behavioural change

Clearly building trust by piloting projects, engaging with community (and not only targeted sellers), closing the communication feedback loop by discussing impacts to pastoralists and community members are ways to build consensus and ensure uptake and continuity of the scheme. Like other development programs, continuous participatory processes[31] are essential.

However, having a "human-centred" design may not be enough to ensure a sustainable change in behaviour. So what is the role of incentives in changing behaviour?

In many, if not most, cases, it would be hoped that PES would result in long-term improvements in, or at least maintenance of, rangeland conditions, which would result in improvements in livestock productivity. However, discrepancies between short-term and long-term incentives and other dynamics may reduce incentives to participate. The market-based approach to PES generally assumes that financial incentives will be sufficient to change resource management practices. In reality, there are two major problems with this conclusion.

First, financial incentives alone are likely to be insufficient motivators to change behaviour, as external factors such as livestock markets and the cultural values attached to commodification of livestock impact behaviour. However, exactly how incentives affect behaviour remain to be tested. In situations in which the environmental actions targeted by a PES scheme requires reduction in grazing pressure or otherwise may reduce individual livestock owners' returns, the willingness to participate may be very low. This may be compounded when there is good access to markets and when a greater percentage of household income depends on livestock sales. PES schemes may have little impact in these cases unless the PES incentives are sufficiently high, which could make the PES program financially unsustainable.

What this suggests is that the mechanisms through which PES incentives affect behaviour are variable and dependent on several factors. Though this hypothesis remains untested, it highlights the importance of understanding local livestock markets and the cultural values attached to commodification of livestock when designing PES schemes.

Second, there is increasing empirical evidence that perverse outcomes in stewardship behaviour might result from biodiversity programs with financial incentives. There are several psychological explanations to these perverse outcomes. For example, financial payments can run the risk of "crowding out" behaviour by reducing internal motivations or can create the perception that it is the duty of someone else to contribute to the provision of biodiversity and ecosystem benefits (Rode et al. 2014). Understanding the underlining psychological mechanisms that affect incentives is important to prevent crowding out and to foster "crowding in". Such analysis could investigate, for instance, the conditions in which short-term crowding out effects can be expected to crystallize into changes in values and mindsets.

For instance, crowding out due to frame-shifting[32] may influence behaviour only temporarily and subside after incentive schemes have ended (Gómez-Baggethun et al. 2010), whereas changes in values and mindsets are more persistent, with potential long-term consequences for biodiversity conservation (Barton 2014).

Finally, the impact of incentives is acutely context-dependent. Pastoralist populations differ widely with respect to mindsets, values and the social norms governing the use of their natural environment as well as their relationships

31. Understanding the perception of environmental resources by pastoralists is an important element in planning sustainable use and management of rangelands. One example is using participatory mapping approaches using satellite imagery to explore how pastoralists differentiate and characterize their grazing areas see: by Wario et al. 2015. *Shaping the herders' "mental maps": Participatory mapping with pastoralists' to understand their grazing area differentiation and characterization.*

32. Frame-shifting explains how when shifting from social to a monetary way of thinking explains why low payments reduce participation in a community activity compared to no payments (Kerr et al. 2012).

with it. Pastoralists are socially and spatially embedded and differences in gender, age, religion, ethnicity, education and family position and the strength and breadth of social networks, social norms—and personality—all impact rangeland management behaviours. For example, the assumption that profit maximization and productivity are key drivers of pastoral livelihood systems may be misleading. Especially where climatic and market risks are pervasive, herd management may be oriented more towards risk management or saving. Therefore, factors that maintain wealth in terms of breeds, herd sizes and compositions become more important (Silvestri, et al. 2012). This has been shown to be the case in southern Africa where evidence assembled indicates that the general lack of involvement in selling livestock is because of the propensity to save through livestock. For example, in Botswana, despite government policies that make the livestock sector artificially attractive, few pastoralists engage in sales (Behnke 2008).

The point is that the signal sent by a payment or a fine can vary considerably across different cultures and populations. As noted by Bowles and Polonía-Reyes (2012, p.416): "crowding out does not follow from the use of incentives per se, but rather from the meaning that the incentives convey to the participants".

There are solutions however to these issues and they lie in aligning external motives (i.e. payments) with internal motives (i.e. existing environmental stewardship) by understanding deeply cultural and social aspects related to herding and rangeland management.

Taking the idea of aligning external and internal sustainable resource management motives further, "faith-based conservation" models could be integrated with PES schemes, as they can provide a non-monetary solution for sustainable rangeland management. Human interactions, social pressures and context specific spiritual values that have shaped the ethics of land management practices can play a greater role in sustained ecological service provision than purely material incentives. For example, the *Maqasid* model, an Islamic version of the human development model, and Islamic ethics and environmental laws are the foundation of *Hima* systems (Suleiman et al. 2013). Promoting these values—throughout different governance levels—by supporting the role of elders, councillors and religious figures in divulging such values, becomes important in sustaining the moral fabric in communities.

Equity

Reward schemes based on payments for ecosystem services that target poor smallholders do exist, as exemplified by ICRAF's two initiatives: *Rewarding upland poor for environmental services* (RUPES) program and the similar *Pro-poor rewards for environmental services in Africa* (PRESA). Both RUPES and PRESA highlight social mobilization, which represents community-based action to socially and politically empower communities to engage in PES schemes.

But even when PES programs are "pro-poor" this might not mean equity is achieved. Equity[33] is a relative concept that must embed local perceptions and understandings of "equity". Furthermore, care must be taken with homogeneous and simplistic labels which deny the nuanced, complex reality within which poor, landless, women and youth pastoralists operate in. With this in mind, concerns of the impact of PES on the poor, the landless or those lacking formal rights, women and the youth are considered here.

Disparities in wealth and poverty

Pagiola (2002) stresses that PES is not intended as a mechanism for poverty reduction, although it is expected to have some impact through additional income for poor participants and in the long run benefits from healthier ecosystems. Others suggest the contrary, and increasingly PES programs do focus on social, as well as environmental impacts, because the assumption is that both are inextricably linked.

33. Equity in process and decision-making refers to participation in the design and setting of rules and inclusion in strategic management. Equity in access and outcomes relates to the distribution of benefits (Porras 2010).

Poverty is an important dimension to consider. In practical terms it widens the PES funding base, including the possibility to tap into poverty reduction funds as is already happening in the South Africa's Working for Water (WfW) national PES program which is funded from a national poverty reduction fund.

The links between PES and poverty can be summarized into three sequential questions, from direct to derived effects, which cover the spectrum of equity impacts (Wunder 2008: 287; Silvestri et al. 2012):

1. to what extent do poor people participate in PES schemes as buyers and sellers of environmental services? (Participation filters)

2. if the poor become ecosystem service sellers, does this make them better off? (Effects on sellers)

4. how are other, non-participant poor affected by PES outcomes? (Derived effects)

In most programs, the participation of poor households is limited by high transaction costs, institutional and technical barriers, and lack of information about the scheme, (OECD 2010). In other PES schemes such as the RISEMP project that promotes silvo-pastoral land use to benefit livestock production (box), poorer households were equally able to participate as much as their wealthier counterparts (Wunder et al. 2008).

Simply targeting the poor may not be enough to ensure equity is addressed. FONAFIFO for example found that using social filters to select participants and ensure the poorest are targeted is cumbersome and may not be useful as poverty is a relative issue. They find that the challenge is to design a new filter that is relatively easy for local officers to apply without affecting administration and transaction costs and which provides an effective entry point enabling more vulnerable farmers to participate in the PES program.

The bottom line is that if PES schemes also want to target social issues, targeted financial incentives alone are unlikely to have large marginal impacts. Instead PES schemes must be carefully crafted to reduce barriers to participation and focus on targeting social aspects such as water, marginalization from productive land, displacement from mining industries, or limited mobility for economic or political reasons. Through non-monetary incentives such as capacity building or improving access to markets, PES schemes can become an instrument to alleviate social strife while maintaining ecosystem service provision. Of course, this complicates the design and management of PES schemes.

Landlessness and lack of formal land titles

PES schemes tend to exclude smallholders due to high transaction costs, uncertainty of formal land titles and their limited impact on ecosystem services (Engel et al. 2008; Pagiola et al. 2008). At present, the beneficiaries of payments derived from most PES schemes are landowners who can enter into contractual agreements with institutions making the payments (companies, government agencies, NGOs, etc.). In this respect, PES schemes are often inappropriate mechanisms for poverty alleviation because they exclude the landless—a characteristic of a significant number of pastoralists in developing countries.

Thus, to ensure PES benefit the landless pastoralists, they must be carefully designed to empower pastoralists without creating a disequilibrium, which would disempower other stakeholders. This is extremely challenging. For example, PES can empower local communities by aiding the formalization of collective land tenure rather than the individualization of land tenure; however, by doing so they may disempower mobile pastoralists by increasing the economic "value" of common property land or limiting access to "marginal" pastures. This aspect is especially critical for mobile herders in extensive pastoral systems which can easily become marginalized from taking part in land-related decisions and denied access all together based on property rights claims.

Another example of how incentive schemes have disempowered the landless is through the eviction of pastoralists by afforestation of exotic trees on grazing land. Tension between foresters and pastoralists are further increased when fast growing, drought resistant, species are favoured over indigenous fodder trees, which provide alternative

protein sources for livestock. As a remedy, Inam-ur-Rahim et al. (2011) propose the use of PES schemes to reduce the negative impacts of afforestation programs by planting indigenous fodder trees and shrubs to increase grazing accessibility for landless and mobile pastoralists in northern Pakistan (see box).

Box 9: Using indigenous fodder trees to increase grazing accessibility for landless and mobile pastoralists in northern Pakistan

In Pakistan, plantation campaigns between 1980 and 1999 reduced access to free grazing areas for mobile herders by 54.5% and reduced access to leased winter grazing areas by 75.9%. Despite an increase in grass and tree cover on the protected sites, the planting of exotic species replacing traditional silvo-pastoral forages was perceived negatively by nomadic grazers. As a result of the program, average herd size of the landless pastoralist decreased by 50%. About 25% of the landless mobile sheep and goat herders sold all their animals and ended up as cropping labour or finding daily wage labour elsewhere. The net result was that landlords, having ownership rights but no direct dependence on hillsides, were rewarded by reaping the benefits through sale of fuel from wood and could increase their control over the hillside, while the landless herders were left to bear the cost (Inam-ur-Rahim et al. 2011).

Gender

There are surprisingly few studies that empirically assess the impacts of PES schemes on women and the extent of women's participation as suppliers of environmental services. For example, in *Greening livestock: Assessing the potential of payment for environmental services in livestock inclusive agricultural production*, (Silvestri et al. 2012) a review of 200 references of PES schemes in the literature noted that less than 5% dealt with gender specific aspects or impacts of PES.

Nevertheless, women are often the backbone of agricultural and pastoral labour, for example women form 43% of the agricultural labour force in developing countries (FAO 2011). They also represent 70% of the world's poor and constitute two-thirds of poor livestock keepers estimated at 400 million people worldwide (FAO 2012).

In certain countries, the role women for pastoral related activities is primordial. In Iran for example, more than 86% of the milking and 42% of the feeding, watering and health care is done by women (FAO 1994).

Interestingly, women also collect firewood while herding, meaning they hold precious insights on changes in rangeland conditions and vegetation cover as well as sustainable rangeland management practices. Moreover, it has been shown that women are more knowledgeable regarding traditional remedies to treat sick livestock and are better at spotting parasites and noting changes in milk productivity or the dung, indicating that the animal is sick.

This offers an opportunity to integrate women's knowledge systems and perceptions[34] into the design of PES schemes for rangeland ecosystem impacts.

When assessing opportunities for operationalizing PES schemes and ensuring gender equity, it is important to note that the division of labour between men and women in pastoral communities is not static[35] (Hatfield and Davies 2006).

It is likely that external pressures such as war, globalization and climate change have shifted gender roles in many pastoral communities (Jenet et al. 2016). In some societies women are beginning to play a larger role in pastoral societies, partly by default as men look for work elsewhere or as young people abandon herding livelihoods.

34. Women's perception of drought, for example, is different from that proposed by men and scientists. Their role and, therefore, views within a livelihood frame offer complementary perceptions and consequently alternative coping and adapting strategies (Nori et al. 2009).

35. For example, Guyo (2017) studies how the role of Borana women has changed with colonization. It demonstrates that while the status of Borana women was not completely equal to that of men, the incorporation of the Borana into the colonial state increased inequality by enhancing male economic and political authority relative to that of women through the commercialization and commodification of livestock and the implementation of post-World War II social reforms that blurred the social status women enjoyed before.

It is important to note that the solution to promote equitable distribution of PES payments may not be as easy as simply transferring incentives directly to women. Sensitive cultural aspects—for example gender and age, regulated powers and relationships between men and women—should be taken into consideration to avoid creating disequilibrium in existing social structures. For example, promoting the commodification of milk in absence of a sound understanding of the gender dimension of the milk economy and the nuanced relationship with the value chain can shift control of milk marketing to men while trying to empower women (FAO 2013).

Some additional actions that need to be considered when designing equitable PES schemes for women include:

Capacity building. For example, the Costa Rica's national PES program charges a special fee that is then used to support women to acquire land to enable their participation in the PES scheme.

Collective action and social capital. Collective action—the voluntary action taken by a group of people to achieve common interests—can contribute to building women's social capital by improving information exchange and resource distribution, to pool risks and ensure that women's voices are heard in decision-making at all levels (FAO 2011). Women's relationships with natural resources are likely to be affected by the land management practices enforced by PES initiatives. Achieving scale through pooling resources can help women farmers overcome some of the constraints as individuals.

Gender initiatives. There are support initiatives which can be harnessed to inform PES design for example in 2010 a gathering of pastoralist women was organized by IFAD resulting in the Mera declaration[36].

Monitoring and evaluation of gender outcomes. Monitoring and evaluation of program performance will help assess the quality and impact of PES programs in terms of equity and can improve efficiency and effectiveness over time.

Youth

The impact of PES on young people remains largely unaddressed; however, it may be important to understand such mechanisms for pastoral communities given that "young people" are the future of sustainable rangeland management and therefore ecosystem service provision. The main concerns linking ecosystem service provision and young people in pastoral communities are: the livelihood-education trade-off often faced by pastoralists (inequitable access to education) and youth migration.

Many of the development policy challenges for pastoralists result from the belief that pastoralists should conform to a more sedentary way of life. For example, current rural education provision is inappropriate for the needs of pastoralist communities[37]; essentially it asks families to choose between education for their children and their livelihoods. This attitude prevents many pastoralists from attending school and in fact pastoralists often exhibit some of the highest rates of illiteracy. A growing number of initiatives are now being proposed that allow herding, education and formal learning to move hand in hand (Krätli and Dyer 2009). PES may incentivize non-formal education that is deemed to support future sustainable rangeland management such as promoting traditional-knowledge, environmental values and sustainable livestock management practices.

Youth migration is another aspect to consider as young pastoralists are vectors of modernism through technology and migration. The increased professional mobility linked to livelihood diversification and urban migration drive young pastoralists away from herding and livestock management practices. As such young people may become less sensitive to the importance of rangeland conservation compared to women or elderly who have continued to practice

36. See https://www.iucn.org/content/mera-declaration

37. For a detailed analysis see Krätli (2001). *Education provision to nomadic pastoralists: A literature review.* Some issues include: Permanent schools with year-round classes do not accommodate pastoralist communities, school hours do not allow for the domestic duties of pastoralist children, very few teachers are willing to work in remote areas that lack basic services, the focus of studies does not match the skills and competencies needed by pastoralist communities, cattle raiding disrupts movement and travel to schools.

pastoral livelihoods in rural areas. PES programs that target young people should take the marginal ecosystem impact of incentivizing young people versus other social groups into consideration. For example, if young people are not interested in pursuing pastoral livelihoods in the future, simply targeting them may not generate long-term ecosystem service provision.

Key messages:

Incentives and behaviour

- Participatory processes and "human-centred" PES design may not be enough to ensure a sustainable change in behaviour. The key question is: what is the role of incentives in changing/maintaining sustainable behaviour?
- Financial incentives alone are likely to be insufficient motivators to change behaviour, as external factors such as livestock markets and the cultural values attached to commodification of livestock impact behaviour. Testing how local livestock markets and the cultural values attached to commodification of livestock affect behaviour reveals the expected impact and financial sustainability of PES schemes.
- There is increasing empirical evidence that perverse outcomes in stakeholders' stewardship behaviours might result from *financial* incentives. There are eleven psychological explanations to these perverse outcomes. For example, financial payments could run the risk of "crowding out" behaviour by reducing internal motivation or create the perception that it is someone else's duty to contribute to the provision of biodiversity and ecosystem benefits.
- The impact of incentives is extremely context-dependent. Pastoralist populations differ widely with respect to mindsets, values and the social norms governing the use of their natural environment as well as their relationships with it. For example, the assumption that profit maximization and productivity are key drivers of pastoral livelihood systems is misleading. Especially where climatic and market risks are pervasive, herd management may be oriented more toward risk management or saving. Therefore, factors that maintain wealth in terms of breeds, herd sizes and compositions become more important.
- The signal sent by a payment or a fine can vary considerably across different cultures and populations. As noted by Bowles and Polonía-Reyes (2012), p.416), "crowding out does not follow from the use of incentives per se, but rather from the meaning that the incentives convey to the participants".
- The solutions lie in aligning external motives (i.e. payments) with internal motives (i.e. existing environmental stewardship), by understanding deeply cultural and social aspects related to herding and rangeland management.

Equity

- In most programs, the participation of the poor households is limited by high transaction costs, institutional and technical barriers, lack of information and weak capacity for negotiation.
- If PES schemes also want to target social issues, targeted financial incentives alone are unlikely to have large marginal impacts. Instead PES schemes must be carefully crafted to reduce barriers to participation and focus on targeting social aspects such as water, marginalization from productive land, displacement from mining industries, or limited mobility for economic or political reasons.
- Landless or lacking rights: At present, the beneficiaries of payments derived from most PES schemes are landowners who can enter into contractual agreements with institutions making the payments (companies, government agencies, NGOs, etc.). In this respect, PES schemes are often inappropriate mechanisms for the landless—a reality for many pastoralists in the developing world.
- Gender: The division of labour between men and women in pastoral communities is not static. For example, it is likely that external pressures such as war, globalization and climate change have shifted gender roles in many pastoral communities. In some societies, women are beginning to play a larger role in pastoral societies, partly by default as men look for work elsewhere or as young people abandon herding livelihoods.

  - Women hold precious insights into changes in rangeland conditions and vegetation cover as well as sustainable rangeland management practices. This offers an opportunity to integrate women's knowledge systems into the design of PES schemes for rangeland ecosystem impacts.
  - The solution to promote equitable distribution of PES payments may not be as easy as simply transferring incentives directly to women. Sensitive cultural aspects should be taken into consideration to avoid creating disequilibrium in existing social structures.
- Youth: The impact of PES on young people remains largely unaddressed; however, it may be important to understand such mechanisms for pastoral communities given that young people are the future of sustainable rangeland management and therefore ecosystem service provision. The marginal ecosystem impact of using incentives targeted at young pastoralists may be high (and have important positive generational impacts) or it may be lower than targeting other social groups such as women and the elderly.
  - The main concerns linking ecosystem service provision and young people in pastoral communities are: the livelihood-education trade-off often faced by pastoralists (inequitable access to education) and youth migration.
  - PES may incentivize non-formal education that is deemed to support future sustainable rangeland management such as promoting traditional-knowledge, environmental values and sustainable livestock management practices.
  - Youth migration may result in young people becoming less sensitive to the importance of rangeland conservation compared to women or the elderly who continue to practice pastoral livelihoods in rural areas.

4.5 PES structure

The key actors in any PES structure are buyers, sellers, intermediaries and knowledge providers. Each of these elements is explored in the following section focusing on pastoralists and rangeland settings.

Buyers of ecosystem services

Buyers' perspectives are centred on opportunity costs, ensuring financial sustainability, due diligence and relationships with institutions, location, as well as benefits and costs. Identifying buyers may be difficult if there is no proof of concept of impact, therefore it is likely that at the beginning buyers will mainly be NGOs and governments, however in the long run private institutions should be engaged as well. This is possible by showing how engaging in PES schemes can benefit private institutions.

A review of PES schemes in rangelands in *Making grasslands sustainable in Mongolia: International experiences with payments for environmental* (ADB 2014) finds that for large PES schemes (>100,000 ha), federal and subnational state funds are the most common sources of funding (and therefore buyers), while for small schemes (<100,000 ha), private funds and international donor funding have been common.

Public sector PES participation is high in Europe and Asia (with a tradition for public-sector environmental management), yet very low in sub-Saharan Africa, where public sector institutions have lower capacity to organize PES schemes. Latin America, the prime region of PES implementation, displays a large variety of arrangements.

Despite the hope for PES mechanisms to leverage private finance, governments have been the main buyers of ecosystem services in rangelands across the developing world, perhaps because rangelands and other targeted ecosystems are often formally under state tenure with governments typically seen as playing the role of managing this "public good" (as is the case in Tunisia).

Public and private PES differ significantly. Commercial PES (private for-profit company) and the non-commercial (non-governmental not-for-profit organizations) exhibit distinct patterns with respect to ecosystem service focus and

financing sources (Ezzine-de-Blas et al. 2016) For example, private finance is typically concentrated in smaller-scale projects, most likely reflecting the willingness of private buyers to pay for environmental services with local benefits, which can easily provide anecdotal evidence of impact.

Sellers of ecosystem services

Defining the seller and, therefore, recipient of PES incentives, is particularly challenging in pastoralist communities. There are two aspects, the *identification* and the *legitimization* of sellers. Three sources of challenges are identified: heterogeneity of relationships, dichotomization of herd management and ownership, and informal governance systems.

Heterogeneity of relationships: The heterogeneity of pastoralists' relationships with rangelands is likely to complicate strategies for targeting sellers in a way that ensures uptake. For example, pastoralists might differ in terms of what rangeland products they rely on (forage, fuelwood, medicinal herbs) in terms of exploitation levels (herd sizes) and land rights (in terms of access, use, management and exclusion rights) (Dutilly-Diane et al. 2007).

In addition, the interdependence between pastoralists and other stakeholders such as farmers and landowners should also be assessed. Different parties may have interests in the same area of land and all may need to be engaged by scheme proponents. For example, a landscape may be communally used by agricultural farmers and pastoralists. The landlord may need to give consent for a tenant farmer to take part in a PES scheme, while a farmer may decide whether and how pastoralists can glean on the remaining crops. Although the PES scheme targets pastoralists, the landlord and farmers might seek to negotiate a share of the payment.

As mentioned earlier, when faced with a large number of heterogeneous users, cost efficiency can be improved through differential payment schemes (OECD 2010). However, the greater the heterogeneity of users the greater the average cost of collective action for implementing a PES program. This is an important point as it suggests that the impact of various PES programs is likely to differ across different types of users, meaning that negotiating costs among the different users is likely to be quite high. Determining a schedule of who should receive benefits and how much may be quite contentious, though groups may agree to a solution that all PES payments be put toward investment in provision of local public goods (wells, schools, health clinics, roads), functioning like local administrative revenue.

Dichotomization of herd management and ownership: Increasingly herders herd and manage livestock that they do not own. The increasing advent of absentee herd owners is problematic as it complicates livestock tenancy arrangements and risks eroding sustainable livestock rearing practices[38]. Who should be targeted by PES schemes in these cases: herd owners or herders?

Herders' management practices are most likely to affect the level and quality of ecosystem provision in grazing lands. At the same time, livestock owners may be able to impose grazing practices on herders and they may in fact have a large impact on ecosystem service provision given that they may own many livestock herds dispersed among different herders across the landscape. Thus, targeting livestock owners could have a greater "ecosystem impact", however rewarding livestock owners may be counter-productive on the distribution of economic power within pastoralist communities.

38. In some cases, these absentee herd owners disrupt traditional herding strategies; for example, demanding that herds are moved according to the dictates of the market rather than the seasonal availability of resources, thereby contributing to rangeland degradation. In North Africa, for example, absentee herd owners insist that herds remain near market centres where they can be quickly traded, leading to widespread degradation in those areas and underutilization of distant rangelands (Davies and Hatfield 2007). In Iran, rich absentee herd owners own large herds which are seasonally transported and managed by hired herders (usually illegal Afghan workers) to kraals owned in conservancies. This has led to overgrazing pressures within nature conservancies such as Touran National Park. These activities are complex to control because of the economic and social power of the herd owners (Abolghasemi and Ashayeri, personal communication, March 2017). On the other hand, some countries with absentee herd owners, such as Mongolia, show few associated environmental impacts and mutually beneficial relationships exist between absentee herd owners and herders (e.g. access to transportation and labour that improves access to remote pastures as well as connectivity to markets) (Davis et al. 2016). However, absentee herd owners are an important issue for pastoral tenure, as they are usually wealthier (inflating herd/flock numbers) and have stronger networks of influence than the pastoralists themselves.

Assessing the structure of pastoralist systems in terms of herder-owner relationships, the ratio of livestock owners to herders in a particular target area, or average number of livestock owned by herders can help decide who to target best and how to ensure maximum socio-environmental and minimal inequality impacts.

Informal community governance systems: Sellers of ecosystem services can be more easily *identified* by targeting individuals that are part of pre-existing rangeland or grazing-land governance structures, that are formally recognized, have proven to provide ecosystem service impacts and have the capacity to incorporate PES schemes. However, the informal nature of most community-based governance pastoral systems may make it hard to *legitimize* sellers of ecosystem services. The literature review, Tunisia's case-study and the preceding analysis shows that it may be easier in communities to target mixed pastoralist systems such as agro-pastoralists or silvo-pastoralists or pastoralist associations (PU or GDAs) because the relationship to their land and the intra-relationships between owners and workers is more clearly defined.

Intermediaries and knowledge providers

Intermediaries are actors linking buyers and sellers in a PES scheme who can help with scheme development and implementation. They are often associated as the relationship builders and trust enhancers *facilitating* the delivery of PES schemes.

Knowledge providers differ from intermediaries in that they are not involved in project management. Instead they include a wide range of actors who can *support* the design of PES schemes, for example, scientists, regulators, resource management experts, valuation specialists, land use planners. Knowledge providers form the knowledge-base on which PES schemes are designed.

Both intermediaries and knowledge providers can be seen as the mechanisms whereby feedback can be integrated to improve PES effectiveness.

Key messages:

- Despite the hope for PES mechanisms to leverage private finance, governments have been the main **buyers** of ecosystem services in rangelands across the developing world.
- *Identifying* and the *legitimizing* the **sellers** and, therefore, recipients of PES incentives is particularly challenging in pastoralist communities. Three sources of challenges (such as unequal distribution, conflict or free-riding behaviour) are identified: heterogeneity of relationships, dichotomization of herd management and ownership and informal governance systems.
- Solutions to these challenges include: i) using PES payments for the provision of local public goods (wells, schools, health clinics, roads), functioning like local administrative revenue; ii) targeting mixed pastoralist systems (agro-pastoralists or silvo-pastoralists) or pastoralist associations (PU or GDAs) because it is easier to define the relationship to their land and the intra-relationships between owners and workers; and iii) assessing the structure of pastoralist systems in terms of herder-owner relationships.
- **Intermediaries** facilitate PES implementation and **knowledge providers** support PES design.

5. Discussion

When discussing about the future of PES, Ferraro (2011) warns that the use of PES is unwarranted unless further evidence can show the link between incentives and ecosystem service provision (Ferraro 2011). Furthermore, the small number of properly conducted evaluation studies only show mixed evidence for actual impact on ecosystem services. The analysis on the practicalities of PES implementation conducted for this report, supported by the little (but increasing) empirical evidence, extensive literature review and Tunisia's case-study confirm Ferraro's alarming observations.

Having said this, PES schemes offer a window of opportunity to direct efforts and finances at the interconnection between livelihood systems and ecosystem service provision.

The following sections first discuss in detail some of the different aspects in which PES, as a solution to rangeland ecosystems, needs to be critically evaluated. Secondly, a summary of the protocol, designed to unearth information which helps understand whether and how PES schemes can be designed and innovated given context, is provided. Third is a summary of findings from applying part of the protocol to Tunisia, as a case-study. Finally, key "complementary solutions" to PES schemes are outlined.

5.1 Critique

Treating the root cause and not the symptom: For many contemporary rangeland-related programs, the theory of change for overcoming grazing pressure is based on behavioural change and technological fixes (ADB 2014). Indeed, over-reliance on simple and quick fixes provided by assistance and market facilitations may result in *path dependency* problems, whereby attractive policy choices in the short run will be hard and costly to reverse once they are deemed to be unsustainable in the long run.

These types of fixes not only create expectations at community level but they may also be unable to address deficiencies in broader governance, institutional or political factors which impact the welfare of pastoralists and rangeland ecological degradation. There is the risk that PES schemes also fall into path dependency problems by treating the symptoms of rangeland degradation rather than the underlying causes.

In some cases, directly addressing poverty, land tenure, governance, or other major constraints on improved resources management may have a greater impact on rangeland management—and be more cost-effective solutions—than the provision of financial incentives. Therefore, it is important to identify and target the root causes of rangeland degradation and treat the problem, as well as the symptoms. There are several examples which reveal that the root causes of rangeland degradation are political and governance decisions and that over-grazing is largely a symptom of these broader issues. For example, the promotion of water points in pastoral areas has induced pastoralists to reduce their movements, leading to overgrazing around the water holes (Owen-Smith 2011). Another example is banning the use of fire as a tool for rangeland management, which in some cases has given way to unpalatable and invasive species, further restricting the grazing areas available to pastoralists (FAO 2009). Both these policy decisions, the promotion of water points and banning of pasture burning have changed rangeland management behaviours resulting in either over or under-grazing.

Sustainability of PES and long-term impact: What happens once incentives are no longer available due to lacking funds or the end of a project? Will ecosystem services continue to be provided? What will happen to sustainable practices? What impacts will these changes have on pastoralists, post-PES implementation?

Paradoxically once a PES program ends, ecosystem services should cease to be provided because in theory PES programs should only be implemented if they can prove additionality. However, if long-term sustainability and permanence are core objectives, PES schemes should be viewed as an initial stimulation for process change, which should then lead to ecosystem provision without the need of external incentives.

As already discussed in detail in the "incentives and behavioural change" section, understanding the dynamics between incentives and behaviour outcomes will reveal the strategies needed to ensure long-term impacts.

One of the primary risks to the sustainability of PES schemes is that incentives can create expectations and weaken intrinsic motivations, eroding socio-cultural structures and ultimately resulting in worse off outcomes had the project not been implemented. Unmet expectations may lead to conflict. For example, in the long run pastoralists may expect continual support by government or other agencies in the form of incentives, which if unmet may deepen the animosity between pastoralist groups and governmental institutions. PES and incentives, like taxes and subsidies, might become appropriated as a political tool to gain consensus, complicating local governance. Recognizing how incentives change behaviours at the personal, community and national level is important because it can also be one of the greatest sources of perverse outcomes and unsustainability.

Maintaining baseline versus rangeland restoration: Should PES projects aim at maintaining baseline ecosystem service provision or restoring degraded rangeland (see Box 10)? What are the relative costs?

For many grassland-based livestock systems around the world, systematic documentation and analysis of costs of protecting versus restoring grasslands are still limited. Nevertheless, restoring value to grasslands may gain practical traction as an issue that intersects tactically with a range of policy arenas, for example climate change adaptation and mitigation, land degradation neutrality, biodiversity conservation and ecosystem service provision[39] (Wilkes et al. 2012). Despite the large number of restoration initiatives that have been established, few attempts have been made to systematically evaluate their effectiveness. Rey Benayas et al. (2009) performed a meta-analysis of 89 restoration assessments undertaken in a wide range of ecosystem types and found that restoration increased provision of biodiversity by 44% and ecosystem services by 25% (Rey Benayas et al. 2009).

Box 10: Example of PES incentives for grassland restoration

Without effective grazing management, the plantations revert to degraded rangeland. Such restoration is therefore ineffective without a change in the land use and management that caused the degradation in the first place. To minimize high management, monitoring and enforcement issues, several shrub plantation projects have been implemented. Specific social groups, such as extended families or pastoral cooperatives, are compensated during the shrub growing period (two–three years) based on the opportunity cost of grazing foregone and, thereafter, the identified group members are guaranteed exclusive use of the areas for grazing.

Beside range rehabilitation programs, the use of water-harvesting structures, such as small earth or stone dikes, to capture rainfall run-off is a complementary approach to improving rangelands and to reduce floods. Construction of check dams, recharge ponds or wells, or diversions in *wadis* will slow down the runoff water and will generally improve the recharge of water to the aquifer.

For more information see: Dutilly-Diane et al. 2007. *Could payments for environmental services improve rangeland management in Central Asia, West Asia and North Africa?*

39. Land degradation neutrality (LDN) is one example of a policy objective that has a dual focus on sustainable land management practices and the ecological restoration of degraded lands. The Intergovernmental Working Group's definition of LDN is a state whereby "the amount and quality of land resources, necessary to support ecosystem functions and services and enhance food security, remains stable or increases within specified temporal and spatial scales and ecosystems." LDN helps make the case for using climate policy and climate finance as an entry point for a global agenda to restore value to grasslands. LDN can also be an entry point for PES schemes (UNCCD 2015).

Perverse incentives: Is it worth the risk? If not designed appropriately PES incentives may generate similar perverse incentives as those created by subsidies. For example, in Syria to encourage domestic production of livestock, governments in the dry areas have typically provided highly subsidized forage to livestock owners. These subsidies have been shown to encourage overstocking and overgrazing by reducing herders' incentives to adapt herd sizes to forage availability. Furthermore, unsustainable land use practices are encouraged such as barley cultivation (Louhaichi et al. 2016).

The ecosystem benefits provided by a PES scheme may be compromised by leakage or moral hazard. One of the potential difficulties of PES programs is that the buyer of ecosystem services has less information about pastoralists' land management practice than the pastoralist himself, creating the potential for moral hazard and difficulties for enforcement and compliance. "Leakage" arises when the conservation problem being addressed by PES is shifted elsewhere, for instance, when a herder receiving payment shifts "overgrazing" practices to another piece of land that is not under the contract.

Other perverse incentives from PES depend on how incentive schemes are designed. For example, given that the ecosystem outcomes are landscape based, PES may favour sedentary pastoralists and any requirement of private property for participation, or overly prescriptive grazing management strategies risk breaking down traditional systems, feeding into sedentarization (FAO 2009). This might indirectly lead to negative impacts on the landless pastoralists such as loss of security and control of land, unemployment and restrictions on resource access (Kerr et al. 2012; Dutilly-Diane et al. 2007). Ultimately perverse incentives may result in a worse-off situation had the PES scheme not been implemented, so it is important to assess the pros and cons of PES implementation.

Alternative analytical frameworks: Looking beyond current development models and into the future, degrowth models are increasingly providing alternative analytical frameworks to the development discourse. Degrowth models bring in new assumptions that can help design PES schemes more sustainably.

Marangon and Troiano (2012) argue that PES can stimulate society to rethink human relations with the natural environment in the same way degrowth rationales do (Marangon and Troiano 2012).

Muniz and João Cruz (2015) discuss how PES schemes can fit into degrowth frameworks. They contend that although degrowth and PES have convergence points, they are conceptually and ideologically different because degrowth is an alternative response to the economic growth model that the PES programs rely on. If one considers applying PES under degrowth assumptions, a substantial reconceptualization of PES is needed where PES abandons market-based frameworks and is viewed as a transitioning instrument. The changes Muniz and João Cruz suggest are interesting to analyse because they in fact provide important insights into the future potential of PES schemes.

For example, valuation tools used to design PES schemes tend to view ecosystem services and nature as economically and monetarily negotiable. This brings considerable ethical implications as well as technical difficulties, which risk undermining human relationships with nature. PES should instead recognize the diversity of intrinsic values around nature, renouncing the unifying monetary perspective (Muniz and João Cruz 2015). This means PES needs to abandon the idea that incentives alone will change behaviour and instead embrace the idea that PES can be combined with context-specific projects that support and promote intrinsic values related to rangeland management. Furthermore, PES should avoid monetary payments or the logic of such payments because payments crowd out the intrinsic motivation to change.

This suggested evolution of PES recognizes that market-based views of environmental services risk oversimplifying complex ecological and cultural systems, inadequately addressing the social and institutional determinants that control land use and management decision making (Muniz and João Cruz 2015). PES schemes should therefore shift from market ideals towards a more holistic vision of PES implementation.

"PES, should abandon the logic of "buyers, providers, intermediaries and regulators", to reach a more holistic livelihood perspective in which social equity, environmental justice, local livelihood context and local socio-ecological

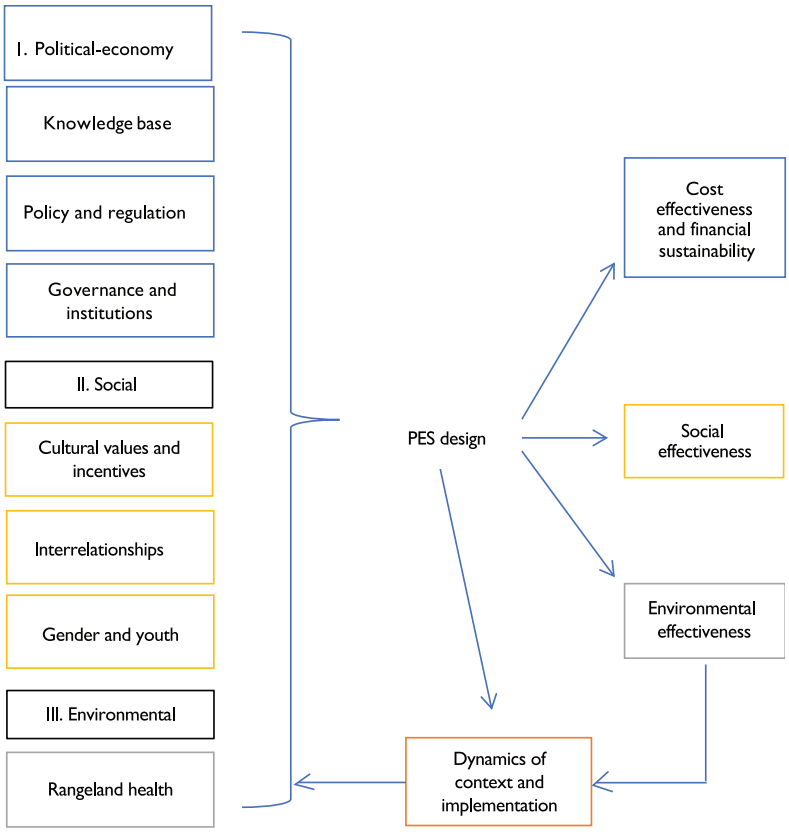
context must be embedded. With a holistic perspective, PES could be disentangled from their market ideology (even when they are not actual markets) and could be able to attend the plurality of values[40] and allow other languages to be considered."

Muniz and João Cruz further argue that incentives should not be viewed as a payment to conserve, or even less to provide a service, but to change practices and even empower people. "PES should create conditions for a retro-feeding mechanism to reach another more sustainable level; i.e. the incentives would be only an initial opportunity (as a transition instrument) to create socio-ecological resilience and autonomy"[41].

5.2 Summary of the scoping protocol

The scoping protocol (Pappagallo et al. 2017) is intended to guide national government agencies and facilitators hired by them, to undertake a rapid, country-level assessment to unveil challenges, risks and opportunities for operationalizing PES for (agro) pastoralists. Essentially, one of the overall aims of the protocol is to assess whether the country-context has the social, political, governmental, institutional preconditions for obtaining a greater ecosystem service value per dollar spent on incentives. The specific objectives are: 1) to assess contextual factors that can be expected to affect the impact, feasibility, scalability and durability of PES implementation at country-level and within specific contexts; 2) identify the institutions, buyers, sellers, intermediaries and knowledge providers which could be involved in the PES scheme: and 3) offer recommendations that help pave the way for future PES implementation.

Figure 3: Protocol Framework–scoping for PES implementation.



40. As already discussed, one important role played by pastoralists is the preservation of option values; they keep animals that have traits that may currently be of no commercial interest but which may be of huge value in the future if environmental and economic conditions change. Such traits include "survival" characteristics, such as the ability to fend for themselves and the ability to cope with diseases (FAO 2009).

41. For example, just as PES schemes could be directed to convert conventional agriculture into agro-ecological systems, which avoid the use of agrochemicals, prevent soil degradation and water contamination as well as improve soil and water quality and biodiversity. They can also be used to incentivize a transition to complementary agro-pastoral, silvo-pastoral systems or to sustain transhumant practices.

This diagram depicts the framework used to inform the scoping protocol. Four aspects of context: the political-economy context, the social context, the environmental context and context dynamics help inform the PES design. PES design in turn affects the three objectives discussed at the beginning of this report; environmental effectiveness, cost effectiveness/financial sustainability and social effectiveness. Context dynamics help assesses how environmental, socioeconomic and political contexts change over time and in turn how PES schemes must adapt to these changes in order to achieve the PES goals.

Three different phases of the investigative process are summarized here. For more detailed information, refer to the scoping protocol.

5.3 Country case: Piloting the scoping protocol in Tunisia

This section summarizes results from piloting some aspects of the preliminary version of the *scoping protocol* for assessing risks and opportunities in operationalizing PES for pastoralists in Tunisia. A review of the existing rangeland, forestry and PES-relevant literature in Tunisia was complemented with seven in-person interviews (see Annex 4 for list of respondents and questionnaires used) and attendance of the workshop "Good governance and management instruments of rangelands in south Tunisia" in Tataouine on 3 and 4 October 2017. The aim of the quick pilot was primarily to test out the methodological and practical challenges of applying the proposed scoping protocol to collect data.

First some of the relevant information collected is summarized, followed by a brief summary some of the challenges encountered when piloting the scoping protocol. It is important to note that given the limited timeframe, interviewees were selected through existing contacts of ICARDA personnel and pursued based on availability. As a result, the information collected only partially responds to the proposed framework for collecting PES-relevant information. For example, no information was collected on the social and environmental context (phase II and III) because pastoralists were not consulted and more interviews are needed for a more complete picture. In other words, this was not intended as a full-scale piloting of the protocol, but rather just an initial attempt to apply some parts of it.

Context

- Livestock production systems in Tunisia remain strongly dependent on purchased feed. Increasing livestock numbers and decreasing rangelands have led to a breakdown in the balance between production and offtake, resulting in heavy reliance on feedstock.
- Top-down sectoral approaches and policies reduce access to and management of forest and rangeland resources by local populations and local entrepreneurs. The allocation of rangelands to the private sector, combined with state aid for planting olive trees, encourage land clearing and conversion to olive plantations, with potentially large costs of environmental degradation and livestock feed deficits. Cereal and olive oil subsidies encourage excessive cultivation of marginal lands, which are prone to soil erosion and desertification, directly adding to the pressure on forests from livestock. In the absence of an integrated landscape management approach, these costs are being ignored. By and large, agricultural policies have been blamed to discourage the sustainable management of landscapes.

Rangeland management changes

- Twenty-seven per cent of Tunisian territories are classified as rangelands (2003) (DGF 2010). The surface area of rangelands in Tunisia has been decreasing from 6.1 million hectares in 2005 to 5.5 million hectares in 2012 (Hadri and Guellouz 2012).
- Opinions regarding the extent and seriousness of the degradation varied in interviews. It does seem that recognition of the seriousness of range degradation has led to the government plans for development of degraded rangelands. Local range improvement achievements during the last two decades have targeted 711,000 hectares using various techniques and activities aimed at increasing community awareness have been part of this (Daly 2015). Interviews suggested that the root causes of rangeland degradation can be attributed to the top-down approaches which have overlooked the complexity of customary land tenure and rangeland management. For example, on the one hand the privatization of collective lands and restructuring of governance systems has created conflict; on

the other hand, policies that promote agriculture and water extraction have resulted in unsustainable strategies reflected by the emergence of "subsidies captors", which result in crop encroachment (Nefzaoui 2004). These two factors have not only led to the reduction in rangelands but also their deterioration. Opinions on whether "overgrazing" is a symptom of previous agricultural and governance policies or not varied.

Livestock management changes

- Livestock production systems have shifted from purely pastoral to agro-pastoral and **large herds have been replaced by smaller, more sedentary and uncoordinated livestock management units.** Overall livestock numbers increased by 25% from 1990 to 2013 due to high population growth and artificially through import of feeds, feeds subsidies and feed transfer from favourable areas to unfavourable areas (Nefzaoui 2004).
- **The contribution of feedstock from rangelands decreased by about 39% in 25 years** due to the evolution in land use (expansion of cereal cropping and arboriculture). Feedstock has become the main source of feed for livestock, for example the use of supplements by small ruminants increased from 0–80% in three decades (Nefzaoui 2004).

Legal frameworks

- **The Forest Code:** There is no legal framework that directly targets rangeland-related governance in Tunisia. Currently the forest code is the "go-to" legal framework for pastoral-related governance. For example, article 75 of the forest code allows temporary occupation and concessions of state owned forest areas for undertaking silvopastoral development projects (Daly 2015).
- **Critique of the Forest Code:** There is a debate as to whether it is necessary to create a new pastoral code, given that the mandate of the Forestry Code is already to manage forests and rangelands. While some institutions are pushing for a new separate "*Code Pastorale*" (rangeland code), others prefer to limit expenses and time by keeping the existing forestry code (which includes rangeland codes). On the one hand, it is argued that a new "*Code Pastorale*" would take too much time, money and expertise which "Tunisia cannot afford at this stage" (personal communication, World Bank). On the other hand, it is argued that the forest code covers only about 33% of rangeland and is not suited for addressing rangeland management issues. This indicates that two-thirds of rangelands are arbitrarily managed, while the remaining third is managed by a code that is not adequate. This justifies the need for a new pastoral code (ICARDA 2017). It is agreed however that the forestry code needs to be improved to better prioritize pastoral and rangeland-related issues. The restructuring of the forest administration and the overhaul of the forestry code are actions included in the *Stratégie Nationale de Développement et de Gestion Durable des Forêts et des Parcours* (2015–2024), which has been politically endorsed (World Bank 2016). There is now a strong consensus on the need for institutional and management change.

Institutions

- **National level**: The Ministry of Agriculture (MARHP) intervenes in five key areas, one of which is the natural resources section. Active organizations in the forestry sector include the General Directorate of Forests (*Direction Générale des Forêts* DGF) which is responsible for applying the forest code and for managing, protecting and developing the state forests and other woodlands, in addition to grazing lands submitted to the country's forest regime.
- **Regional level:** Forest management is carried out within 26 Regional Commissariats for Agricultural Development (*Commissariat Régional de Développement Agricole*, CRDA) covering every administrative district in Tunisia[42].
- **Local level:** The creation of GDA in 1999, are an attempt to increase involvement of pastoralists in rangeland management issues. Participation of local populations is slowly being recognized as necessary for the protection and preservation of pastoral resources, though implementation of participatory processes is still superficial. Furthermore, consultation, information, communication and awareness-raising activities are largely inadequate (World Bank 2016).

42. For example, the Silvo-pastoral Development Office for the North West (ODYSEPANO) is a public institution, established in 1981, in charge of promoting agro-silvopastoral development in the five administrative districts of northwestern Tunisia. Its activities encompass implementing forest and agro-forestry plantations.

Governance

- Currently, most natural resource management decisions are taken at central level and are applied according to the hierarchical levels of the administration. This one-sided **top-down approach, dictated by legislation,** emphasizes on law enforcement for natural resource governance (World Bank 2016). However, capacity for law enforcement is limited, resulting in suboptimal rangeland management.
- There is a **high level of institutional fragmentation,** which complicates the coordination and coherence of development strategies and programs. In October 2016, the Ministry of Agriculture (MARHP) announced it would proceed with the necessary restructuring of the ministry. The first phase will focus on the merging of the institutions governing forests and rangelands (the General Directorate of Forests (DGF); the *Régie des exploitations* (Forest Harvesting Administration) and the Authority for Forest and Pastoral Development of the Northwest (ODESYPANO) (World Bank 2017).

Challenges and opportunities for PES implementation

- An important obstacle for natural resource-related project implementation is the fact that **administrative boundaries do not coincide with other kinds of territorial limits.** Natural resources and collective rangelands in particular belong to "Arouchs", whose geographical contours do not coincide with the administrative boundaries. As a result, most development projects have been built on the basis of administrative boundaries, generating jurisdictional conflicts that are difficult to resolve (ICARDA 2017).
- **Financial restraints.** In Tunisia, investments in the forestry and pastoral sector have mainly been implemented by the public sector, whose budgetary resources remain insufficient. PES design should find creative solutions that tap into alternative sectors, such as the private sector.
- **Institutional fragmentation.** The multitude of actors involved reveals the complexity and lack of coordination that characterizes the administration. This lack of a single management structure for rangelands, or a steering structure between the different entities, coupled with the lack of specialized skills in the pastoral sector within the DGF (particularly for steppe rangelands in south and central Tunisia), represents a major obstacle to the preservation and sustainable management of Tunisia's rangelands. This results in a weak consideration of the economic value and stakes of forests and rangelands, which results in budget cuts that penalize the development of the sector. Furthermore, **the absence of a specific institution for rangeland management** has given way to a multitude of institutions that only partially deal with rangelands; these institutions have different objectives. Capacity building prior to PES implementation should work on joining these fragmented views into a single holistic vision. This may mean re-structuring and organizing rangeland governance into a single entity that deals with all aspects related to the pastoral landscape.
- **Lack of participation and distrust.** Interviews with field practitioners revealed a degree of distrust of local populations towards the Tunisian administration resulting from previous failed experiences and diverging interests. In fact, the divergence relates to the nature of the priorities conferred to projects, since interventions often favour the protection of natural resources whose impacts on improving people's living and production conditions can only be envisaged in the medium and long term (World Bank 2017). However, the new so-called participatory approaches try to remedy this handicap, but the successes in this field remain limited and require institutional change and the creation of genuine "negotiating spaces" between public and private partners (Abaab and Genin 2004).
- **Leveraging priorities in agricultural policy.** Tunisian forestry policy is an integral part of agricultural policy, where investments for water infrastructure are highly prioritized (World Bank 2017). Given the relative priority of water-related policy at national level, water regulations could offer opportunities for the insertion of rangeland policy. For example, by considering agricultural and rural space as watersheds in which the upstream and downstream interventions maintain water quality and quantity. The use of national water/electricity institutions to pay for the protection of rangelands/forests has already been suggested, however these institutions are "not ready to play the game, as this is not seen as a priority" (Bennouna 2017). As mentioned previously, much research is needed in designing PES-schemes that are financially sustainable and independent of public budgets.
- Piloting the scoping protocol in Tunisia has brought to light several aspects regarding: i) the methodology for collecting PES-relevant information; and ii) the content and quality of the PES-related information. The main challenges encountered are summarized in three points, bearing in mind that these findings are based on a limited number of interviews.

- **Encountering scarce, inconsistent and contradictory information.** When researching for relevant literature and interviewing stakeholders, it was found that rangeland and pastoral-related information to be scarce and inconsistent. For example, it is difficult to access up-to-date basic data on the geographical extent of rangelands, the status of rangeland health and the size of the livestock sector. This is not the case for the forestry sector, which is more active in terms of research, policy and project implementation. In fact, the main literature source found in this study was related to forestry, which at times included rangeland-related information. Depending on who was interviewed, different and opposing views on rangeland and pastoral-related issues were encountered supported by diverging facts and figures. Of course, this is to be expected; however, the high degree of inconsistency experienced in this pilot reflects: a) the lack of reliable and consistent research in the field of pastoral development, which gives way to highly subjective interpretations on the context of rangeland management and pastoral livelihoods; and b) for the majority of those interviewed and those involved in pastoral policy and development, that knowledge regarding such topics was found to be basic. This suggests a higher-degree of politicization versus technical and practical expertise on the topic. Although it was not possible to target all of the most appropriate stakeholders for this pilot, informal discussions confirmed this general impression. This indicates that pastoral policymaking is nascent and relatively undeveloped (testament to this is the fact that there is no separate pastoral code and rangelands are managed under forestry codes), requiring extensive stakeholder dialogue (which is beginning to happen). PES implementation may be premature; in fact, basic knowledge on the theory of PES was largely missing (two out of the seven people interviewed had a solid grasp of PES concepts). Those who had PES knowledge suggested that such incentive mechanisms would not be a priority in the public policy sector. Incomplete data and limited knowledge is likely to be expected in most countries where pastoral research and development is lagging, making the task of implementing the scoping protocol challenging.
- **Who you speak to is just as important as what information you are collecting.** As a first step identifying and targeting the "right" interviewees will ensure useful and relevant information for PES implementation is collected. This is not as evident as it seems. In this respect, this study was relatively unsuccessful a) because the availability of interviewees was limited in the sampled pool and b) although the role and background of interviewees seemed to be relevant, during the interviews it was found that many did not have the level of practical and specific knowledge needed to provide the information required for the scoping protocol. In other words, "expertise" did not equate with deep knowledge on PES-related topics. Given the practical and specific nature of the knowledge needed for the scoping protocol, more planning is required to formulate the sampled pool and target the right interviewees. This is particularly important when implementing the scoping protocol under time constraints. Having said this, it is also important not be too prescriptive, as speaking to a wide variety of stakeholders (from pastoralists to development field practitioners to higher-level representatives) ensures various points of views can be incorporated. Experience from this research points to the fact that the right questions need to be asked to the right people, as such future iterations of the scoping protocol should improve on the specificity of the questions asked.
- **Subjective opinions versus objective facts.** One of the major insights has been the difficulty in interpreting, summarizing and communicating the various opinions collected in a way that wholly represents the contextual political narrative of pastoral development. For PES implementation, representing the complete picture of the political ecology of pastoralism using both subjective and objective information is fundamental. For example, as it emerged during the piloting experience, including the various opinions on the role of the GDA or the diverging views regarding the formulation of a new "*Code Pastorale*" is key to understanding the implementation challenges which are likely to be encountered. Further development in the data analysis methodology is needed for the scoping protocol; I found ranking questions to help focus the discussion and create a picture in terms of the relative priorities of the stated opinions.

5.4 Complementary solutions to PES

One of the major conclusions from the literature review and from the analysis of operationalizing PES schemes to (agro) pastoralists is that it is unlikely that market-based PES schemes alone will change behaviour or maintain practices that produce favourable ecosystem outcomes.

Deeply understanding cultural values related to owning cattle, managing rangelands, money, social-structures and community-based decision-making help provide creative solutions that align internal and external motives.

It is argued here that PES schemes need to be linked to complementary solutions that are more sensitive to the challenges discussed throughout the report. Several creative pathways can be used to leverage PES schemes, while avoiding perverse outcomes. The examples reported in the following section are not intended to be prescriptive, rather they exemplify the creativity needed when designing and operationalizing context-specific PES schemes in rangeland settings. These innovations require the engagement and participation of local pastoralist communities.

Non-financial incentives: As discussed extensively above, there is evidence that behaviour is affected in different ways depending on the "value" attached to the different forms of incentives. As such exploring the heterogeneity in preferences regarding participation and type of payment is especially important for the operationalization of effective PES schemes.

For example, in-kind payments might be preferred in locations that are far from formal markets. Furthermore, characteristics of the market such as price and demand/supply fluctuations may be important determinants for preferences for food or agricultural input instead of cash payments. These are important considerations for pastoral communities that live in marginal isolated areas. Non-monetary incentives may have a greater "value" attached to them than cash incentives. Lacking infrastructure (roads, potable water points, cheap transportation systems, electricity), extreme climatic conditions (drought increases the value of grains and crops) or limited access to public services (schools, health services) can provide a plethora of opportunities for more targeted, innovative and non-monetary based incentive schemes.

Examples of in-kind transfers for pastoralists may include the use of vouchers which are redeemable for livestock inputs, such as feed[43], provision of alternative livelihood sources that also provide further ecosystem services such as beehives, in-kind support such as land-use rights, practical support on rangeland management (for example renting machines to manage and clear invasive species encroachment), harnessing feed-related incentives to ensure sustainable rangeland management, access to markets, access to training and information and access to protected areas.

PES linked to high-impact industries: Biodiversity offset programs, the use of biodiversity offsets (BO) is highlighted here not as an example for the design of PES schemes, but rather as an example of the possibilities for PES to be used to reduce negative socio-ecological impacts of high-impact industries. With this in mind, there are important concerns regarding BOs being another way of facilitating the approval of environmentally highly damaging projects through monetary compensations.

BOs are "measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development and persisting after appropriate avoidance, minimization, and restoration measures have been taken" [44] (World Bank 2016).

Various types of biodiversity offsets exist (see Box 11). These differ from other kinds of conservation activities in that they link to damage resulting from *operations* and ensure "no net loss" or "net gain" on socio-ecologic impact.

43. Recent trends in the Maghreb indicate a shift from range-related animal feeding towards an increased use of cropped forage to the market purchase of fodder. Typically, in the region, rangeland grazing covers about half of small stock feeding requirements (40% of animal requirements in dry season and 60% in wet season), representing more than half of the total cost of livestock production. In dry years, breeders are forced to sell important portions of the flock to remain within feeding expenses (Nori et al. 2009).

44. This definition, from the International Finance Corporation (IFC) Performance Standard 6 on Biodiversity Conservation and Sustainable Management of Living Natural Resources (PS6), is similar to the definitions used by other conservation and development organizations that focus on offsets, including the Business and Biodiversity Offsets Program (BBOP), International Council on Mining and Metals (ICMM) and World Conservation Union (IUCN).

Box 11: Types of payments for biodiversity—Conserving management practices

Conservation easements: The owner is paid to use and manage defined piece of land only for conservation purposes; restrictions are usually in perpetuity and transferable upon sale of the land.

- Conservation land lease: The owner is paid to use and manage a defined piece of land for conservation purposes, for a defined period of time.
- Conservation concession: The public forest agency is paid to maintain a defined area under conservation uses only; comparable to a forest logging concession.
- Community concession in public protected areas: Individuals or communities are allocated use rights to a defined area of forest or grassland in return for a commitment to protect the area from practices that harm biodiversity.
- Management contracts for habitat or species conservation on private farms, forests, or grazing lands: A contract that details biodiversity management activities and payments linked to the achievement of specified objectives.

BOs are more landscape-based then what PES would be in principle, however like PES schemes they are based on additionality, equivalence and permanence principles and include restoration offsets and preservation offsets.

The increasing domestic demand for environmental services and international expectations of mining, oil and gas and agriculture companies to operate responsibly through social and environmental regulations[45] provides an entry point—in terms of funding—for PES schemes. Unlike BOs, PES would target specific ecosystem services or stakeholders and would not "offset" the biodiversity impacts of operations.

One example of a BO program which involves pastoralists is the Oyu Tolgoi biodiversity offset program in Mongolia, where Ivanhoe Mines and Rio Tinto in collaboration with Flora and Fauna International developed a landscape-level biodiversity offsets scheme for the Oyu Tolgoi copper mine, Mongolia's largest mine to date. This includes the creation of a fund (estimated to be in the order of USD70 million) to finance conservation activities in the mine's neighbouring districts and includes a "rangeland improvement management" strategy with an incentive scheme to compensate herders for opportunity costs incurred. An update on the development of the program has generated much scepticism regarding the capacity and ethical implications of the BO program (more details in Box 12).

45. For example, since early 2000, the practical face of "corporate sustainability" has been represented by the Global Compact, an internationally recognized framework of ten principles, which makes the case for corporate sustainability by encouraging corporations to incorporate, operationalize and report on socially responsible practices. Today, the Global Compact, with approximately 8,000 corporate signatories from more than 140 countries, is a considerable force behind expectations surrounding business and human rights. These expectations include greater transparency, accountability and participation in governance (commonly referred to as "open government"), as well as new approaches to corporate behaviour, through international law mechanisms (e.g. The International Labour Organization Convention Article 169 on Free Prior and Informed Consent) and voluntary mechanisms (Global Reporting Initiative, Extractive Industry Transparency Initiative).

Box 12: Oyu Tolgoi biodiversity offset program

The proposed activities of the biodiversity offset program may include reducing hunting levels, improving rangeland management and strengthening protected areas.

"Herders will receive support in the transition to more ecologically sustainable stocking rates through the provision of incentives or compensation for opportunity costs, which may be made in the form of direct payments to households, community payments or non-cash benefits such as education or health care."

"Compensation could be given as various conservation incentives including direct payments to households, community payments or non-cash benefits e.g. education or healthcare. There is also a need for an emergency fund to be made available for basic necessities at times of climatic and economic stress."

The full monitoring and evaluation system design is not yet complete and its potential to link payments to either performance of conservation activities or to conservation outcomes is controversial.

With respect to "improvement of rangeland management" offset payments are conditional on the herder's reduction of grazing impact on the remaining grazing patches, thus a significant reduction in their herds. It has been argued that: "This is basically a transfer of responsibility and burden from the mine operator responsible for the deterioration of the grassland to the herders, who then should compensate for this deterioration by reducing their numbers of animals."

For a more detailed analysis of the controversies see: Tricarico, A. et al. (2012).

Linking PES to socio-ecological safety nets: PES schemes can be linked to existing economic or ecology-based "safety nets" used by pastoralists. PES can be used to incentivize communal management practices where participants have self-selected to take part in an established system. The self-selection of participants and communal dimension eliminates many of the challenges discussed earlier related to identifying sellers of ecosystem services, equity, minimizing transaction costs, ensuring participation and maintaining intrinsic motivations.

Agriculture and livestock-based safety nets are not a new practice. For example, the Qaaran in Somali, Iribu in Afar and Buusa Gonofa in Borana, pool resources (monetary and in-kind) to support those households that have lost livestock from drought, raids and disease. These social safety nets enhance labour sharing and security during periods of stress (Mortimore 2009).

Other examples of safety nets are communal forested or rangeland areas set-aside for emergency grazing during drought, such as the grass bank concept, the Ngitili grazing reserves in Tanzania (see Box 13), the Hima in Jordan or the *Agdal* in Morocco.

These safety nets produce ecosystem services by alleviating grazing pressures elsewhere during drought, by reducing deforestation pressures to access new grazing lands and by decreasing the need to buy expensive fodder.

Box 13: Safety-nets

The grass bank: The grass bank concept pioneered in southern Arizona by the Malpai Borderlands Group. A grass bank is an area that is set aside to provide forage for ranchers when forage on their home ranch is unavailable or limited.

Grass banks typically have three components: a formal or informal association of ranchers that come together to form the grass bank; an area of forage that serves as the grass bank; and rules among the members of the association that determine who gets access to the grass bank and when. Typically, members of the grass bank association are required to implement certain management practices. Grass banks are used as a buffer against drought and can help sustain ranches or prevent overgrazing in dry years.

Ngitili forest and grazing reserves in Sukumaland, Tanzania A culturally established practice among the Sukuma, the Ngitili is either a private or a communal grazing and fodder reserve, supported by a revised forest policy which places a strong emphasis on participatory management and decentralization. The Ngitili provides dry season forage, fuel and poles, medicinal plants, wild fruits and other foods (especially during food shortages), shade and quiet (Mortimore 2009).

Linking conservation and pastoralists: The different knowledge systems in which conservationists and pastoralists operate have historically, and still continue, to result in conflicting visions. On the one hand conservationists push for a reduction of human settlements in nature reserves while for pastoralists, rangelands and forests are their livelihood resources. The recent change in understanding of range ecology is persuading policymakers that pastoralism is necessary for effective rangelands management (Glew 2012). A new profession, "the conservation herder" has even been proposed whereby a trained and respected pastoralist could be remunerated for his responsibility to managing biodiversity and ecosystem services (Molnár et al. 2016).

This gradual convergence of the conservation and development agendas has led to the emergence of a suite of new interventions that expand the focus of conservation to land outside of formal protected areas and links biodiversity conservation with local economies and pastoral governance. The last 20 years has increasingly seen the use of integrated conservation and community-based natural resource management as a conservation strategy. The result has been a considerable increase in the area under conservation management. For example, in Nambia by the end of 2013, the 19.4% of its land surface was managed by community-based conservancies, bringing the total land surface under conservation management to 43% (Namibia Association of CBNRM Support Organizations 2014).

By tapping into tourism, wildlife PES[46] is an income diversification tool that is expanding among pastoral landowners living close to wildlife protected areas. The use of PES to halt habitat loss and degradation that leads to decline in wildlife populations is becoming common across East and southern Africa. In Kenya, wildlife PES (see Box 14), mostly involve conservation land leases in private individual, communal or public trust lands, particularly adjacent to protected areas in the arid and semi-arid lands which cover 88% of Kenya's landmass and contain almost 90% of Kenya's wildlife (Norton-Griffiths and Said 2010).

46. Under these PES schemes, pastoral land users are compensated with payments derived from public funds (mainly state wildlife and protected area agencies and nongovernmental sources) and/or private sources (mainly commercial tourism operators) for their stewardship of landscapes or wildlife that have scenic or recreational value to tourists and for maintaining certain land uses that are compatible with wildlife conservation.

Box 14: Wildlife lease program (WLP) in Kenya

The WLP is a PES scheme whereby pastoral landowners living on the wildlife dispersal area to the south of Nairobi National Park are paid USD10/ha/year to refrain from cultivation, land sales and sub-division and to allow wildlife on their private land.

Since 2000, the WLP provided payments totalling USD605,170 to 388 landowners that enrolled a total of 16,774 ha of land in the WLP PES scheme. Close to three-quarters of all our sampled households are income-poor and nearly half are land-poor. Econometric analysis of surveyed data suggests that, in terms of participation, the WLP is not strictly pro-poor as farm size and human capital significantly positively influence participation and intensity of participation. Despite these reservations in terms of poverty, the WLP was found to be the most equitable of all income sources for participating households and is also an invaluable source of income diversification during droughts when livestock income may decline. The incentives from WLP were found to be of a sufficient magnitude to lift all households found in locations with a poverty gap of 23% and below, to the rural poverty line (Silvestri et al. 2012).

PES for mobile pastoralists: To enable a sustainable development of pastoralism, it is important to recognize a territorial approach in rangeland and dryland management. In the cases where pastoralism is highly mobile and occupies vast territories, agreements and policy harmonization between neighbouring countries deserve special attention when dealing with the design of PES in cross-border areas (for example in trans-frontier national parks or along revived transhumant routes (see Box 15). The integration of unclear boundaries, cross-border and seasonal mobility over vast areas in PES methodologies is required to ensure that projects can benefit mobile pastoralists.

But in practice how would payments be made to mobile pastoralists? It has been suggested that the mobility of pastoralists might demand payment sharing or pro rata distribution of payments according to when land is being used. Integrating spatial analysis with geographical information systems and remote sensing tools could provide the basis for monitoring these vast areas (Dougill et al. 2012).

Box 15: Niger Programme d'appui à la gestion de la réserve nationale de l'Aïr et du Ténéré (PAGRNAT)

PAGRNAT developed an approach to sustainable rangeland management based on customary practice that promoted livestock mobility and thereby the opportunistic tracking of resources in a highly unpredictable environment. Using the Tuareg concept of echiwel, the project identified up to twenty "terrain de parcours", socially defined areas regularly used by a group of families and their livestock with priority rights of access over key resources (e.g. dry season water, grazing). The overlapping and fluid nature of these areas' boundaries as well as the practice of negotiated access by the inhabitants of the different "terrain de parcours" enabled the local population to make optimal use of the available resources and match livestock numbers to available forage in most years (Mortimore 2009).

Linking PES to access to markets through indigenous breed conservation: The marginal impact of PES schemes to pastoralist in different countries is also dependent, to a certain degree, on access to livestock markets and ability to make a livelihood from the sale of livestock.

For example, one form of "commodification of livestock" is the preservation of option values. Pastoralists keep animals that have traits, such as "survival" characteristics, that may currently be of no commercial interest but which may be of huge value in the future if environmental and economic conditions change (FAO 2009).

PES incentives can thus become essential for ensuring breed survival *in situ*. The existence of livestock breeds with specific grazing habits and the ability to thrive in specific environments is also essential to achieve broader biodiversity conservation goals[47].

One approach to understanding the cultural value attached to livestock rearing is through biocultural community protocols. A biocultural community protocol is a document that is developed after a community undertakes a consultative process to outline their core cultural and spiritual values and customary laws relating to their traditional knowledge and resources (FAO 2010). Biocultural protocols provide clear terms and conditions regulating access to their knowledge and resources. As suggested by the Ark of Livestock Biodiversity program (see box 16).

Box 16: Biocultural community protocols and niche livestock markets

Starting in July 2011, the objective is to build on the existing biocultural community protocols of three pastoralist communities in India, Pakistan and Kenya and to examine the scope for developing a special brand or label that indicates to consumers that a product is from a locally adapted livestock breeds and derives from biodiversity conserving production systems ("Ark of Livestock Biodiversity"). One of the project objectives is to refine the methodology for BCPs and to establish standards that communities and support NGOs can refer to.

The overall goal of the project is to shape and leverage emerging policy frameworks for livestock sustainability and for biodiversity conservation to the benefit of small-scale livestock keepers. GASL (Global Agenda of Action for Sustainable Livestock) and similar initiatives adopt a more holistic view of sustainability and integrate issues such as livelihoods and biodiversity into their sustainability assessments. See: http://www.ark-biodiversity.org/about.

In practical terms, incentives can be used in parallel with schemes that improve access to niche markets where improving the quality of meat and meat-products through local breed selection, or establishing product certification that guarantee that products are produced within sustainable socio-ecological systems, may reduce the number of livestock heads needed while increasing or maintaining revenues.

Designing community-wide or landscape-based PES schemes: PES face the challenge of distributing benefits widely and avoiding societal conflicts over land-use. As already suggested, one solution is to expand the targeted scope of PES schemes to include communities or entire landscapes. In doing so, by targeting the community and/or defining the scale and scope at the landscape level, some of the existing challenges to the implementation of PES schemes can be overcome such as evaluating opportunity costs and ecosystem service delivery (capturing indirect effects and leakage, bundling ecosystem service provision), reducing transaction costs, controlling for difficulties in ensuring conditionality and limited inclusivity leading to inequitable distribution of benefits.

Community-based payment for ecosystem services (CB-PES) schemes support local-level projects that facilitate community development and poverty alleviation. Dougill et al. (2012) explore how lessons on institutional development from community-based natural resource management (CBNRM) can be applied to the design of CB-PES projects in semi-arid rangelands as exemplified by CB-PES projects in forest systems in Africa.

When a PES project is community-based rather than centred on individual ownership rights, further principles need to be incorporated around community empowerment, capacity building and sound local-level governance (Arild 2010).

Recommendations for the design and implementation of rangeland CB-PES projects include the need for: (i) links to strong existing local institutions; (ii) clear land tenure arrangements; (iii) community control over land management decision-making; and (iv) up-front and flexible payment schemes. Rangeland CB-PES project design also requires consideration of: (v) project boundaries; (vi) benefit distribution; and (vii) capacity building for community monitoring.

47. The Global Plan of Action (FAO 2007b), adopted by the International Technical Conference on Animal Genetic Resources for Food and Agriculture, acknowledges the contribution of livestock keepers in indigenous and local production systems to the domestication, development, maintenance and conservation of animal genetic diversity. Strategic Priority 5 and Strategic Priority 6 of the Global Plan of Action make particular reference to indigenous and local production systems and smallholder farmers and pastoralists.

Tunisia's example of the PRODESUD project (see Tunisia case-study) exemplifies how a community-based incentive-based scheme overcame some of the challenges related to land tenure and the identification of sellers of rangeland ecosystem services.

Linking landscape based PES with certification: An alternative solution to PES schemes proposed by Ghazoul et al. (2009) (box) is called "landscape labelling", which combines environmental certification principles with PES ideas. It is argued that a landscape label based on ecosystem services delivery offers other benefits going beyond PES schemes' issues, including reduced transaction costs and improved inclusivity. The question of who is paying for ecosystem services, namely the willing buyer in PES schemes, also becomes irrelevant under landscape certification principles because the provision of ecosystem services is indirectly rewarded through the added value paid by consumers[48].

The landscape labelling approach is based on ecoagriculture approaches. Building on similar earlier concepts, including sustainable agriculture, agroecology and integrated resource management, ecoagriculture focuses on the synergy existing between conservation, production and livelihoods. Ecoagriculture has been proposed as an answer to the challenge of combining land uses at landscape level (integrated multipurpose landscapes). It recognizes and rewards ecosystem services provided by a landscape through certification principles. Similar to community-based PES described above, a principal objective of landscape labelling is to deliver benefits to communities, rather than individual landowners, based on the continued delivery of ecosystem services as evaluated at landscape scales[49], rather than at the scale of private landholdings. Thus added-value is potentially generated not only to a specific commodity, but to all commodities or services (e.g. ecotourism, wildlife conservation) originating in the landscape in question. The opportunity of a landscape approach is that it allows for various stakeholders (local communities, buyers of ecosystem services, conservationists and others) to identify, value and target a wide variety of services and landscape values concurrently. This takes on a more holistic and coordinated approach managing multipurpose landscapes[50] which can better account for the appropriate distribution of ecosystem service provision and pricing of PES. This might be a solution in communities with a high percentage of pastoralists.

A word on the carbon market: Pastoralists are the custodians of more than 5,000 million hectares of rangelands which currently account for about 30% of the world's soil carbon stocks. Improved rangeland management, as a carbon sequestration strategy, has the potential to store up to 2,000 Mt of CO2 equivalent by 2030 (Convention on Biological Diversity 2010).

In pastoral or grazing systems, the access to PES opportunities for livestock keepers can be driven by payments for restoration of degraded lands and for sustainable grazing land management, both of which present the potential for carbon sequestration. While in mixed crop–livestock systems, access to PES opportunities for livestock farmers can be driven by the adoption of improved pastures with high density trees and fodder banks that reduce land degradation and integrated livestock and manure management.

48. For more information read Ghazoul et al. 2011. *Landscape labelling approaches to PES: Bundling services, products and stewards*.

49. This honours the fact that landscapes cannot be objectively defined a priori as a geographic area with hard boundaries because human-dominated landscapes include not only the biophysical components of a geographical area, but also social, political and psychological components of that system. A landscape label could also represent the cultural and symbolic attributes of the landscape, as defined by local communities, thereby helping to define its heritage value and uniqueness for people beyond the landscape.

50. Multipurpose landscapes can be defined as areas that can simultaneously produce several commodities. The multipurpose nature of such areas also refers to the fact that they can also provide a range of other services which are normally not included in market mechanisms, e.g. ecosystem services such as carbon capture, pollination, or offsetting environmental externalities, e.g. pollution.

China is piloting the sustainable grassland management methodology for cost effectively accounting and monitoring carbon sequestration in grasslands[51]. The method, once approved, would allow herders to tap into carbon financing for restoring grassland and raising livestock productivity. Tunisia' case-study also revealed that national-level rangeland and forest investments will be financed by carbon-related and climate-related finance (REDD+).

5.5 Gaps in the knowledge and opportunities for further research

The review of existing literature identified four major categories of gaps in knowledge.

- **Monitoring and evaluation of the ecosystem impacts of PES for pastoralists** still requires considerable research and piloting experiences. This is one of the major gaps identified by this study and, as a result, the study has not able to offer indications on practical tools and methods for environmental monitoring. Understanding ecosystem function and documenting ecosystem flows remains an important challenge, especially given unresolved scientific issues in certain areas and the expense of collecting such data. It may be expected that through future experiences of PES implementation in the pastoral sector in developing countries and improved knowledge on ecosystem functions, solutions for cost-effective environmental monitoring systems can be found. On a similar note, analysing and **measuring the causal link between incentives on pastoral choices and rangeland health** needs further research.
- There is scope for further research in **gender considerations in PES implementation,** factoring in the changing role of women in pastoral societies and assessing their role in ecosystem provision is still limited.
- More experience is required to find creative solutions that render **PES schemes financially sustainable and independent of public budgets.** One of the greatest struggles in PES project implementation is finding ways to finance such schemes in the long run.
- **Understanding how the use of incentive schemes interferes with, complements or counteracts other subsidy policies** would help differentiate between the impact of incentives on rangelands and that of non-targeted but expensive subsidies on rangelands. This is an important argument, which needs to be backed by facts, which would persuade decision makers on the use of PES.

51. The Chinese government is taking lessons from Qinghai in developing its fledgling national carbon market. The sustainable grassland management methodology developed by partners in the Three rivers grassland carbon sequestration project met the rigorous double-verification requirements of the verified carbon standard (VCS). The method has now been approved internationally and has been alleged to "benefit herders worldwide and provide a strong incentive for better grassland management". Other initiatives are underway in Mongolia and Uruguay to see if herders in these countries can also apply the sustainable grassland management methodology to gain access to carbon markets.

6. Recommendations

When evaluating the opportunities and challenges of operationalizing PES for pastoralists it is important to realize that there will be trade-offs in reaching the three objectives of environmental effectiveness, cost effectiveness / financial sustainability and social effectiveness. The aim of PES implementation is to find innovative solutions that increase additionality through changes in program design.

The following recommendations summarize the key aspects that need to be taken into consideration when operationalizing PES for pastoralists in rangeland settings.

In the absence of data and scientific proof, the precautionary principle can be adopted: Methodological challenges and extremely high costs of data collection to measure the impact of management practices on ecosystem outputs in rangeland contexts, coupled with lacking evidence proving environmental effectiveness of PES means that it is hard to demonstrate the level of additionality in PES implementation. This in turn makes it challenging to attract funds. One approach is to embrace the precautionary principle, such as that adopted by "the Watershared model" in Bolivia (see Case example III at the end of the report). This means not depending on data to drive PES design, instead PES schemes are based on assumptions and initiated before scientific certainty is reached. PES schemes are designed and piloted, performance is monitored, lessons are iteratively integrated into the design and ecosystem service outputs are monitored as best as possible.

Effective solutions today may not be effective solutions tomorrow, the need for flexible PES design, iterative processes and conditioning of payments: Ecosystem service outputs are dynamic. Furthermore, the marginal social utility of increased additionality may vary across programs and time. As a result, a PES scheme that is cost-effective, environmentally-effective or socially-effective during the policy design phase may not be so in the future (or vice versa).

PES scheme design should account for changing factors affecting rangeland and pastoral systems such as the political economy, costs/benefits of alternative environmental policy solutions and rangeland status. Incorporating these system changes will ensure incentive levels/types are consistent in delivering ecosystem service objectives. These "context dynamics" can only be addressed through iterative processes where feedback, from monitoring and evaluation processes, is re-integrated within the framework. Alternatively conditioning of payments—that is directly tying incentives to flows of ecosystem services—can induce continuous innovation in rangeland management to match changing external factors.

Premature implementation of PES may undermine its financial effectiveness. Piloting small-scale PES projects and capacity-building is important: The implementation of the scoping protocol (Pappagallo et al. 2017) will reveal whether the country is "ready" or not for PES. In some cases, directly addressing poverty, land tenure, governance, or other major constraints on improved resources management may have a greater impact on rangeland management—and be more cost-effective solutions—than the provision of financial incentives.

In Tunisia for example, this study found that, although there are opportunities for piloting small-scale PES schemes with pastoralists; PES implementation is premature at this stage. Given its transitional phase, socio-politically, there are other priorities in the agenda. The current institutional confusion and instability is quite significant and is a major

identified risk for financially effective PES implementation (see Tunisia case-example section for a summary of findings). Preparing the ground for operationalizing PES, by building the "capacity" for PES schemes to be understood and endorsed, may be more substantial in some countries than for others. This will also impact the financial effectiveness of PES as a solution to sustainable rangeland management and, in the end, financial and technical resources would better be directed towards creating enabling environments for PES implementation (assuming that incentives do result in ecosystem provision). Preparing the ground for PES implementation include several "capacity-building" processes such as: extensive stakeholder engagement, piloting small-scale PES projects, proof of concept and impact, understanding and prioritizing PES as a policy goal from local to national institutional levels, establishing long-term partnerships and working on trust and relationship building.

Fostering trust and avoiding conflict requires flexibility and extensive engagement with local institutions: The potential for conflict between prescribed practices, that are assumed to have positive ecosystem impacts and the need for adaptive management is a key issue.

If PES project protocols do not allow land users sufficient flexibility to manage livestock and rangeland resources in response to changing conditions, there is a risk of eroding important survival practices. Similarly, if PES schemes do not allow for the flexibility of pastoralists to maintain existing relationships to the land and others, there is a risk of creating disequilibrium, intensifying localized tension, which would undermine the long-term sustainability of the program.

Without structured and active local governance systems the introduction of PES scheme may create conflict and raises questions on who receives payment, and how effectively, fairly and transparently payments can be managed.

This calls for significant engagement with stakeholders, pre-implementation, to ensure that self-organization is able to engage with PES schemes effectively.

PES solutions that honour the informal and flexible nature of pastoral land governance practices must still be piloted more thoroughly. Given that very little is known about how to handle such situations when implementing PES schemes, it may be helpful to engage with local institutions and grassroots organizations, which have considerable on the ground experience on land-rights dynamics, negotiation of benefit-sharing agreements and conflict. Alternatively, it may be helpful to identify strong institutions that support PES implementation, for example, institutions that aid the development of community-based rangeland or natural resource management or local pastoral governance frameworks such as pastoral units.

If long-term sustainability and permanence are core objectives, PES schemes should be viewed as an initial stimulation for process change, which should then lead to ecosystem provision without the need of incentives:

Most PES schemes are designed in a way that ignores the long-term (20-plus years) impact of incentives. If PES provide a genuine solution in any given situation, presumably this will result in the restoration and/or permanent provision of the targeted ecosystem services. However, it is rare—to my knowledge non-existent—that a PES scheme has been designed on a 10–20-year time-scale, with incentives being gradually phased out in a way that ensures that ecosystem provision continues to be provided without incentives.

This "new vision" of PES schemes as a transitioning instrument would bring PES programs to focus more on "process change". For example, incentives should not be viewed as a payment to conserve, or even less to provide a service, but to change practices and even empower people. PES should create conditions for a retro-feeding mechanism to reach another more sustainable level. For example, PES schemes could be directed to convert conventional agriculture into agro-ecological systems, which avoid the use of agrochemicals, prevent soil degradation and water contamination as well as improve soil and water quality, improve productivity and create corridors to biodiversity flux. They could also be used to incentivize a transition to complementary agro-pastoral, silvo-pastoral systems or to sustain transhumant practices, incentivize niche markets, connect pastoralism with tourism, etc.

7. Conclusion

As evident from this study, defining the risks and opportunities of operationalizing PES for agropastoralists is extremely context-dependent and complex. This should not come as a surprise given that pastoral systems are characterized by highly variable, informal and dynamic socio-ecological dynamics that require flexible analytical frameworks. One major conclusion is that proposing PES schemes as a single solution to sustainable rangeland management and ecosystem service provision is unrealistic and misleading. The ability of PES schemes to incorporate important political ecology components, while attaining social, environmental and cost effectiveness criteria requires creative and inclusive PES design methodologies. Several elements need to be combined to ensure that the various efficiencies are attained. For example, participatory stakeholder processes may not be sufficient if the underlying assumptions on the causal link between specific rangeland management practices and rangeland ecosystem service provisions are flawed. What this suggests is that before implementing PES schemes considerable efforts need to be devoted to understanding contextual pastoral systems, piloting and refining PES schemes. The preliminary protocol developed begins to elucidate on the practical questions that need to be answered before operationalizing PES schemes. It is likely that in practice, PES needs to be combined with complementary solutions to overcome some of the major challenges highlighted and this report has provided a few suggestions in that area. Perhaps PES schemes should be viewed more as a transitioning instrument, with a focus on "process change". Looking forward, considerable research and examples of successful PES experiences are still needed to answer more decisively and as best as possible, the initial key question posed in the study: "What role can incentives play in changing or maintaining sustainable rangeland management behaviour?"

Annexes

Annex 1: Resources

http://www.espa.ac.uk/results/impact-stories

http://www.espa.ac.uk/results/policy-practice-briefs

http://www.oired.vt.edu/sanremcrsp/professionals/research-themes/pes/

Annex 2: Reading material

The following suggested reading material is categorized from most relevant and useful (+++) to important but not required reading (+).

(+++)

Greening livestock: Assessing the potential of payment for environmental services in livestock inclusive agricultural production systems (LiAPS) in developing countries

Year: 2012
Authors: Silvestri, S., Osano, P., de Leeuw, J., Herrero, M., Ericksen, P., Kariuki, J., Njuki, J., Bedelian, C. and Notenbaert, A.
Funding/Institutions: CGIAR, the CGIAR Program on Climate Change, Agriculture and Food Security (CCAFS), the Federal Republic of Germany, Ministry of Economic Cooperation and Development BMZ under its GIZ/BEAF International Agricultural Research Grants Programme.
Summary: The report assesses the potential of payments for environmental services (PES) in various livestock inclusive farming systems in the developing world.

It seeks to answer the following questions: What experiences exist with PES in LiAPS? How effective are existing PES schemes in addressing the environmental management and socio-economic development agendas? How are these PES schemes organized? What potential exists to draw on the lessons learnt to upscale PES over larger areas to benefit a wider group of people?

Some of their main findings are summarized here:

- Although livestock is widely distributed across agro-ecosystems of the developing world, there are still very few PES schemes that specifically involve livestock keepers. There are opportunities for livestock keepers to benefit from PES for climate regulation, watershed and biodiversity conservation.
- Currently methods and tools for measurement and verification of environmental services are not well developed.

- Although there is considerable potential for private markets in PES, experience shows that public funding remains essential for public and quasi-public goods such as biodiversity conservation, particularly at national and global scales.
- Climate regulation services:
    - In pastoral or grazing systems, the access to PES opportunities for livestock keepers can be driven by payments for restoration of degraded lands and for sustainable grazing land management, both of which presents the potential for carbon sequestration.
    - In mixed crop–livestock systems, access to PES opportunities for livestock farmers can be driven by: adoption of improved feed supplement that can lead to GHG emissions reduction; adoption of improved pastures with high density trees and fodder banks that reduce land degradation; the use of organic fertilizer to increase the capacity of carbon sequestration; and integrated livestock and manure management.
- Watershed and hydrological services
    - In extensive or pastoral systems, PES schemes involving livestock keepers can promote watershed conservation by controlling undesirable land use change caused by extensive cattle grazing in dry land forest because this can cause soil erosion and soil compaction and lead to forest degradation which is thought to diminish water quality and quantity thereby increasing the risks of landslides and flooding.
    - In mixed crop–livestock systems, livestock farmers can participate in PES and be paid to grow trees and forest in the upper catchment of the watershed.

Relevance: The report is a good reference for a background overview on PES related to the livestock sector. In particular, it is exhaustive in its analysis of PES in LiAPS integrated with other frameworks such as climate regulations, biodiversity conservation and watershed management and hydrological services.

It is a useful read as it touches upon most of the relevant topics (PES design and institutional arrangements, monitoring and verification, issues with perverse incentives, legislation, property rights, land tenure and equity). It is however overoptimistic and does not offer a detailed enough analysis necessary to understand how to overcome the complexities of operationalizing PES schemes, particularly in relation to monitoring and evaluation and the associated risks of incentive-schemes.

Making grasslands sustainable in Mongolia: International experiences with payments for environmental services in grazing lands and other rangelands.

Year: 2014
Authors: Wilkes, A., Tennigkeit, T. and Schmidt, S. with inputs from Soloski B. and Carodenuto, S.
Funding/Institutions: Asian Development Bank, Ministry of Environment and Green Development in Mongolia. Strengthening Carbon Financing, IFAD

This report is one of a number of reports generated by an Asian Development Bank (ADB) regional technical assistance project for Regional Grassland Management in Northeast Asia, with additional funding from the Regional Cooperation and Integration Trust Fund. Support for this paper was also provided through the "Rewards for, use of, and shared investment in pro-poor environmental services" (RUPES) project funded by the International Fund for Agricultural Development to the World Agroforestry Centre and the "Linking Herders to Carbon Markets" project supported by the Swiss Agency for Development and Cooperation.

Summary: The report is a review of 50 PES schemes in grazing lands in 6 continents, covering a variety of rangeland biomes. It focuses on describing the structure of the diverse implemented PES schemes and how they operate (and not the impact they have). The second section looks at the extent to which PES schemes could be used to increase the provision of environmental services in Mongolian rangelands.

It might be useful to summarize some of the findings related to the structures of the PS schemes:

- Almost half of the schemes did not specify which ecosystem services were targeted or specified multiple services, while other schemes targeted biodiversity (14), carbon (6), water (6) and salinity (1).
- Some 41 of the 50 schemes reviewed paid land users to perform specific management practices that on the basis of general knowledge or scientific research are expected to increase the supply of ecosystem services, while 9 paid for estimated (6) or measured (3) delivery of ecosystem services.
- Although ecosystem service delivery is mostly not measured, some schemes that paid for performance of practices targeted land plots for enrolment by ex-ante estimation of the current or expected change in the environmental values of the land plots. In all but one case, the PES schemes paid land users directly. In 14 cases, the payments were on a flat rate per land area basis, while some schemes (12) paid on the basis of the ex-ante assessment of environmental values of the practices adopted or land plots. Eight schemes paid on the basis of ex ante measured or estimated environmental services delivered.
- Although PES schemes are often promoted as a way to leverage private sector finance, about half of the schemes were financed from local or central government budgets. Private funds, international donors and user fees financed more than half of the smaller schemes reviewed. Most of the larger schemes (by area) were financed from central or sub-national government budgets.

Relevance: The well-structured report helps understand the analytical logic and structure needed to assess possibilities for operationalizing PES schemes. It is the only report I have come across that analyses the processes of operationalizing rangeland or pastoral related PES schemes based on a review of implemented programs. The use of Mongolia as a case-study is relevant and useful background read for understanding how to implement the protocol for example.

Payment for ecosystem services and food security

Year: 2011
Authors: Various
Funding/Institutions: FAO
Summary: Detailed analysis of PES and agri-environmental schemes with practical chapters focusing on specific aspects such as legislative tools, socio-cultural drivers, opportunities and gaps for PES implementation.

Relevance: An important read to explore in detail practical issues related to PES implementation. The most relevant chapters used to inform our report are *Landscape Labelling; Approaches to PES: Bundling Services, Products and Stewards*: a new concept for PES is proposed that seeks to overcome some of the problems associated with the current generation of PES schemes, *Enabling conditions and complementary legislative tools:* overview of the interplay between legal frameworks and PES implementation, *Cost-effective targeting of PES:* How payments for biodiversity and ecosystem services are targeted to ensure the cost effectiveness of a PES program. *Social and cultural drivers behind the success of PES:* discussion of the fundamental challenge of how to ensure sustainable participation to a PES program.

Payments for ecosystem services: Legal and institutional frameworks

Year: 2009
Authors: Greiber, T.
Funding/Institutions: International Union for Conservation of Nature and Natural Resources (IUCN)
Summary: Diagnostic tool which helps to better understand the necessary legal and institutional basis for water-related PES schemes.

Relevance: The focus on legal frameworks and instruments, content of PES-related legislation, property-rights, enabling institutions, contract related issues and governance helps give a solid understanding on the risks and challenges of implementing PES in general (not specific to livestock and rangeland sector).

The path to greener pastures: Pastoralism, the backbone of the world's drylands

Year: 2017
Authors: Jenet, A.
Funding/Institutions: This study was conducted as part of the project "Regional Consultation with pastoralist and livestock breeder CSOs – Towards better policies in support of pastoralism", co-funded by the International Fund for Agricultural Development (IFAD). Published by Vétérinaires Sans Frontières International (VSF)

Summary: Overview of challenges and opportunities for livestock and pastoral-related policies and programs in pastoral regions. The report is informed by a global assessment of literature and policy documents on pastoralism, a survey on the enabling environment and policies in 26 countries with large numbers of pastoralists, a survey of pastoralist practices and realities in eight pastoralist "hotspots", and five participatory regional stakeholder gatherings.

Relevance: Comprehensive and balanced global overview of pastoral-related policies and programs. The uniqueness of this report is its nuanced understanding of livestock and pastoral related dynamics so it is an important background read to comprehend the contexts within which PES will operate in.

Improving governance of pastoral lands

Year: 2016
Authors: Davies, J., Herrera, P., Ruiz-Mirazo, J. Mohamed-Katerere, J. Hannam, I. and Nuesri, E.
Funding/Institutions: The overall guide has been authored by the International Union for Conservation of Nature (IUCN) and World Initiative for Sustainable Pastoralism (WISP) in collaboration with the Commission on Environment, Economic and Social Policy (CEESP) and the World Commission on Environmental Law (WCEL).

Summary: This technical guide on Improving the governance of pastoral lands provides advice and examples of how to strengthen governance of tenure in a pastoral context, recognizing the complexity of pastoral tenure arrangements and the great diversity of pastoral societies worldwide. It complements other technical guides, including: Governing tenure rights to commons; Governing land for women and men; Improving governance of forest tenure; Responsible governance of tenure and the law; and Respecting free, prior and informed consent.

Relevance: An extremely important read to deepen understanding on governance, land tenure and institutional issues related to pastoral livelihoods in rangeland settings with case-study examples around the world.

Pastoralism and the green economy—a natural nexus?

Year: 2014
Authors: McGahey, D., Davies, J., Hagelberg, N. and Ouedraogo, R.
Funding/Instiutions: This report is financed by UNEP and is part of the efforts of UNEP, IUCN and the World Initiative for Sustainable Pastoralism (WISP), to provide the social, economic and environmental arguments for increased recognition of sustainable pastoralism as a viable land management option for the world's rangelands.

Summary: This study focuses on pastoralism's current and future potential for securing sustainable management and green economy outcomes from the world's rangelands. The study identifies the key enabling conditions required for pastoralism to deliver on its potential role in a Green Economy.

Relevance: The study's focus on pastoralism as a "Green Economy" potential reveals complementary solutions to PES implementation. Especially relevant is the chapter on "maintenance of natural capital" (p 8-16)

(++)

Supporting sustainable pastoral livelihoods: A global perspective on minimum standards and good practices

The guidelines have been designed to help development and conservation experts familiarize themselves with the principles underlying pastoralism as well as some of the opportunities and constraints to sustainable development.

Livestock and pastoralists (IFAD)
This succinct summary was drawn together as a tool for practitioners to design pastoral-related and is a useful background read.

Adding value to livestock diversity—Marketing to promote local breeds and improve livelihoods
Useful for understanding niche market opportunities for the creative application of PES linked to livestock-related markets. Eight cases are presented from India, Kyrgystan, Mongolia, Argentina, South Africa, Argentina, Mauritania and Somalia.

Biodiversity offsets: A user guide
Practical guide focusing on biodiversity offsets, which parallel many of the issues found in PES implementation.

Environmental funds and payments for ecosystem services: RedLAC capacity building project for environmental funds
Good practical overview of existing institutions, funding and projects related to PES. The focus is on the potential of PES to mobilize resources for conservation projects. It includes and step by step guide on how to develop a PES project, funding solutions by tapping into various environmental funds and Costa Rica's FONAFIFO PES program as a case study.

Payments for environmental services in Costa Rica
One of the only comprehensive evaluations of the practical challenges encountered when implementing PES program at the country-level

Governance of ecosystem services—Lessons learned from Cameroon, China, Costa Rica and Ecuador
The study was the starting point of the project Effective governance for the provision of ecosystem services as a means of poverty reduction implemented by the IUCN. It thus offers a simple introduction to the policymaking realm of PES governance, with a focus on forest-related ecosystem service provision.

Global review of the economics of pastoralism
Synthesis of existing knowledge on the value of pastoralism, the gaps in this knowledge, trends in pastoral economies and policy options that can support drylands economies most effectively.

The land we graze: A synthesis of case studies about how pastoralists' organizations defend their land rights
A simple overview of pastoral-tenure and related challenges, exemplified through 21 case-studies in 17 countries.

Improving governance of pastoral lands: Implementing the voluntary guidelines on the responsible governance of tenure of land, fisheries and forests in the context of national food security
The technical guide attempts to address the full range of tenure arrangements in pastoral rangelands in different regions of the world. Additionally, it considers tenure over resources that are not necessarily covered by "land" rights, including water, salt pans and trees, and how these rights interact with rights over land

State of biodiversity markets: Offset and compensation programs worldwide
Analysis of the global market size of biodiversity-related compensation programs. Although this is not strictly relevant to PES schemes, it gives a sense of the global market opportunities and existing programs globally.

Options for support to grassland restoration in the context of climate change mitigation
This report reviews the options for support to grassland restoration in the context of demand growth for livestock products and climate change mitigation

A good practice guide: Pastoralism, nature conservation and development
A basic summary of topics related to the nexus between pastoralism and conservation

Customary land tenure in the modern world rights to resources in crisis: Reviewing the fate of customary tenure in Africa
This is the first in a series of briefs about modern African land tenure that provides up-to-date analysis on the status of customary land rights in Sub-Saharan Africa

Annex 3: Case-examples

1. Colombia, Costa Rica, and Nicaragua: Regional integrated silvopastoral ecosystem management project (RISEMP)

The Regional Integrated Silvopastoral Ecosystem Management Project, which began implementation in 2002 with USD4.5 million financing from the Global Environment Facility (GEF) and the World Bank acting as implementing agency, has been testing the use of the payment-for-service mechanism to encourage the adoption of silvopastoral practices in three countries of Central and South America: Colombia, Costa Rica, and Nicaragua. The aim of the project was to rehabilitate degraded pastures to protect soils, store carbon, and foster biodiversity. It also aimed to develop PES to spur profitability of silvopastoral systems by 50% by the fifth year.

An important constraint to the adoption of silvopastoral practices is their limited profitability from the perspective of individual land users. Even if silvopastoral practices are financially viable, the high initial investment costs required pose problems for credit-constrained land users. The long-term nature of investments in most silvopastoral practices means that tenure security is an important factor in their adoption.

Designing the mechanism required addressing issues such as (1) measuring the actual amount of environmental services being provided, so that appropriate payments can be made; (2) providing payments in a way that resulted in the desired change in land use; and (3) avoiding the creation of perverse incentives (for example, for land users to cut down existing trees so as to qualify for additional payments for tree planting).

The project also includes extensive monitoring of the effectiveness of each mechanism in stimulating adoption of the proposed measures and of the resulting impact on environmental services and on household welfare. These features, together with the three-country approach, will provide in the coming years a very rich dataset for testing the use of contract mechanisms for biodiversity conservation.

In 2007 The Project developed an 'environmental services index' (ESI) a combination of indices of biodiversity conservation and carbon sequestration under different land uses. This approach is similar to the Environmental Benefits Index (EBI) used in the US Conservation Reserve Program (CRP). Participants were paid for net increases in ESI points.

Impacts:

In the project's first two years, over 24% of the total area experienced some form of land use change. The area of degraded pasture fell by two thirds, while pastures with high tree density increased substantially, as did fodder banks and live fences. By 2007 it appeared to have succeeded in inducing farmers to increase substantially the use of practices that generate higher levels of ecosystem services.

The project resulted in 60% reduction in degraded pastures in the three countries, and the area of silvopastoral land use (e.g. improved pastures with high density trees, fodder banks and live fences) increased significantly.

The environmental benefits associated with the project included a 71% increase in carbon sequestered, increases in bird, bat and butterfly species and a moderate increase in forested area. Milk production increased by 10% and farm income also increased by 115%. Herbicide use dropped by 60%, and the practice of using fire to manage pasture is now less frequent.

Other demonstrated environmental benefits included the improvement of water infiltration; soil retention; soil productivity; land rehabilitation, and the reduction of fossil fuel dependence (e.g. substitution of inorganic fertilizer with nitrogen fixing plants).

Questions remained about the long-term sustainability of the approach, however. To ensure sustainability, long-term payments are likely to be needed, raising the question of how they will be financed. Payments by water users and by carbon buyers provide a partial answer to this challenge, but still leave many gaps.

To read more on the current impacts see: Pagiola, S., Honey-Rosés, J. and Freire-González, J. 2017. *Assessing the Permanence of land use change induced by payments for environmental services: Evidence from Nicaragua.*

Sources:

Silvestri, S. et al. 2012. *Greening livestock: Assessing the potential of payment for environmental services in livestock inclusive agricultural production.*

Pagiola, S., Agostini, P., Gobbi, J., de Haan, C., Ibrahim, M., Murgueitio, E., Ramírez, E., Rosales, M. and Ruíz, J.P. 2004. *Paying for Biodiversity Conservation Services in Agricultural Landscapes.*

Pagiol, S., Ramírez, E., Gobbi, J., de Haan, C., Ibrahim, M., Murgueitio, E. and Ruíz, J.P. 2007. *Paying for the environmental services of silvopastoral practices in Nicaragua.*

2. Costa Rica: Country-wide payments for environmental services (PSA)

Costa Rica pioneered the use of PES in developing countries by establishing a formal, country-wide program of payments (*Pago por Servicios Ambientale*s, PSA). The PSA program has been partly credited for helping the country, once known as having one of the world's highest deforestation rates, to achieve negative net deforestation in the early 2000s (Pagiola 2002).

Costa Rica's PSA program is framed around the Forest Law No.7575, which provides the regulatory basis to contract landowners for the services provided by their lands, and establishes the National Fund for Forest Financing (Fondo Nacional de Financiamento Forestal, FONAFIFO). The program has experimented with a series of policies to try and improve efficacy of PES implementation. For example, it has used various forms of group contracts, opened local offices, introduced a criteria matrix for sieving through contract applications and looked at alternative sources of finance.

A recent comprehensive evaluation uncovers some of the challenges the program has faced from over fifteen years of implementation. For example, the PSA program has tried to improve its social footprint by lowering barriers of participation. Costs for entry were high for poor farmers who could apply at a single central office after completing a long list of official forms. Meanwhile larger operations were snapping up the contracts under a first-come, first-served policy. Relatively large landowners and companies in these areas are still securing most contracts but attempts at reducing transaction costs and targeting areas with higher poverty indexes and identifying poor farmers beyond geographic location has improved access to poorer farmers. Group contracts, meant to counteract the high fixed transaction costs, have collapsed, partly owing to problems with local intermediation. Furthermore, one of the main difficulties has been in measuring the program's social impact, especially through aggregate indicators that are not linked with landownership like the Social Development Index.

Sources:

Pagiola, S. 2006. *Payments for Environmental Services in Costa Rica*

3. Bolivia: Reciprocal watershed agreements as an example of innovative and effective incentivization for ecosystem service provision

Since 2003, Fundacíon Natura Bolivia (FNB) has been working on developing "The Watershared agreements": a simple, grassroots versions of incentive-based conservation that helps upper watershed forest and land managers to sustainably manage their forest and water resources, to benefit both themselves and downstream water users. By 2016, 40 Bolivian municipalities had appropriated and adapted the Watershared model and had changed the behaviour of almost 200,000 people: 4,500 upstream farmers were conserving 210,000 ha of water-producing forest, and 195,000 downstream users were paying them approximately USD500,000 a year to do so.

While there have certainly been a few Watershared failures, local PES schemes have not yet shown themselves able to self-replicate and have the same rapid on-the-ground impacts as Watershared schemes.

The core strength of watershed agreements is its simple and innovative design that side-step many of the challenges discussed in this report associated with PES schemes such as financial sustainability, incentives, costs, inclusiveness and equity, monitoring and evaluation.

- They do not rely on extensive hydrological and economic studies to define the correct payment levels. Nor do they focus on the opportunity cost of conservation as the primary driver of levels and types of compensation. Rather, they attempt to strengthen and formalize pro-conservation social norms, by publicly recognizing individuals who contribute to the common good by conserving their 'water factories'.
- FNB realized they can't scale up to have a large-scale impact if they have to negotiate individual contracts. In contrast to most PES schemes, Watershared agreements do not depend on data to drive their design: instead, they are usually initiated before scientific certainty is reached. The Watershared approach is to reduce bureaucracy and to design and pilot schemes using the precautionary principle.
- Watershared's success came from reverse engineering approaches to the program design. For example, by rapidly piloting a program, monitor and evaluating performance, integrating lessons and then refining and improving the model.
- They respond to one of the key findings of behavioural economic experiments, that financial incentives are "the most expensive way to motivate people" and that social norms are not only cheaper, but may be more effective as well". Instead of cash payments, terms of the contracts see each fund's pooled contributions used to purchase goods that enable landowners in the watershed area to derive alternative sources of income to logging and agriculture.
- As a result, farmers are paid in bees and capacity building to make honey – this was the preferred compensation modality. Watershared 'compensations' are thus tokens of appreciation rather than economic transactions.
- The rapid success of low-cost Watershared schemes can be partly attributed to the fact that agreements are perceived as a grassroots collaborative process for watershed management. This is in contrast to perceptions about the alternatives: centralized water pricing, the 'commodification' of natural resources, and PES as a taxable revenue stream for central government.
- Reciprocal watershed agreements do not require formal land titles but instead rely on locally accepted definitions of who owns and controls, or grants access to, watershed forests. In Bolivia, tenure is confirmed and agreements are signed on the basis of simple assurances from neighbours and the village chief that a piece of land belongs to an individual. Watershared ownership decisions are thus based on local consensus, and although such tenure does not necessarily have de jure recognition, the de facto definition of boundaries used by participants in the Watershared scheme is often stronger.
- Watershared is currently around 70% self-funded, with resources coming primarily from local governments and water users. This bodes well for long-term sustainability.
- They measure impact through randomized implementation. Working with the Sustainability Science Program at Harvard University in the US, Natura officials developed the surveys and the rigid, if-then protocols necessary to assess the socio-economic needs of affected communities, their attitudes to conservation and their effects on the watershed.

Sources:

Reciprocal Water Agreements: http://www.naturabolivia.org/en/reciprocal-water-agreements.

Butler, R. 2012. *Bees, Trees, and Mountain Streams: Bolivia Redefines Watershed Payments.* http://www.ecosystemmarketplace.com/articles/bees-trees-and-mountain-streams-br-bolivia-redefines-watershed-payments.

Asquith, N. 2016. *Watershared: Adaptation, mitigation, watershed protection and economic development in Latin America.*

4. Jordan restoring rangelands through the Al-Hima system

Context: With the establishment of border restrictions in the 1950's between Syria, Iraq and Jordan, there has been a major breakdown in traditional pastoral migration. An analogous breakdown in pre-existing tribal land tenure systems occurred when ownership rights over rangelands were transferred to state-ownership in 1973.

The change in the governance system is one of the major factors that led to the degradation of Jordanian rangelands. With the decline in access to rangeland resources, Jordanian pastoral communities began to supplement natural forage production with purchased feedstock, who's prices began rising in the 1980s. The government subsequently introduced a subsidy on livestock feed which encouraged owners to increase herd size further exacerbating rangeland deterioration.

In this context, the IUCN-ROWA is pushing for the revival of Hima systems to help improve sustainable management of rangelands.

The 'Al-Hima' land management system is a historical and traditional system of land management in the Arab region that encourages the sustainable, shared use of common resources in communities.

Myint, M.M. and Westerberg, V. conducted an ex-ante cost-benefit analysis of the large-scale adoption of the Hima approach within the Zarqa River Basin piloted in 2010 and implemented in 2013 by IUCN and the Jordanian Ministry of Agriculture.

Methodology: The ecosystem services that arise from rangeland restoration were valued using a combination of stated preference, avoided costs, replacement cost and market prices approaches. The economic analysis was built on high-resolution remote sensing, GIS, and biophysical soil and water assessment tools, and was used to assess the impact of land use changes on forage availability, ground water infiltration, carbon sequestration, and sediment stabilization.

Results: The study has shown that large-scale adoption of the Hima approach piloted by IUCN, based on improved local level governance to enable pastures to be grazed and rested systematically within the Zarqa River Basin, may:

- Deliver between USD203 and 409 million worth of net-benefits to Jordanian society, using discount rates between 2.5 and 8%. Benefits of large-scale rangeland restoration from the Hima system were found to outweigh the management and implementation costs at a discount rate of 8%.
- Save up to USD 23.7 million on fodder purchase for pastoral communities by sustainably managing their rangelands in the Zarqa River Basin.
- The value of enhanced groundwater recharge from large-scale Hima restoration is in the order of USD265 million.
- The benefits associated with carbon sequestration within the Zarqa river basin are estimated at a value of up to USD53 million over a 25-year project cycle. The authors suggest exploring options to compensate pastoral communities for other benefits that are enjoyed by the wider society, through for example carbon sequestration.

Discussion: The research found in this paper provides compelling evidence that the Rangeland Strategy should be implemented through widespread support for community based rangeland management with the al Hima approach, while addressing potential significant obstacles over land rights.

One of the major conclusions is that the reintroduction of the Hima system cannot take place in the absence of effective common property regimes which requires addressing significant obstacles over land rights. Improvement tenure of rangeland communities was proposed in the 2001 Jordanian Rangeland Strategy (MoA 2001). This has been revisited and recently adopted which places communal management and control at the centre of rangelands development, and Egypt has experimented with similar community-based approaches (2014). Also, recently the prime minister endorsed the project in the Amman Declaration on Innovating Hima, drawn up in 2014 and signed in 2015.

Project capacity: At the forefront of the Hima adoption scheme is the IUCN-ROWA, IFAD and the GEF which have been launching a suite of sustainable-rangeland related programs since early 2000. These institutions have partnered with the Ministry of Agriculture and the Ministry of Planning and International Cooperation to support legal and institutional frameworks such as "The Jordanian Rangeland Strategy" to enable the implementation of PES schemes at all governance levels. Some PES-related projects for pastoralists are:

- "Mainstreaming Sustainable Land Management Practices", IFAD-GEF (total cost USD39.6 million, including USD6.8 million from GEF, USD11.6 million from IFAD and other co-financing of USD21.2 million).
- "Mainstreaming Biodiversity in Sylvo Pastoral Sharah Areas in Ma'an Governorate" IFAD-GEF (total cost USD4.3 million, including USD1 million from GEF, USD3 million from Jordanian Government and other co-financing of USD300,000). The project supports integrating participatory community planning and poverty reduction activities with biodiversity conservation in sylvo-pastoral and rangeland management in buffer zones / Nature Reserves.
- "Securing Rights and Restoring Land". EU-Danida-IUCN partnership 2010-2015. USD500,000. This project was one of the key factors leading to development of the HERD PIF (see below). It supported restoration of rangeland ecosystems for livelihood resilience, through improved governance and management practices and led to revision of the Jordanian National Rangelands Strategy and the Jordan UNCCD-NAP by IUCN in 2014. A major outcome has been mobilization of high-level political support in Jordan and Egypt for scaling-up community based approaches to rangeland restoration.
- Healthy Ecosystems for Rangeland Development (HERD): sustainable rangeland management for biodiversity conservation and climate change mitigation (2016).

Sources:

GEF Project Identification Form 2016. Healthy Ecosystems for Rangeland Development (HERD): sustainable rangeland management for biodiversity conservation and climate change mitigation.

IUCN. 2014. *Two years strategy for the implementation of Payment for Ecosystem Services in Jordan: A Legal and Instiutional Reform Strategy*.

Myint, M.M. and Westerberg, V. 2015. **An economic valuation of a large-scale rangeland restoration project through the Hima system in Jordan**

Ministry of Agriculture Directorate of Rangelands and Badia Development. 2014. *Updated Rangeland Strategy for Jordan*

IUCN. *Al Mukayada Albe'ia: Promoting exchange for conservation and sustainability in Jordan.*

5. Mongolia: Implementation of the country's first pasture-related PES program

At present, in Mongolia there are no regulations that require compensation payments for ecological damage or that enable or regulate compensation for preservation or restoration of resources. However, developing economic mechanisms for environmental management have been listed as a priority action area in the current government's Green Development Strategy.

One of the most relevant pasture-related PES program is PlanVivo. It is the first rangeland PES scheme to be implemented in Mongolia, collaborating with 200 herder households with territories covering 77,000 hectares to sequester more than 100,000 tCO2 through improved grazing management practices. The project is shaped by the wider context of climate change and the growth of formal and informal mining sectors with associated impacts of pollution, loss of water sources, failure to meet (inter)national biodiversity targets and struggles over resource access.

Design of program: The specific objectives of the program are the valuation of ecosystem services produced by sustainable rangeland management, to facilitate the implementation of a sustainable, locally relevant PES scheme, and to facilitate methodological innovations in participatory valuations of ecosystem services.

Sources:

Global Agenda for Sustainable Livestock. 2017. *Linking herders to markets for environmental services*

Upton, C., Dorligsuren, D., Dulmaa, D. and Gantsogt, G. 2015. *Pastures, Conservation and Climate Action, Mongolia: Plan Vivo Project Design Document.*

6. Syria: Modelling payment levels to shift pastoral behaviour towards sustainable rangeland management practices

The following case-study exemplifies how, in the context of Syria's pastoral-rangeland-governance relationship, PES schemes may help change behaviour to ensure the adoption of sustainable rangeland management practices for pastoralists.

Context: Early government subsidies for barley cultivation have been largely accused for causing serious rangeland degradation in Syria. Since 1995 the Syrian Government banned barley cultivation in the Badia recognizing the damaging effects of cereal cultivation on the highly fragile soils and natural vegetation in these environments.

However, due to the absence of viable alternatives for livestock feeding and the disintegration of "open access" land tenure regimes of grazing areas, Bedouins still "illegally" cultivate barley, especially in the lowlands.

Recognizing the need to rehabilitate the severely degraded rangelands and re-establish fodder production, the government initiated the Badia Rangelands Development Project (BRDP). This project restored about three million hectares of the Badia rangelands by providing all the needed inputs (e.g. seedlings, tractors and irrigation) while the communities participated physically in implementing the project activities while being remunerated for their daily labour.

Two years after implementation it became clear that the program had little impact in changing behaviour. The reasons for this were many including:

- Bedouins' strong preference for barley cultivation rather than traditional rangeland practices has been found to be caused by feelings that the Badia belongs to the government. Thus, any financial incentives from government that may relate to land management and land use have not been perceived to have particular economic benefit for the individual pastoralist.

- Because the land tenure status of the Badia is "open access" rangeland, entitled local users cannot prevent other non-entitled users from grazing the land, unless it is cultivated with barley. This malfunctioning of rangeland governance coupled with the legal status of rangelands presents a tenurial impediment to sustainable rangeland management practices.
- Bedouins have very limited access to official credit. As a result, famers establish partnerships with financers (or investors or lenders) in the city who can fund barley cultivation on the fertile lowlands. In these financial arrangements production risks are either shared with, or at times borne by the investor. As a result, Bedouins are inclined to cultivate barley even if, in most cases, they sustain a total loss due to bad weather. Such arrangements between Bedouins and financiers have become common and have existed for a long time indicating that barley cultivation bans have had minimal impact on changing behaviour.

Hypothesized incentives required to change behaviour: Using a case study from Syria and the Minimum Data Analysis method (TOA-MD) provides empirical evidence regarding incentive payments and the optimal amount needed to ensure different adoption levels of sustainable rangeland management practices. Without any incentive payments (current scenario), the adoption level for sustainable rangeland management practices was 10%. How would adoption change if the cost of adoption was reduced and incentives provided?

In answer to this Louhaici et al. found that a 10% cut in the establishment cost would see farmers adopt shrub transplantation on 55% of the lowland sites. If the cost reductions were to be coupled with PES, adoption levels would increase substantially. A complete removal of the cost of adoption (i.e. 100% subsidy on the cost of adoption) would lead to 100% adoption of sustainable rangeland management practices. Thus, modest incentive payments would make sustainable rangeland management practices more attractive than barley cultivation and, thus, contribute to restoration of degraded rangelands.

Sources:

Louhaichi et al. 2016. *Financial incentives: Possible options for sustainable rangeland management?*

Annex 4: Piloting the scoping protocol. List of interviewees and questionnaire template

Names	Institution	Email
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I. Identifying supporting conditions

Political economy context

Policy and regulation

Legal frameworks

Establishing: Are there any "establishing" legal frameworks that can be used as an entry-point for funding or implementation of PES for (agro) pastoralists and rangeland-related issues?

Regulating: Are there any "regulating" legal frameworks? How will these limit or aid PES implementation for (agro) pastoralists?

Enabling: Are there any pastoral or rangeland related provisions in the constitution that would aid or thwart PES implementation?

- Are there any PES-specific laws that could be applied to design country-wide PES implementation for rangelands?
- Are there any sectoral environmental legislations that aid or thwart PES implementation for rangelands? Are there any opportunities for amendments that can facilitate future PES implementation?
- What indirectly relevant laws signal the utility of PES implementation for rangeland management?

National-level rangeland incentive mechanisms and financial funds

- Existing incentives for protection of grasslands include:

Regulatory incentives: National or sub-national legislation (e.g. land use and agricultural zonation laws, nature protection and environment protection laws), grassland and grazing laws, prohibitions on habitat destruction / vegetation conversion, land use planning

Private law mechanisms: Easements, covenants, private contracts for conservation

Financial incentives: Taxation policies, e.g. related to easements

Existing funds linked to incentive schemes for improved management of grasslands

Financial aid: Credit policies

Grant aid: Government cost-sharing grants (e.g. landcare grants), input subsidies, technical assistance (extension services)

Conditional payments: Payments for specified practices, Payments for specified ecosystem services, Input subsidies, Off-take subsidies, One-off grant payments, Recurring payments for ecosystem services

Product market payments: Labelling for niche products (e.g. Geographical Indications), Certification of products, Eco-tourism revenues

Governance and institutions

Governance

- What pastoral and rangeland governance practices (whether active or not) have or are being used?
- What are the changes and expected trends in customary rangeland tenure systems?
- What are the expected challenges of integrating PES schemes with such governance practices?

Institutions

- What formal or informal institutions coordinate rangeland management?
- What national, regional and international institutions are relevant to local rangeland governance?

Initiatives

- Which of the institutions mentioned play an active role and have a long-term vision?
- What relevant initiatives can be cited?

Land rights and tenure

- What different forms of land tenure regimes are there?
- What are the changes and expected trends in customary rangeland tenure systems?
- What are the expected challenges of integrating PES schemes with such land tenure regimes? For example:
  - Is there a possibility to have a right to use the ecosystem services without being the owner of the land?
  - Is there a possibility to have a right to derive income from the ecosystem services without being the owner of the land (which will enable you to enter into PES contracts)?

Knowledge-base

- What knowledge, data collection efforts, institutions or specific people are there that seek to scientifically assess the livestock-pastoral-rangeland nexus?
- Is the knowledge base credible and useful to inform PES assumptions?
- What alternative knowledge systems exist? Who are the knowledge providers?

II. Analysing risks and challenges

Rank from most important (1) to least (n). Other statements of risk can be added by respondent.

Statement of risk	Rank	Comments
PES will not gain traction locally		
Legal context not able to support incentive-based mechanisms		
PES will erode traditional rangeland management practices		
PES will erode pastoral social structures and tradition		
Long term financial sustainability is a concern		
Leakage (unsustainable rangeland practices practiced elsewhere)		
PES will erode intrinsic motivation for sustainable rangeland management		
Local institutions do not have enough capacity to enforce PES		
Pastoral policy and rangeland management is not a national priority		
Land tenure poses a substantial challenge		

Identification of stakeholders

- Who are the most relevant stakeholders managing rangeland systems? What are their respective roles?
- Buyers, sellers, intermediaries, knowledge providers

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