



If Not Counted Does Not Count?

A programmatic reflection on
methodology options and gaps in
Total Economic Valuation studies
of pastoral systems

Saverio Krätli

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Drylands and pastoralism

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The substantial value of pastoral systems remains largely invisible to local, national and regional calculations of economic performance (for example the construction of GDP). Official data continue to be used even when their reliability is known to be poor. A complementary framework in cost-benefit analysis, known as Total Economic Valuation (TEV), is increasingly being used by NGOs and regional bodies to help put onto the map the many aspects of economic value contributed by pastoral systems– contributions that are presently not counted. This Issue Paper provides a practical tool for those interested in carrying out work on the TEV of pastoralism.

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Summary

Local administrations and national governments often prefer the promotion of non-pastoral uses of pastoral land, to interventions that would secure pastoral production as a viable livelihood/economic system. Partly, this preference reflects a gap in the data that informs policy makers on the contribution pastoral systems make to local and national economies.

There are two main reasons for this. First, standard data collection in pastoral areas is challenging and expensive, and therefore comparatively rare and unsystematic. Second, the 'one-size-fits-all' design of standard mechanisms of appraisal does not usually represent the specificities of pastoral systems. Consequently, when looking at pastoralism, standard appraisal often focuses on parameters that are not contextually relevant, and fails to capture what really matters.

A complementary framework, known as Total Economic Valuation (TEV), is increasingly being used by researchers, NGOs and regional bodies (e.g. IGAD), to bring into the frame of comparative appraisal the many goods and benefits pastoral systems contribute to local, national and regional economies. The purpose of this paper is to provide a practical tool for those interested in carrying out work on the Total Economic Valuation of pastoralism.

TEV: where from, why and what

TEV is a tool, originally developed in cost-benefit analysis, to deal with the 'priceless' assets that would otherwise escape standard procedures of appraisal. The work on pastoral TEV began in the mid 2000s with a series of studies by the International Institute for Environment and Development (IIED) and the IUCN World Initiative for Sustainable Pastoralism. More recently, a series of IGAD studies on the value of the livestock sector in its member states, although not focussing specifically on pastoralism, have added substantial methodological depth to the approach.

Overall, the work of TEV highlights the weakness of existing quantitative data as far as pastoralism is concerned (confused, fragmentary, incomplete, incommensurable, aggregated); and the need for methodological tools capable of capturing both the market and non-market goods and services produced by pastoralism as a complex livelihood system (as opposed to simply animal production). Where the availability of data has allowed some analysis, pastoral systems have been found to offer surprisingly high returns for a sector that has historically suffered from underinvestment.

Interest in pastoral total economic valuation is part of the broad process of transformation in the understanding of pastoral systems which started with the critical mass of new empirical evidence generated in the 1970s and 1980s. Most relevant here is the recent redefining of pastoral systems as being specialists in harnessing environmental instability for food production: whereas most forms of crop farming experience the dryland environment as a *problem* due to the absence of uniformity and stability, pastoral systems experience it as an *asset* due to the presence of dynamic variability.

Building blocks, gaps and theoretical challenges

The studies on pastoral TEV have already identified about forty categories of value (direct and indirect), ranging from those associated with the trade of animal products, to less obvious ones such as job-creation outside of pastoralism or the value of transport, finance and environmental services. Based on the work so far, some of the methodological gaps and challenges are:

- as both external investors and livestock traders make use of specialised pastoral labour and social capital, a proportion of the value of livestock financial services to non-pastoralists, and of the added-value attributed to the livestock-trade, depends on the existence of pastoral systems to reproduce specialised management expertise and social organisation;

- pastoral households tend to have very limited access to the basic services normally associated with citizenship in a modern state; that people in pastoralism often provide for these services by themselves represents economic value, quantifiable by proxy with the local cost of providing these services in areas where they are available;
- crop-livestock integration above the level of the farm (large-scale/regional integration), made possible by pastoral livestock mobility, increases resilience and sustainability – therefore securing the creation of economic value over time – not only in pastoralism but also in crop farming;
- pastoral systems help fill remote areas with state-related civil society, areas that are poorly reached by the institutions of the state, making them governable – this value is quantifiable in relation to the cost of dealing with the consequences when such areas cease to be governable;
- cost-benefit analysis, which TEV contributes to, should state its perspective upfront (the country, the government, the global market, food security, peace, or the growth of GDP), and consider the possibility of winner and losers: ‘how much’ questions only make sense if accompanied by ‘for whom’ questions;
- we need difference or ‘edges’ in order to perceive anything, making difference a crucial asset in knowledge making; the fundamental difference in the way of using the environment for food production, as represented by pastoral systems, is already emerging as an asset (for example in the work on the resilience of food-production systems under climate change): this ‘service of difference’ could be quantified with procedures similar to those used in calculating the value of environmental services.

What next

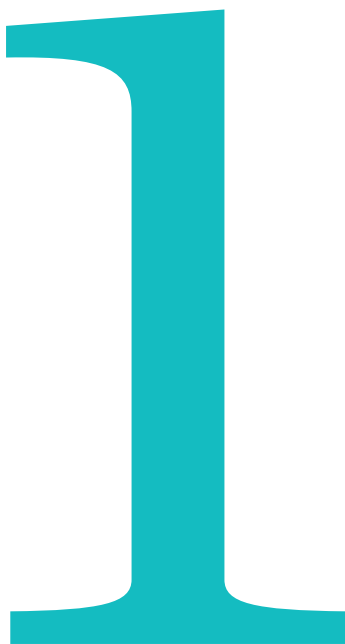
The final section of the paper looks at potentials and challenges in developing a broader strategy for operationalising and institutionalising the TEV framework. A three-tiered strategy is presented, with key issues discussed in relation to each tier.

In Tier 1, all the benefits, goods and services provided by pastoralism are identified. The crucial challenge at this stage is to establish a clear link with pastoral production strategies. Therefore the definition of ‘pastoralism’ itself and the conditions that enable its recognition on the basis of the logic and strategies of production in use, are fundamental to this tier.

In Tier 2, the economic value of these benefits, goods and services is quantified in order to support decision making in economic terms. When investing in pastoral TEV research, returns could be maximised by focussing on: i. values that could be calculated at a relatively small cost by completing a set of parameters where only one is missing; ii. values that directly concern everybody’s experience (for example supplying street vendors with roasted meat); iii. values for which a critical mass of data can be generated by accumulating identical case studies in different areas. Information on operational parameters crucial to pastoral TEV work is presently scattered in the literature. The pace of pastoral TEV work could be accelerated by gathering this information in an online database.

Finally, in Tier 3, pastoral TEV work focuses on formally *incorporating* the value of pastoral systems, goods and services into national economic planning. For this process to succeed, a measure of demand-led approach needs to be woven into all dimensions of pastoral TEV since its early stages. Besides, the acknowledgement of value soon fades away when not continuously renewed through political negotiation. Therefore, the successful institutionalisation of pastoral TEV work will also need to include capacity building for such a negotiation, starting from the pastoral producers themselves.

Introduction



The promotion of non-pastoral uses of the land in pastoral areas – ranching, commercial irrigated agriculture, biofuels or high-end ecotourism – is often preferred by local administrations and national governments to interventions that would secure pastoral production as a viable livelihood/economic system. Partly, these preferences reflect the lack of good quality and comprehensive data on the contribution pastoral systems make to local and national economies. Standard data collection in pastoral areas, distant from urban centres and often poorly supplied with even the most basic services, is challenging and expensive. This is not the only reason for the poor visibility of these food production systems in statistical analysis and policy-making circles however.

While lack of data is an obvious obstacle, more problematic is the selective eye – albeit impersonal – of survey procedures and appraisal mechanisms. When the scale of analysis is large enough to include food production systems characterised by fundamentally different ways of using the environment, commensurability becomes an issue. Standard mechanisms of appraisal have stronger affinity with certain ways of using the environment than with others, so their application across differences, even when systematic and uniform, cannot protect from skewed results. A complementary framework, known as Total Economic Valuation or TEV, is increasingly being used by researchers, NGOs and regional bodies (e.g. the Intergovernmental Authority on Development) to bring into the frame of comparative appraisal the many goods and benefits pastoral systems contribute to local, national and regional economies.

The purpose of this paper is to provide a practical tool for those interested in carrying out work on the Total Economic Valuation of pastoralism. Its focus is on the methodological and operational aspects of pastoral TEV. Two main sets of documents have been reviewed: the studies on the Total Value of Pastoralism that resulted from a collaboration in mid 2000s between the International Institute for Environment and Development (IIED) and the International Union for Conservation of Nature (IUCN) World Initiative for Sustainable Pastoralism programme; and the studies on the Contribution of Livestock to the Economies of IGAD Member States, carried out between 2009 and 2012 under the lead of Roy Behnke. All these studies are available online (the addresses are provided in the list of references).

The paper is organised in three parts. Section 1 introduces the concept of TEV, explains its relevance to the study of pastoral systems and rural development, and gives an overview of the work of pastoral TEV to date. Section 2 concentrates on the 'building blocks' of pastoral TEV, that is the categories of value and the ways these have been calculated so far (or have not), highlighting gaps and theoretical challenges. Finally, Section 3 draws on the previous analysis to define a broader strategy for institutionalising the TEV framework, and explores a set of options for future research. Although the discussion has relevance for pastoral TEV research in general, most of the examples concern East Africa.¹

¹This paper was produced in the context of the Pastoralists' Voices project funded by CORDAID and jointly implemented by Tufts University and the International Institute for Environment and Development (IIED) in partnership with PFE and Ethiopian Universities (Hawassa, Haramaya, Jijiga, Semera and Mekele) and the University of Nairobi. The paper was initially written as the background document to a training workshop on the design of research methodologies for Pastoral Total Economic Valuation, held in Addis Ababa on 29th January-1st February 2013.

Pastoral TEV coming of age

A large, stylized teal number '2' is positioned in the lower-left quadrant of the page. It has a thick, rounded stroke and a small circular loop at the top left.

TEV: Where From?

The concept of 'total economic valuation' (TEV) comes from cost-benefit analysis. Introduced in civil engineering at the end of the 19th century, TEV was used to calculate the value derived from infrastructure systems (e.g. road, bridges, water supply and sewers) or man-made heritage resources, compared to not having them.

The work on the total economic valuation of pastoralism borrowed the concept from environmental economics, where TEV was introduced in the 1980s, as a strategy for promoting the conservation of 'priceless' ecological assets such as biodiversity.² In a 'real world' where decisional processes are dominated by market-based appraisal, priceless assets are poorly represented compared to those carrying a monetary tag. This simple shortcoming in the practices of economic representation exposes decision-making to a dangerous dilemma: irreversible alterations of priceless assets can precipitate enormous costs. Taking a pragmatic approach to this quandary, the promoters of TEV in environmental economics engaged with the existing mechanisms of appraisals and worked to fill the gaps in their powers of representation.

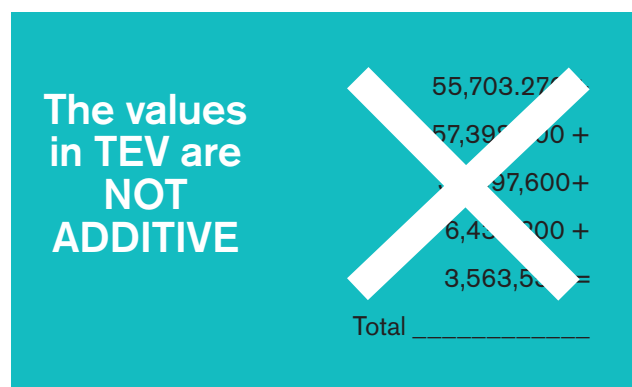
The work on pastoral TEV shares this approach but a word of caution is needed. Firstly, in the use of TEV with pastoralism there is no implication that pastoralism should be understood in correlation with natural assets or as part of nature. Indeed, as we have seen, before being adopted in environmental economics TEV was used in relation to man-made assets. Secondly, there is no implication that pastoralism is disconnected from the market³ or that there is no monetary value associated with pastoral systems. There are many valuable dimensions of these complex production/livelihood systems that remain invisible to standard market-based appraisals, compared to other forms of land use. This results in an 'un-level playing field' for the analysis that informs decision-making processes. As in the case of the other assets that have been the concern of TEV (natural or man-made), irreversible alterations that might appear neutral or even beneficial, especially in the short term, can precipitate incalculable costs in the medium and long term.

BOX 1. TEV HELPS TO GAIN KNOWLEDGE ABOUT...

- misfits between measuring tools and procedures and what is being measured;
- gaps in the data: naming what we don't know and helping measuring;
- off-limit areas where market appraisal is out of its depth: invaluable assets that cannot be traded for money (e.g. redundancy in High Reliability Systems, cf Roe et al 1998).

TEV is not intended to place a price tag on invaluable assets. Most of the values described in TEV are not 'additive' but are complex and partially overlapping. Therefore, the 'total' in total economic valuation refers to the comprehensive nature of the analysis rather than to an overall sum. The method is concerned with visibility more than with accountancy, with mapping and unfolding all avenues and categories of value rather than with building a total figure. In this respect, TEV is a fundamentally different approach from additive processes such as building a GDP, although it can contribute to them. Ultimately, TEV is to be used as a tool for putting priceless assets on the map, and as a platform of comparison with market-native assets in order to provide a more balanced representation of value in decisional processes.

Figure 1



²Cf. Pearce (1993).

³Amongst the various classifications of livestock systems, an unfortunate strand has tied together market and modernization at one extreme of the spectrum and, at the other extreme, 'tradition' and rejection of the market. The belief that pastoralists do not sell their livestock is now listed amongst the 'myths and misunderstanding of pastoral development' in UN publications (UNDP 2003). Several studies have shown that, when pastoralists have kept away from the markets, it was because the terms of trade were very unfavourable to them e.g. Baker (1975). In regions where herders could enjoy good terms of trade, they marketed their animals on a regular basis. In the 1920s – after thirty years of settled farming that had followed the losses from the rinderpest epidemics of 1890s – a pastoral group considered amongst the most 'traditional', the Fulani-Wodaabe, financed their return to nomadism with the exceptionally high prices on the livestock markets triggered by fast urbanisation in Nigeria (Bonfiglioli 1982; historical overview of pastoralist livestock marketing is in Kerven 1992).

TEV with pastoralism

The current interest in the total economic valuation of pastoralism is part of the wide-ranging reconsideration of these production systems. The challenge to the traditional ecological paradigm in pastoral development in the 1990s,⁴ initiated the slow process of 're-qualifying' the theoretical categories and methodological tools used in analysing pastoral systems. Carried out for more than twenty years, this process has gradually extended beyond scholarly circles into the international and national development arenas.⁵ It is beyond the scope of this document to engage in a description of this fundamental change but it might be helpful to recollect at least the key elements of it:

1. The challenge to the equilibrium-ecology paradigm (in pastoral development) drew on the empirical observation of pastoral systems in Africa to argue that most rangeland ecosystems are better understood as driven by complex dynamics rather than by homeostatic mechanisms.⁶
2. Development tools that had been considered universally valid were shown to be model-dependent, and often inappropriate outside their native context of relatively stable and uniform (temperate) environments.⁷ On the other hand, pastoral solutions that through the lenses of the old paradigm had appeared economically irrational (e.g. mobility), could now be made sense of, and understood as key to a different but perfectly logical strategy of production.
3. With agricultural productivity and ecological sustainability being identified with conditions of stability (although in different ways), the environmental variability of the rangelands had simply appeared as a disturbance that needed correcting or neutralising. In the new perspective, with environmental variability now conceptualised as a structural feature of the rangeland ecosystem, there is now room for a more sophisticated understanding of pastoral strategies, in particular the combination of

animals feeding selectivity with strategies to secure access to pasture where and when nutrients peak.

4. When free to operate according to its logic, dry land pastoralism can find an asset in the presence of dynamic variability, whereas most forms of crop farming – especially the globalised model of command-and-control agriculture – find a problem in the absence of uniformity and stability. With this perspective, particularly in light of the concern for global climate change, pastoralism holds an important lesson on harnessing environmental instability for food production.⁸

Decades of looking at pastoralism and the drylands through the wrong lenses have left a cumbersome legacy, deeply embedded in all aspects of pastoral development, from policies and legislation to capacity building, the availability, structure and focus of existing data, and even the language itself. For example, the unquestioned descriptions of the rangelands in terms of 'fragility' and 'scarcity'; or the characterisation of pastoralism 'by subtraction' – as lacking something (sedentarisation, crop farming, the market economy, modernisation); or the definition of pastoral resources by exclusion, as a 'left over' (unproductive, marginal, remote, uninteresting for other uses). Because of this legacy, today a substantial proportion of data on pastoralism is either misleading or not very relevant, whilst many dimensions of pastoralism's economic contribution remain largely invisible.

The work on pastoral TEV is intended to bring hidden values into the open and, by so doing, to help prevent the dangerous oversight in policy making of taking them for granted. As nicely put by Jon Davies in an early work on pastoral TVE: 'There are clearly hidden values to pastoralism that may not be noticed as they go, but will be missed when they are gone. It is prudent to make the public and the appropriate government ministries aware of these values whilst they still exist' (Davies 2007: 22).

⁴Amongst others, Ellis and Swift (1988); Behnke et al (1993); Scoones (1994); Niamir-Fuller 1999; Hodgson (2000); Homewood 2008; Krätli and Schareika (2010); Gertel and Le Heron (2011); Catley et al (2012).

⁵Again, amongst many others, UNDP-GDI (2003); Mortimore et al (2008); COMESA (2009); IIED and SOS Sahel (2009); African Union (2010); Republic of Kenya (2012).

⁶For example Ellis and Swift: 'We have attempted to show that in Ngisonyoka Turkana and most probably in many other arid or semi-arid pastoral ecosystems, equilibrium conditions are not attainable. Rather, ecosystem dynamics are dominated by the stochastic perturbations of multi-year droughts. [...] The obvious conclusion is that conventional development procedures are destabilising influences in ecosystems which are dominated by stochastic abiotic perturbations and which operate essentially as non-equilibrium ecosystems' (Ellis and Swift 1988: 457–458).

⁷For example, Behnke and Scoones' argument that carrying capacity can only be defined in relation to a management system: different management systems *in the same ecosystem* (e.g. a ranch or a nature reserve) would have different carrying capacity (1993); or the claim that 'the history of livestock development in Africa [...] has been one of equilibrium solutions being imposed on non-equilibrium environments' (Scoones 1995: 4).

⁸This argument has been in the literature, although not yet in the foreground, since the challenge to the old paradigm was first formally launched: 'The producer's strategy within non-equilibrium systems is to move livestock sequentially across a series of environments ... exploiting optimal periods in each area they use ... Herd management must aim at responding to alternate periods of high and low productivity, with an emphasis on exploiting environmental heterogeneity rather than attempting to manipulate the environment to maximise stability and uniformity' (Behnke and Scoones 1993: 14–15). A detailed discussion and a synthetic presentation of it can be found, respectively, in Krätli and Schareika 2010 and Krätli et al 2013a). On the command-and-control approach to natural resource management and agriculture, and its need for uniformity and stability, cf. Folke et al 2002; Thompson et al 2007).

How far so far?

The work on the TEV of pastoralism began about seven years ago. It built on a number of more general studies on the economy of pastoralism commissioned by IIED and the IUCN World Initiative for Sustainable Pastoralism (Nyariki 2004; Behnke 2006; Odhiambo 2006; Gura 2006; Biber 2006; Dutilly-Diane 2006; Wane 2006; Hatfield and Davies 2007)⁹ and on a seminal IIED paper proposing the TEV framework as a strategic way forward (Hesse and MacGregor 2006). These initial studies (from now on 'IUCN/IIED studies') highlighted a number of challenges, particularly: the need for a clear definition of pastoralism as the necessary starting point for sound comparative analysis; the weakness of existing quantitative data as far as pastoralism is concerned (confused, fragmentary, incomplete, incommensurable, aggregated); and the need for methodological tools capable of capturing both market and non-market goods and services produced by pastoralism as a complex livelihood system (as opposed to simple animal production). This last point signalled a growing awareness that looking at pastoralism through the lenses of animal production and marketing is necessary, but insufficient, as it misses out a great range of important contributions pastoralism

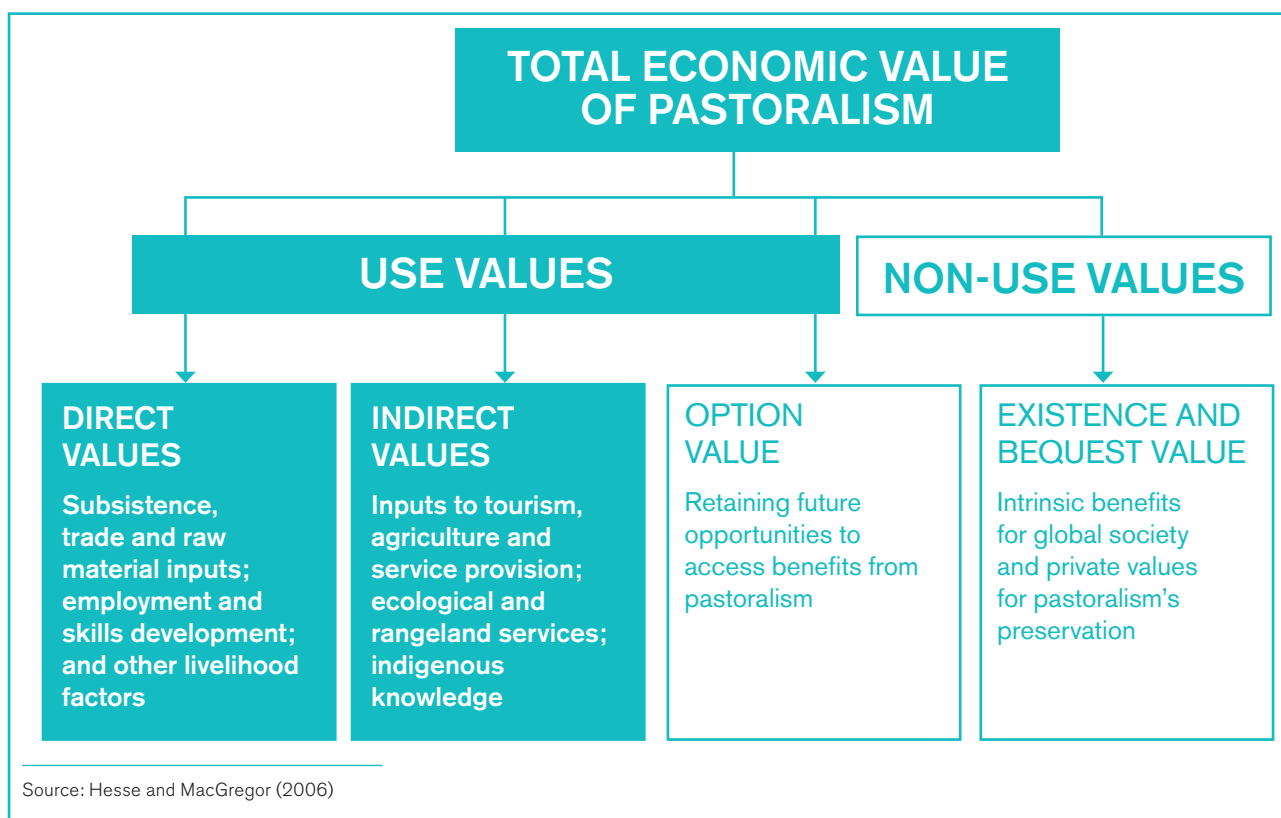
makes to wider society and the environment – many of which are of critical economic importance:

There are significant complementary indirect goods and services associated with pastoral landscapes, and with pastoralism as a human activity, that stand to be lost or compromised by neglect, expropriation or conversion of rangelands [...] rangelands and rangeland stakeholders will benefit from an approach based on recognition of the multiple roles and values of rangelands, beyond the narrow focus on commercial products (Hatfield and Davies 2007: 17).

As long as these contributions remain unaccounted for they are invisible to policy making: their beneficial effects taken for granted as something that has always been there and always will. Hesse and MacGregor (2006) proposed to capture them, together with the more commonly measured parameters, by using a simplified TEV model shown below.

This model omitted 'option values' and the 'non-use values' of 'existence/bequest', concentrating strategically on direct and indirect use values, expected

Figure 2



⁹The work by IUCN-WISP had a global perspective, but here we focus on the studies concerning Africa.

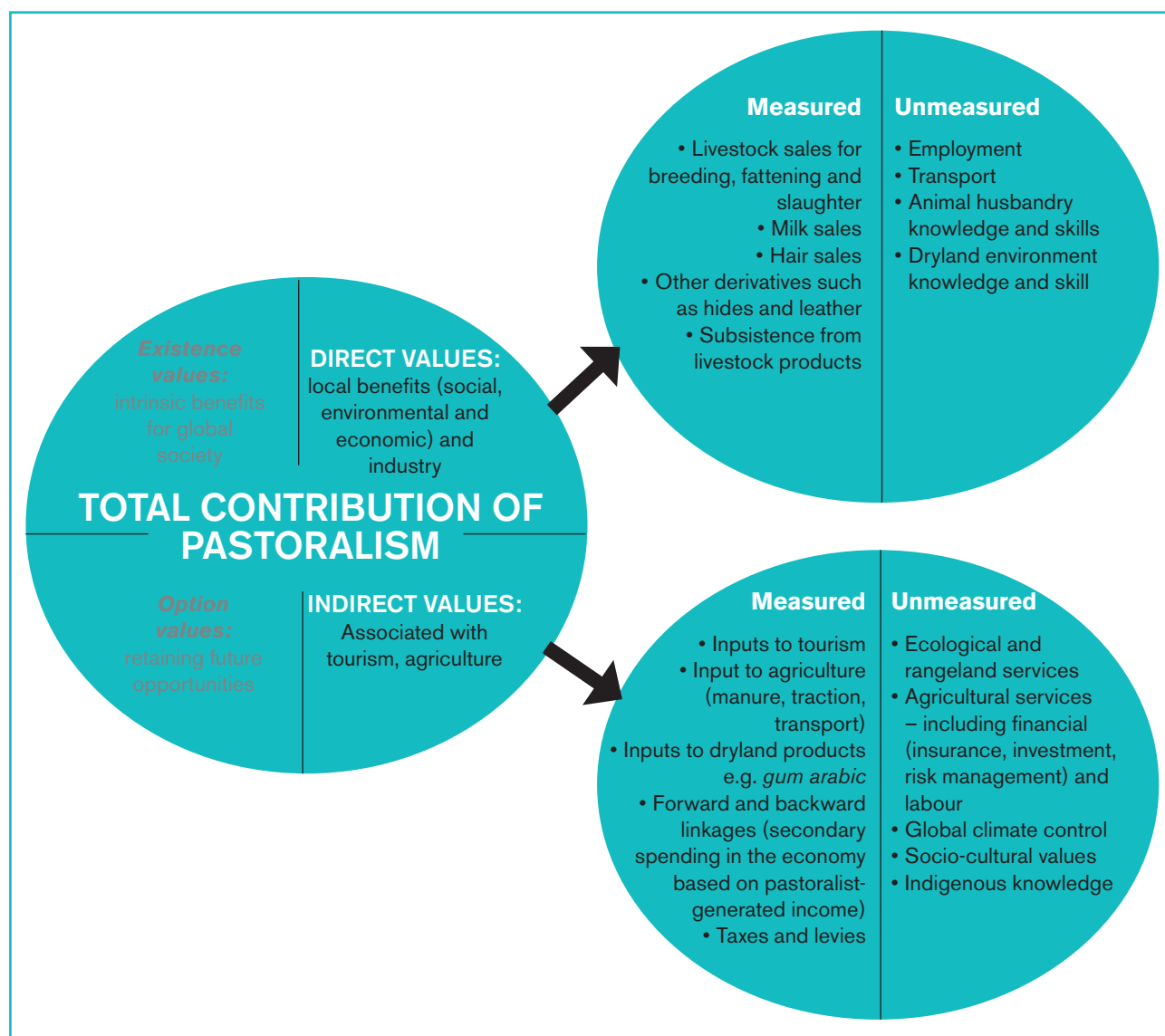
to be relatively simpler to calculate and leading to a stronger case in policy making circles. In this case, 'use values' represent the value received, directly or indirectly, from the goods and services provided by pastoralism.

With the added distinction between 'measured' and unmeasured' values, this framework was adopted in a series of seven studies by IUCN-WISP, including three in Africa – Mali (WISP 2006), Kenya (Davies 2007) and Ethiopia (SOS Sahel Ethiopia 2008) – and a global review (Rodriguez 2008).¹⁰

The pastoral TEV framework used in the IUCN studies

More recently, the TEV approach was used in the studies commissioned by IGAD-Livestock Policy Initiative on the contribution of livestock to the economies of IGAD member states (from now on, 'IGAD studies').¹¹ In each state, these studies are concerned with the livestock sector as a whole, not specifically with pastoralism. They also focus on calculating livestock's contribution to the GDP (although not exclusively). Despite this generality, the depth and thoroughness of their research basis, and their often innovative methodological solutions, make them a formidable source for any future work on pastoral TEV of pastoralism.

Figure 3



¹⁰The whole series of TEV of pastoralism studies (Mali, Kenya, Ethiopia, Spain, Peru and Kyrgyzstan, and their review), as well as the previous studies on the economics of pastoralism, can be downloaded from the IUCN-WISP website, <http://data.iucn.org/wisp/wisp-publications.html>

¹¹These studies are: Behnke 2010 (Ethiopia Part 1); Behnke and Metaferia 2011 (Ethiopia Part 2); Behnke and Muthami 2011 (Kenya); Behnke and Osman 2011 (Sudan); Behnke and Nakirya 2012 (Uganda). The experience of the Sudan study also led to a paper specifically focusing on pastoralism: Behnke 2012.

Main findings of IUCN/IIED studies

The IUCN/IIED studies used the simplified TEV framework (focusing on direct and indirect values) with the aim of capturing the full range of pastoralism's contributions, not only the products one can buy at the market. They found that pastoralism is rarely visible in the national data and therefore likely to be greatly undervalued. Where data allow some analysis, pastoral systems are found to make substantial contributions to their national economies. For a sector that has historically suffered from unfavourable policies and neglect, today this represents impressively high returns on investment.

The focus on livestock and meat productivity in policies and development programmes overlooks the crucial difference that pastoral systems (as opposed to the meat-focussed ranching models often promoted in their place), as well as supplying the markets with low-cost meat, also support a wide range of other goods and services – starting from a substantial milk economy (often controlled by women and therefore critical to their livelihood and position in the society) with an important subsistence value (Davies 2007).¹² Even one of the best monitored categories of direct value, livestock exports, can remain substantially hidden behind practices of adjustments to cope with severe but poorly enforced government restrictions on cross-border trade (with cross-border trade labeled as 'smuggling', its economic value goes unrecognised). Only about 60% of animal sales in Ethiopia go recorded, with the transactions that remain invisible estimated to represent a value of 138 million USD per year (Rodriguez 2008).

Beside commercialisation, many livestock products are also circulated for free as a way of strengthening social cohesion and as a form of moral economy. Failing to see these practices, and limiting the accounting of value to commercialised livestock output, may have a double negative effect. Firstly, it overlooks the substantial economic value of these services for the national economy – for example as 'financial services' (Behnke 2010), but also because smooth trading depends on trust, which in turns depends on social organisation and social networks. Secondly, indirectly favouring the expansion of market-driven relationships into these dimensions of the livelihood system is at the cost of undermining the informal institutions that regulate these fundamental services (with the risk of leading them to collapse).

Expanded commercialisation will read in the accountancy books as a positive change, but only because the costs of losing the services associated with circulating free goods is *not accounted for*. Similarly, in agriculture people produce both to make money and to save money. Most farming pastoralists in the drylands make money from their livestock and use the lower and more unpredictable returns from farming in order to save money (or reduce the intake on their 'capital' stock). Producers may also use livestock to save money, as a way of securing highly valued food (meat and milk), while avoiding penalising market costs (Behnke 2006).

The IUCN studies stress that rangelands ecosystems are often 'grazing-dependent', that is they would not function without livestock: 'a reduction of mobility of herds or complete exclusion of herds often results in reduction of essential ecosystem services and accompanying system biodiversity, health and stability' (Davies 2007: 2). In line with this, the importance of environmental services associated with pastoral systems, and the fact that national accounts generally do not capture them, was also highlighted – although most country partners in this exercise did not have the expertise to assess their values in quantitative terms (Rodriguez 2008).

Pioneering the use of TEV with pastoralism, the IUCN/IIED studies have covered a lot of ground in mapping areas of values that go unaccounted, but they have also faced serious challenges, especially in defining such values in monetary terms. A major hindrance has been the lack (or patchiness) of disaggregated data on pastoralism: lack of reliable demographic data on pastoral populations; lack of reliable estimates on the proportion of pastoral livestock in the national herds; lack of data on the marketing of livestock products disaggregated by production system; and a lack of reliable household budget surveys to measure subsistence values. This poor quality of data affects all aspects of TEV work: from assessing the relevant value of sales and consumption of livestock and livestock products; to understanding the indirect values (e.g. contribution to tourism, agriculture or the national economy, or environmental services); to measuring the social and cultural values of livestock and livestock products, including the generation of social capital.

Overall, the exercise has highlighted the need for a critical assessment of the way data on pastoralism is currently generated and used in different countries; which is also important in light of the emerging

¹²Cf. Behnke (1984: 269): 'Amongst pastoralists an animal's eventual death or slaughter (often in anticipation of death) is simply the last stage in its productive career [...] A commercial producer, on the other hand, cannot realise a profit from his animal until he disposes of it'.

BOX 2: COMMON CHALLENGES IN VALUING PASTORAL SYSTEMS

1. The knowledge gaps are generally larger than the available knowledge;
2. Current valuation tools concentrate on per-animal productivity and commercial off take;
3. Record keeping tends to exclude informal markets, where most transactions occur;
4. Data on the pastoralist sector is not disaggregated from the wider livestock or agricultural sectors;
5. The cost of standard data collection in pastoralist areas is prohibitive, given distances, conditions and movement;
6. Backward and forward linkages to the wider economy are often overlooked;
7. Valuations tend to ignore the contribution of pastoralism in terms of number of people employed and supported;
8. Livelihoods are not neatly compartmentalised and many pastoral people diversify into off-farm activities;
9. Climate and price fluctuations mean that any detailed analysis needs to span over several years in order to obtain representative figures;
10. It is necessary to work at different geographical scales and national data have to be refined by microeconomic surveys;
11. Methodologies for economic valuation of environmental services are becoming more common for on-site effects but off-site effects are generally poorly assessed.

Source: Hatfield and Davies (2007)

awareness of the gaps in our understanding of pastoral systems (Rodriguez 2008). In particular, the lack of understanding of pastoral systems has important consequences for decision-making on changes of use of pastoral land, where decisions involve comparative cost benefit analysis across fundamental differences in the logic of production. With data on pastoral systems often being unreliable, or generated on the basis of a poor understanding of their operating logic, important values can easily go unaccounted for. For example, what is the actual opportunity cost to a pastoral system, and to the national economy as a whole, of converting dry-season grazing reserves to other uses? (These areas have relatively more water sources and are therefore typical targets of land-use conversion in the rangelands.) Cost benefit analysis in these cases typically follows a 'hectare per hectare' comparison of different uses. It is well known, however, that the existence of relatively small dry-season grazing reserves enables the overall economic exploitation of much bigger areas. With the conversion of these grazing reserves to other uses, the much larger areas would also be lost to the pastoral system – and to the national economy (Rodriguez 2008). Without a sound

understanding of the way pastoralism works, and the incorporation of this knowledge into the calculative tools and procedures of national accounts, such costs remain invisible (therefore external) to the analysis.

Finally, the experience of these pioneering studies has highlighted the difficulty of producing robust TEV work in a context of great uncertainty and incommensurability of data, and therefore the critical need for investing in methodological rigour (Rodriguez 2008). Besides, even in its simplified form, the TEV framework remains a vast territory of enquiry. Without abandoning the overall aim of a comprehensive mapping of values, an important lesson from these studies is the need to carefully consider the costs and benefits of a wide-ranging analysis in individual studies. In the spirit of pragmatism that characterises the TEV approach, the functional analysis of pastoral economies may be better served by identifying and focusing on a strategic number of indicators of clear interest to policy-making. Some of the challenges faced by these pioneering studies have been successfully addressed in the more recent series of studies for IGAD.

BOX 3. SOME OF THE MONETARY VALUES IDENTIFIED THROUGH TEV

SUDAN: With the great bulk of livestock production under pastoral management systems, the 2009 livestock offtake in the northern states was worth 3.7 billion USD (Behnke and Osman 2011).

ETHIOPIA: Estimated 80% of exports from pastoral systems. Working camels provide transport services worth 46 million dollars per year. Collective insurance value of pastoral herds estimated at 340 million USD. Returns to capital investment around 25–30% per year (Behnke and Metaferia 2011; Behnke 2010).

KENYA: The Arid and Semi-Arid Lands host about 70% of the national livestock herd for an estimated capital value of 800 million USD and an annual offtake close to 70 million USD (Republic of Kenya 2012; Davies 2007). More than 80% of the beef consumed in the country is produced in pastoral systems (Behnke and Muthami 2011).

UGANDA: Returns per hectare of land in pastoral systems found to be 6.8 times higher than returns to ranching systems in south-western Uganda (Ocaido et al. 2009).

Main findings of IGAD studies¹³

The IGAD studies concentrated on livestock's contribution to GDP, starting from the procedures used by ministries of finance in their annual GDP accounting. Looking at the entire livestock sector allowed the studies to by-pass the problem of data aggregation encountered by the IUCN studies which focused specifically on pastoralism. The IGAD studies used a 'production approach' (one of the common methods to calculate GDP) and rather than simply relying on the official figures, recalculated the values drawing on the combined information from the available sources, including the academic literature. In the production approach, the value of the GDP is constructed by combining the outputs of every category of economic activity. The first study of the series (Ethiopia) is in two parts. Part 1 (Behnke 2010) discusses the methodology for the whole series.

The results show GDP contributions of the livestock sector (and pastoralism within it) is substantially higher than the figures obtained through the standard procedures currently in use. In Ethiopia, the gross value of ruminant livestock's contribution to agriculture (2008–09), when recalculated with a TEV approach, increases 113%. Similarly, the recalculated contribution of ruminant livestock to agricultural GDP represents an increase of 86% in Uganda (with cattle being by far the most important species) and about 150% in Kenya.¹⁴ In Uganda, the recalculation used only the official data, but analysed them differently. More than 80% of the beef consumed in Kenya is produced by pastoralists (Behnke and Muthami 2011: 7). The value of the milk economy is greatly underestimated and poorly understood (Sadler et al 2009; Musinga et al 2009; Nori 2010). With domestic economies for livestock many times bigger than their export markets (about five times bigger in Ethiopia, fifteen times bigger in Mali, and almost fifty times bigger in Sudan), exports receive a disproportionate amount of attention. In Sudan, livestock was found to be, by value, the largest sub-sector of domestic economy.

Innovative methods to estimate the value of livestock-based 'financial services' (credit, insurance and risk-sharing) have shed new light on this poorly documented area of enquiry. The monetary value of these services in Kenya was estimated (in 2009) at more than 400 million USD, with at least 90% in pastoral systems. In Ethiopia, the figure was 1.1 billion USD, with about 40% in pastoral systems, plus 199.3 million USD in risk-pooling services from pastoral herds. In Sudan the figure was 1.9 billion USD, with an estimated 90% in pastoral systems. Similarly, these studies highlight the need to include livestock within systematic procedures of 'satellite accounting' – a method that allows tracking down the proportion of livestock products that are taken up by the service and manufacturing sectors of the economy (rather than being consumed at point of first sale) and are therefore currently accounted under headings different from livestock.

Standard procedures used in the construction of GDP operate with calculative tools and sets of data that are either inadequate to represent production in pastoral systems, or exclude pastoralism altogether. In Kenya, the agricultural GDP is calculated with a 'commodity flow' approach, a method that tracks agricultural products after they have been commercialised (as consumer goods, as inputs into other products or processes, as exports, or as contributions to fixed capital and inventories). Designed for commercialised agriculture

¹³There is one study per country (see list of references) plus Part 1 of the study on Ethiopia which is dedicated to describing the methodology for the whole series (Behnke 2010). Unless otherwise specified, the references to a particular country in this section are from the corresponding study.

¹⁴In Kenya, these results have already been used to back up the recent policy on the development of the Arid and Semi Arid Lands (ASAL), which states that 'the ASALs have hidden strengths and enormous resources that can be harnessed not only to sustain themselves but to contribute to national development' (Republic of Kenya 2012).

and particularly industrial crops, this method falls short of capturing value associated with subsistence use, which is important in the case of livestock and livestock products from pastoral systems.

Non-marketed agricultural production is principally estimated through periodic household budget surveys and projections to cover the data-less intervals. The benchmark used by the Kenya National Bureau of Statistics to calculate the subsistence portion of agricultural GDP was defined in 1997, and fails to include pastoralists: 'consequently pastoral consumption patterns are assumed for national accounting purposes to be identical to those of poor rural farming households, which is almost certainly not the case' (Behnke and Muthami 2011: 11). In Ethiopia, the data on national livestock populations used by the Central Statistics Agency does not include the important pastoral areas of Somali and Afar Regions. To determine the volume of livestock production, the accountants at the ministry of finance use a set of coefficients passed over within the office from the 1980s and developed from forgotten sources (Behnke 2010). In Sudan, national livestock numbers are estimated using a linear herd-growth model from data of 1976 (the last livestock census).

Neither the IUCN or IGAD studies engaged in primary data collection: they simply took a fresh look at the available data. None of the states considered in these exercises held data on livestock that allow the disaggregation of data on pastoralism (the nearest approximation is usually on geographical or administrative basis).¹⁵ None of them held data or procedural mechanisms that allow estimates of the economic importance of animal power. The information on cross-border trade is poor or missing (especially in Ethiopia). The overall lesson from all these works therefore seems that, in analysing the value of pastoralism, methodology plays a crucial role: how we look determines what we see. The next section concentrates on this dimension.

¹⁵Since the time these studies were carried out, there has been a new census in Sudan (2008) and in Kenya this is soon expected to change thanks to the data on the number of livestock by households collected during the 2009 population census.

The building blocks

3

Mapping the economic values of pastoralism – that is identifying and classifying them as direct or indirect values – is the first step of the TEV exercise. Adjustments to the initial framework were made along the way. For example, Davies (2007) found that categories such as ‘transportation’ and ‘indigenous knowledge’ could be considered production costs (as ‘inputs to the production system’) as well as economic values.

Direct and indirect values of pastoralism

Table 1 below consolidates the categories of value addressed in the reviewed literature, keeping the distinction between ‘measured’ and ‘unmeasured’ introduced by the IUCN studies. As values often overlap the literature warns against the risk of counting them twice under different categories. In practice, TEV is more than an exercise of accountancy, as the mere mapping of a value, even before gaining the capacity to quantify it, already contributes to its visibility.

The first major challenge to pastoral TEV work is the lack of disaggregated data. The quality of the data on livestock numbers and distribution across production systems determines the quality (and to an extent also the possibility) of the TEV exercise. As the collection of official data on livestock does not usually disaggregate by production system, a disaggregation of the pastoral proportion must be made through combining different sets of data. This is often done on geographic basis (e.g. highlands and lowlands in Ethiopia) or administrative basis (e.g. by district). Census datasets including information on livestock can be of help, but not without a critical examination of the categories used to classify the population and the criteria employed to place people in one category or another. For example, the last three censuses in Sudan (1973, 1983 and 2008) have classified the population into ‘urban’, ‘rural’ and ‘nomadic’, with the latter based on tribal origins, although ‘nomads’ and ‘pastoralists’ do not necessarily overlap (Krätli et al. 2013b).

The second major challenge is the lack of a univocal definition of ‘pastoralism’. Pastoral TEV studies have acknowledged the problem and usually made use of Jeremy Swift’s definition hinging on the importance of livestock in the household economy: more than 50% of gross revenue (the value of subsistence plus marketed production), or more than 20% of household food energy is directly derived from livestock.¹⁶ Although this remains one of the simplest and most straightforward definitions, it is not without problems (especially now that many pastoralist households, including fully nomadic ones, rely substantially on seasonal labour or

remittances). Hatfield and Davies (2007: 6) settled for an inclusive statement: ‘Pastoralism, regardless of the extent to which it contributes to the household economy, refers to any predominantly livestock-based production system that is mainly extensive in nature and uses some form of mobility of livestock’. Even when data on ‘pastoralism’ are available, TEV researchers are likely to deal with different sets collected according to different and often incommensurable definitions.

Successes and gaps

Here, we discuss the results of pastoral TEV work, highlighting the most effective achievements and the areas of the exercise that have remained opaque or have been missing altogether. Annex 1 provides an initial inventory of the values addressed under each category, as found in the reviewed literature, or which emerged in the course of the analysis presented in this section.

Satellite accounting

In GDP accounting the IGAD studies draw attention to the need to tag as ‘livestock sector accounts’ expenditures that are currently recorded under different industry groupings. Behnke (2010) calls for a ‘reconnaissance exercise’ according to the principles of internal satellite accounting, but on the basis of data already with the ministries of finance (therefore avoiding, for the sake of the trial, the complex and costly procedures of this method). Ethiopia has carried out full-scale satellite accounting for the environment and tourism, but not for livestock. This is how the need for satellite accounting is presented:

Agricultural GDP is based on the value of unprocessed or lightly processed agricultural produce at point of first sale – metaphorically at the farm gate. Some agricultural produce is consumed at this stage, but much is taken up by the service and manufacturing sectors of the economy which use it, modify it, and add value to it. As these livestock goods and services transit through the wider economy they continue to contribute to GDP, now classified not as agricultural output but as services or manufactured products. The secondary GDP benefits derived from livestock in this way appear under a variety of accounting headings and are not readily identified with livestock, which makes it difficult to assess the full extent of livestock’s influence on the national economy (Behnke 2010: 33).

¹⁶Originally from Swift J., Wilson R.T. and Harmsworth J., 1981, *Livestock production in the West African Sahel*, Addis Ababa, ILCA – (Chapter 1.3: ‘Systems Research in the Arid Zones of Mali. Initial results’).

Table 1. The values of pastoralism identified in the IUCN and IGAD studies

DIRECT VALUES	INDIRECT VALUES
Livestock trade	Contribution to tourism
domestic	direct tourist attraction
exports	indirect tourist attraction
Milk trade	production cost of having large game
Meat trade	opportunity costs of converting pastoral land to conservation
Hides and skins trade	Contribution to agriculture
Subsistence use	livestock dung as fertilizer (manure)
consumption by herding household	livestock dung as fuel (subsistence and trade)
consumption by other groups	livestock dung in building industry
retrieval and consumption of dead animals	reversing land degradation (including farmland)
Employment in pastoralism	animal power (traction)
self-employed herders	animals sold to fund agricultural activities
waged labour in herding	domestic animal biodiversity
Employment created outside pastoralism	Contribution to the national economy
veterinarians and technical personnel	taxes and levies
sellers of street grilled-meat (nyama choma)	backward and forward linkages
Transport services	inputs to dryland products
transport for the household	charcoal
transport for commercial purposes	social-ecological (and economic) resilience
Informal financial services	Environmental services
livestock as savings and investment	soil
livestock as credit	water
livestock as private insurance	biodiversity
livestock as collective insurance (risk pooling)	carbon sequestration
Development of skills and knowledge	improving water and mineral cycling
Use of natural environment	value of dry and high forest

* Backward linkage: when a particular production encourages investment in earlier stages of production; forward linkage: when a particular production encourages investment in subsequent stages of production (Hirschman, 1958). With regard to pastoralism, street grilled-meat sellers, livestock transporters, and hide and skin industry are examples of forward linkages; while itinerant sellers of animal drugs, cultural tourism in the ASAL, feedlot operations supplied by pastoral livestock and private enterprises selling water to pastoral livestock are examples of backwards linkages.

Capturing informal financial services

The authors of the IGAD studies have developed methods to calculate the monetary value of the informal financial services provided by livestock – as savings, sources of credit and insurance – with a view to inputting them into the calculations of the contribution of livestock to the national economy. The strategy of saving or investing in livestock is also common to non-pastoral groups such as, for example, farmers, civil servants and urban-based businessmen (Hesse and MacGregor 2006). This dimension would be very relevant to

evaluating the full impact of dismantling the service (e.g. also social and political, but also the distribution of the economic impact). The calculation of livestock-based financial services should consider to what extent the strategies of non-pastoralist investors depend, in the short and long term, on the existence of pastoral systems. Dependence on the reproduction of specialist pastoral labour is an obvious example: when sedentary people keep livestock in any significant number in the drylands, these animals are often entrusted to pastoral households or waged herders from pastoral households.

In Sudan, waged shepherds are preferably paid in livestock, on the assumption that they will take better care of the flock if it contains also their own stock. This strategy only works if the shepherd is building his own flock; in other words, if he sees a future in pastoralism (Krätli et al. 2013b). On the range, waged herders work side by side with 'self-employed' pastoralists, making use of the same communally managed resources (pasture and pastoral watering points, as well as services and pastoral development interventions). As waged herders are themselves members of pastoral groups (often planning a future as herd owners), in looking after the livestock of absentee owners they take advantage of the social capital and networks of knowledge-sharing within their pastoral community (for example information about the conditions of pasture, or guidance from the most competent members of the community during particularly challenging situations such as a major drought).

We can regard the complexity of these conditions as being pastoral 'man-made heritage and infrastructure systems'. Livestock is a sought after financial investment amongst non-pastoral groups because returns to costs are exceptionally favourable. In as much as a significant proportion of this benefit comes out of 'pastoral heritage and infrastructures', the continuity and the efficiency of livestock-based financial services enjoyed by non-pastoralists depends on the continuity of the pastoral system.

On-the-hoof trade

A similar point about the dependence on 'pastoral heritage and infrastructures' can also be made for 'on-the-hoof transport' in the livestock trade. Animals that would need finishing in feedlots before being sold for beef are fattened 'on the hoof' during the journey to the terminal market (Corniaux et al 2012, for West Africa; Krätli et al. 2013b, for Sudan). These practices make use of pastoral production strategies, pastoral resources and specialist labour, trained and reproduced within the pastoral systems. In this way, a proportion of the value added after that animal has been sold to a trader still depends on the pastoral system for its generation. This value is relatively simple to calculate by proxy with the costs of feedlot operations.

Animal power

The value of animal power has been recognised as an important knowledge gap in terms of pastoral TEV. Imaginative ways have been pioneered to estimate the value of animal power for traction and transport, both as a discrete commercial enterprise and in support to agriculture. In this growing landscape, a dimension

that has not yet been considered is the value of animal power for water extraction and transportation. In the case of extraction, it could be compared to equivalent cost – for equal discharge – in fuel, pumps and maintenance of motorised wells. For transportation, it could be compared to the cost of transporting water by truck (common for example in North Kordofan), for an equal distance and amount.

Livelihood dimensions other than animal production

Pastoral systems are more complex than commercial-only animal production systems (e.g. ranching). Although centred on animal production, they deliver more than just animal products. Pastoral households usually have very limited access to the basic services associated with citizenship in a modern state. As a consequence, people either stay without, or provide basic services for themselves – not only on an individual basis but as a group through social organisation and customary institutions. They do so in a significant measure in terms of water, transport, security and justice, health care and, to an extent, the education of children. In as much as people provide for themselves, this represents a value quantifiable by proxy with the local cost of providing these services. For example, an estimated 70 percent of animal health in pastoral systems in East Africa is provided by the producers themselves¹⁷ through knowledge generated and reproduced within the pastoral communities. The cost of the other 30 percent is equal to 0.42 of the value provided by pastoralism with regard to this service.

Net livestock offtakes from subtracting purchases?

Livestock offtakes can be gross or net. Net offtakes are determined by subtracting livestock purchases from gross offtakes. High levels of purchases (e.g. for fattening and draught) combined with low rates of slaughter for home consumption can result in net offtakes being about a third of gross offtakes (Behnke 2010). This is done on the assumption that the purchased animals simply compensate for those sold: x animals out, minus y animals in. When the focus is just pastoralism rather than the whole livestock sector however, this approach might be misleading: When producers sell adult animals but purchase young ones, measuring offtake rates in head of livestock can lead to a significant proportion of produced value remaining uncounted, hidden by the methodology. Behnke also warns that, as offtake rates can fluctuate significantly from one year to the next, the results of single-year studies must be treated with caution.

¹⁷Cf. an estimate suggested in the course of the training workshop (IIED 2013).

Resilience in food production

When free to operate without paralysing constraints, pastoral systems are key to the large-scale crop-livestock integration that is characteristic of highly variable environments. Thanks to the mobility of livestock producers, crop-livestock integration takes place across geo-ecological macro zones and between specialised groups of producers, rather than at the level of the farm where it involves a trade off with specialisation and ecological sustainability. In this way, the high levels of specialisation – at individual and social level, including complementarity, social capital and safety nets – necessary for successful food production in unpredictable environmental conditions, can be preserved. Good examples are most systems of long-distance transhumance. Pastoral livestock is taken to the north during the wet season – often with a good number of animals entrusted to pastoralists by owners amongst the farming communities – where the animals can enjoy an exceptionally nutritious diet. In the dry season the livestock is taken to the farming areas in the south. The arrival of the transhumants is a boost to the local economies: Pastoralists returning from the isolation of poorly serviced northern rangelands make their purchases at the local markets. These then fill up with low-priced animals and there is abundance of meat and milk. Pastoralists need to secure crop residues to help their livestock through the dry season. As the animals feed, they manure the fields. Manure contracts are now increasingly replaced by the commercialisation of residues. When crops fail (in many dryland areas producers manage no more than one harvest every 2–3 years) the farmers can still make money by selling the failed crop as feed. When this particular form of crop-livestock integration is functioning, resilience and sustainability increase for both systems (Krätli et al 2013b, Krätli et al. 2013c). This value is characteristically associated with livestock mobility as the key to achieving large-scale integration.

Social reproduction and political space

While pastoral TEV and the work on payment for environmental services (Dutilly-Diane et al 2007; Silvestri et al 2012) give recognition to the value of pastoralism for the management of the rangelands as an ecological space, there is little reference in the literature to the value of pastoralism for the management of the rangelands as a political space. Hesse and MacGregor (2006) do mention social reproduction and peace amongst the indirect values. The categorisation

of this value was based on the principle that livestock inheritance within pastoral families is critical to enabling new household units to form, and society as a whole to reproduce itself. Livestock loans or gifts further maintain the fabric of society.

Mobility and the communal management of resources involve continuous processes of negotiation that lead to exchanges and complementarities. The challenges involved in estimating this value in monetary terms mean that this category has so far remained empty. A more effective way of looking at this value could be to focus on the way pastoral systems, with their substantial 'infrastructure' of informal institutions and social organisation, help fill the political space in remote areas that are poorly reached by the institutions of the state, making them more governable. Although given little consideration in the past, this service is now being seen as increasingly valuable. Only extensive pastoral economies can cover the huge areas concerned. Governments have insufficient control. Where pastoral systems recede, spaces that were governed become ungoverned. One method for defining in monetary terms the value of securing governed spaces could be by proxy – based on land areas – with the costs of operations such as the US AFRICOM, to secure what are considered 'ungoverned spaces' (Ploch 2011) or the cost of rebuilding Mali.¹⁸

A recent attempt to cost the use of mobile pastoralism compared to traditional forms of military surveillance has been carried out in the context of the preparation for a new project called 'Troupeaux de la paix' (Herds for Peace).¹⁹ According to this rough estimation, a subsidy of €500 euros per year could secure the sustainable maintenance of a pastoral herd, including insurance, over a territory of about 700 square kilometres -independently from actual returns in terms of animal production.²⁰ Scaling up, about nine million euros could pay for one year of surveillance of two thirds of Niger while securing more than 3500 jobs. This should be compared to the cost of surveillance by drone: more than 55 million euros for a single device, excluding the cost of operating it.²¹

Dung

Animal dung has been addressed in pastoral TEV work for its value as fuel (both subsistence and commercial) and manure (agriculture and regeneration of rangeland). Dung is also used in brick making and, in rural areas, for wall coating. In Sudan, the dung from feedlot operations

¹⁸The figure presented at the international donor conference "Together for a new Mali", held in Brussels on 15th May 2013, was €4.343 billion, cf. <http://donor-conference-mali.eu>

¹⁹Serge Aubague (CARE International), January 2014, personal communication.

²⁰Based on multiples of an abstract 'pastoral unit' consisting in one herd of sixty head operating over a 15 km range around a water point (706 square kilometres), the sustainable running of which is costed at a bit more than €10 per square kilometre

²¹Based on a proposal by France, in June 2013, for the purchase of 12 drones at the total cost of 670 million euros (La Tribune).

(believed to be almost entirely supplied from pastoral systems) is collected by poor households who use it partly as fuel and partly accumulate it to sell it (Krätli et al. 2013b). This also involves 'forward linkage' value in supporting livelihoods in other activities. On the other hand, using manure rather than chemical fertilizer not only has 'fertilizing' value, but has additional saving in that it does not involve the environmental problems (and associated costs) caused by the use of chemical fertilizers (e.g. water pollution).

Employment generated by pastoralism outside pastoralism

So far, this value has been addressed only in a limited way, looking at veterinary and technical services, and the selling of street grilled-meat (nyama choma). There are many other jobs supported by pastoral livestock all along the market chain. A recent study in Sudan (Krätli et al. 2013b) has attempted a valuation of some: livestock traders and market operators, feedlot operators, transporters of sheep on trucks to terminal markets, drovers of cattle on the hoof to terminal markets, workers in abattoirs, meat factories and hide-and-skin industry. Data on these jobs is usually missing, but it is often possible to delimit the boundaries of uncertainty by combining the available information to estimate discrete sets. For example, a conservative estimate of the number of full-time jobs involved in the transportation of sheep to the terminal markets by truck in Sudan was calculated from the number of exported sheep, maximum load on a truck, and minimum number of people per trip, combined with the number of working days in a year. Similarly, an estimate of the number of jobs involved in transporting cattle to terminal markets on-the-hoof was calculated from the total number of cattle known to be taken in this way, every year, to the main terminal market of Omdurman, the minimum team of drovers, the maximum number of cattle per team, and the maximum number of trips per year. Going a step further, one can also estimate the number of dependents supported by these jobs. In the analysis of the value of nyama choma business in Arusha, Letara et al (2006) estimated that the 5,600 jobs in the business supported about 325,000 dependents.

Use of the natural environment

The attention paid to the use of the natural environment seems to have focused on subsistence, which might be part of the reason why this category has been placed on the map but not calculated. There are, nevertheless, numerous commercial uses too, practiced directly by pastoralists. In certain areas (e.g. Turkana) women and children collect berries, edible giant ants and

grasshoppers, and sell them at the market (the latter at a premium). Besides charcoal burning, women collect firewood and timber for the building industry (e.g. in Karamoja). As in the case of charcoal, these latter activities (usually unsustainable) are the result of impoverishment, and the reduced capacity to engage in pastoral production strategies. Therefore the calculation of their 'value' has limited use. As for the value of the 'biodiversity of fodder plants' included under this category in the IUCN studies, it has so far been considered in terms of genetic resources and ecosystem health. With our increasing understanding of the economic role of livestock feeding selectivity, it is becoming clear that pastoral production strategies affect the biodiversity of fodder plants in more complex ways. In pastoral systems, livestock's capacity for feeding selectively has long been fostered and trained by breeding and herd management (Bremen and De Wit 1983; Krätli 2008). By moving strategically on the range over centuries pastoral herds have had a crucial role in producing the characteristic landscape of the rangelands – the same landscape that is so valued by conservationists. Selective feeding by pastoral herds has affected plant distribution in ways that have favoured combinations of plant species (trees, bushes and grasses) that are beneficial to livestock keeping under pastoral conditions. In practice, this meant managing the ecosystem and developing it, over time, for pastoral production. The recently adopted policy for the development of Northern Kenya acknowledges this role of pastoralism with a determination to 'Recognise, through legislation, pastoralism as a legitimate form of productive land use and development on the same basis as farming' (Republic of Kenya 2012: 19).

Subsistence vs market?

Market and subsistence are often seen as opposite ends of the economic spectrum. Indeed, at least one classification of livestock systems defines 'pastoralism' in terms of subsistence and as the form of production most distant from the market economy, as opposed to ranching and (where present) industrial animal production under zero grazing. Within this perspective, determining the monetary value of subsistence as done in pastoral TEV, may have ambivalent impact. If 'subsistence' is the opposite of market, or simply the absence of market, then the monetary value of subsistence is a negative value, not a positive one, for the market economy: a market-void and an area of possible expansion. On the other hand, the emphasis on the value of subsistence as a positive and important economic value carries with it an implicit reconsideration of the legitimate boundaries of the market and the processes of commodification that, as often argued,

are a requirement of development. Davies highlighted this issue:

A crucial oversight in this report is detail of the gender division of labour and perceptions of economic value. [...] The accumulation of social capital through exchange of items such as milk represents a vital component of the pastoral economy: a component that is largely managed by women. By aggregating figures on the subsistence economy with the market economy, this report implies that the subsistence product is also a latent commercial product. However, this ignores the social (and by extension economic) cost that such a change in the use of pastoral products would represent (Davies 2007: 21).

Davies (2007) uses available data on household consumption in Turkana to obtain a subsistence value of 2,639 USD per household (meat and milk).²² Assuming, for the sake of the reasoning, that these figures are representative of the subsistence economy of an estimated 90,000 pastoral households in Kenya, the total pastoral subsistence economy would be 237.5 million USD. Whether, from a policy-making perspective, this is an incentive to preserve pastoralism or an incentive to dismantle it will depend on the policy objectives – besides of course political pressure from civil society. If the policy focus is on food security, then dismantling the subsistence service of pastoralism would subtract 237.5 million dollars from the effort (as well as undermining the entire production system with potentially much higher costs). If the policy focus is on the global market however, then a narrow approach would see this 237.5 million dollars as a value that is 'trapped' away from the market economy (i.e. food that is not bought and sold). A similar reasoning applies to all other values of this kind, for example the value of the pasture on common land, or the value of the water from free watering points, or indeed the value of manure unless commercialised.

Winners and losers

A point closely related to the one above is that 'costs' and 'benefits' do not necessarily concern the same pocket. As a consequence, a meaningful cost-benefit analysis should provide a perspective: the country, the government, the global market, food security,

peace, the growth of GDP, etc. Ultimately, this means being able to qualify the winners and losers; that is, not only asking 'how much' questions but also 'for whom' questions. The recent analysis of the financial implications of replacing pastoralism with irrigated agriculture in the Awash Valley in North-Eastern Ethiopia – despite evidence indicating that absolute costs are more significant than absolute benefits – is a good example of how the asymmetric distribution of costs and benefits may reflect on policy-making beyond any other considerations (Behnke and Kerven 2012).

'Service of difference' and knowledge-making

Specialised pastoral systems offer exceptionally favourable grounds for the global advancement of knowledge and its adaptation to a changing world. As nicely put by one of the 'fathers' of systems theory, Gregory Bateson:²³

[...] presuppose that science is a way of perceiving and making what we call 'sense' of our percepts. But perception operates only upon difference. All receipt of information is necessarily a receipt of news of difference, and all perception of difference is limited by threshold [...] It follows that what we, as scientists, can perceive is always limited by threshold (Bateson 1979: 29).

That 'perception operates only upon difference' means, in a very practical sense, that we need 'edges' in order to perceive anything. Difference is therefore a crucially valuable asset in knowledge making. It is also an asset increasingly hard to come by in a globalised world – especially difference that has to do with fundamental assumptions about the world itself; from those that underpin our daily activities, to those that provide the basis of scientific knowledge. When these assumptions are shared by a large enough number of people that they are taken for granted, they lose their 'edges' and fall out of sight. As long as these assumptions serve us well, being invisible is an advantage. Invisibility keeps them safe and out of the way, a bit like the 'invisible files' in the operating systems of computers, processing fundamental services in the background. But sooner or later assumptions become obsolete, cease serving us well, and become the 'box' that is so difficult to 'think out of'.

²²This figure is obtained by subtracting the value relative to the consumption of blood, which is not a shared practice amongst all pastoral groups in Kenya, and leaving only meat and milk.

²³Gregory Bateson (1904–1980) was an eclectic scientist well known for seminal work in several disciplines, from biology to anthropology and philosophy of knowledge. Here, Bateson is particularly relevant for his contribution to systems thinking/cybernetics and the holistic approach. Bateson's models have been used in the study of knowledge flow and decision making processes in pastoral systems in Kenya (Kaufmann, 2011; 2007).

While the 'invisible files' in a computer can be switched to 'visible' at the touch of a button, in the real world fundamental assumptions fallen out of sight are soon forgotten. How can we change them if we have lost track of their existence? In the short and medium term, the more people who share the same fundamental assumptions the better; but in the long term, as the world changes in some fundamental way and we need to change with it, the globalisation of fundamental assumptions can become an obstacle to adaptation. At that point, when we need to restore the visibility of our assumptions, the only way to do so is to find their 'edges' by encountering difference again.

The paradigm shift in range ecology, around the understanding of ecosystem dynamics and equilibrium, offers a good example. The 'balance of nature' assumption at the foundation of traditional range ecology – debated in the early days of the discipline but then taken for granted for almost a century – was restored to full visibility and reconsidered largely thanks to the 'encounter with difference' in the context of empirical observation of the dryland/pastoral ecosystems.

The need for change and adaptation is often mentioned in relation to pastoralists: they should reconsider their 'peripheral' fundamental assumptions about the world and get a share in those that have been so successfully globalised. In reality, by a mere factor of scale, it is a lot easier for pastoralists to encounter difference – seeing the 'edges' of their own fundamental assumptions and adapting to a changing world – than it is for those already taking globalised assumptions for granted. Under this particular but crucial respect, the latter need the former much more than the other way round. The service of difference provided by pastoral systems, preconditioned to seeing and adapting fundamental assumptions in a globalised world – has yet to be fully recognised and valued.

One knowledge-making context in which this particular value of pastoralism is already emerging as an asset, is the work on the resilience of food production systems under climate change. As a production system that specialises in exploiting ephemeral concentrations of resources (i.e. non-uniform distribution), pastoralism 'gives edges' to one of the most globalised assumptions in agricultural production: that growth in production depends on uniformity and stability in the environment, and therefore that environmental heterogeneity and variability are obstacles to be removed (Krätli and Schareika 2010; Thompson et al 2007; Behnke and Scoones 1993). With environmental variability becoming the norm in most of the world as a consequence of global climate change, the cost of removing it in food production is becoming unsustainable for most of the markets. Today science is exploring alternatives to this assumption and pastoral systems have a key place in this research agenda (Folke et al 2002; Niamir-Fuller 1998). The service of difference could be seen as 'option value' or 'existence value'. We prefer to treat it as an indirect value on the same level as 'environmental services', in analogy with Bateson's concept of 'ecology of mind'.

How to and what next

4

This final section looks at the bigger picture about future TEV work, engaging with the potentials and challenges of developing a broader strategy for operationalising/ institutionalising the TEV framework. We present a general three-tiered strategy and three sub-sections, and look at issues specific to each tier: 1. the language available to talk about pastoralism and its implications for TEV; 2. a plan for a permanent participatory database of operational parameters to work on TEV, and options for TEV work in Ethiopia and Kenya; 3. the centrality of embedding a proportion of demand-led approach at the core of TEV work.

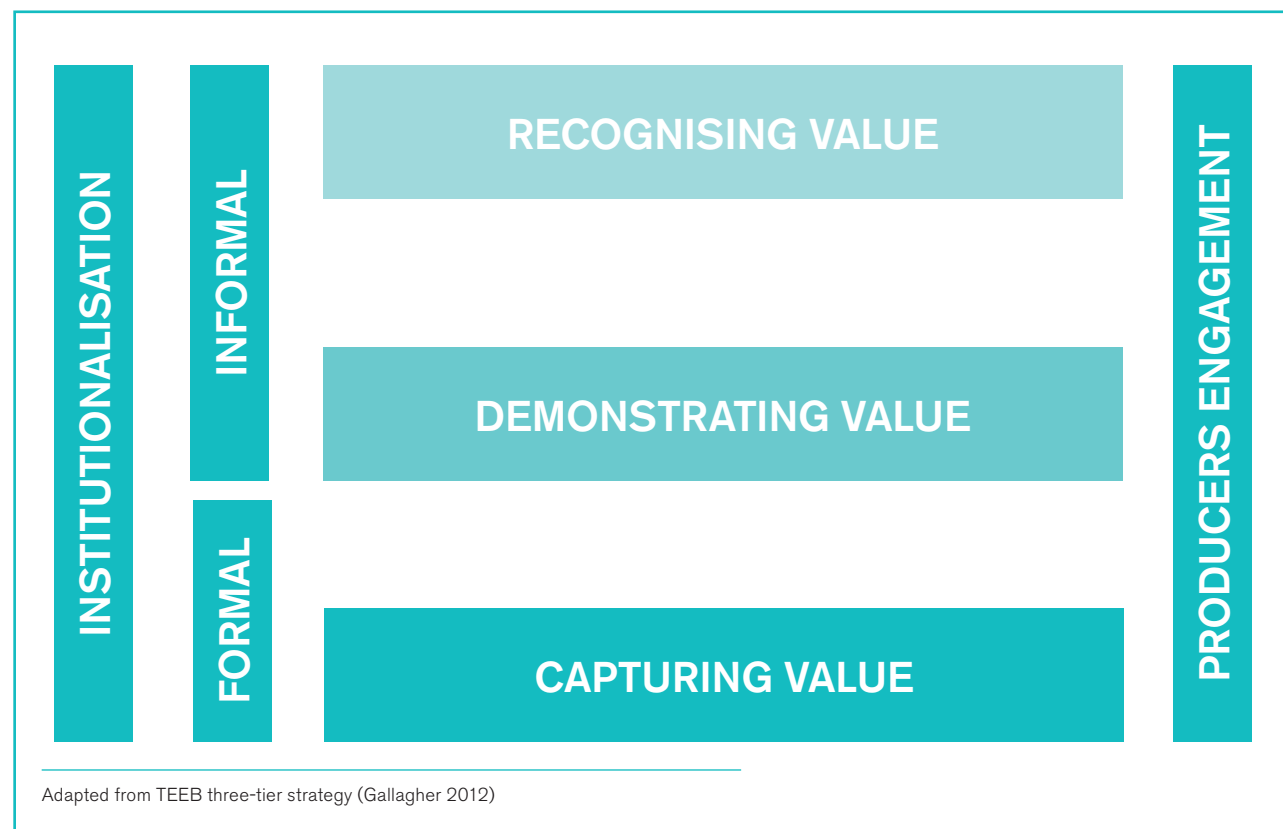
A strategy for pastoral TEV

The following strategy is an adaptation of the three-tiered approach developed within The Economics of Ecosystems and Biodiversity (TEEB) and used in a recent IFAD review of the Economic Value of Biodiversity in Dry and Sub-Humid Lands (Gallagher 2012). The strength of this approach, in our view, is its systematic inclusion of a process of institutionalisation of TEV. We understand this process as effectively formalised in tier 3, but also playing an important role in the other two if the whole strategy is to succeed. This point is further addressed in the description of the three tiers here below and in the last subsection.

Tier 1: Recognising value

Tier one of the proposed strategy consists of identifying the range of benefits, goods and services provided by pastoralism in ways that show the clear links between them and the pastoral strategies of production. This should involve criteria for distinguishing between value-making that is inherent to the system, from value-making that is triggered by the incapacity to fully operate the system (e.g. charcoal burning). A dialogue with the institutional circles that are expected to make use of the results of pastoral TEV work – meant to incorporate, although not exclusively, a demand-driven dimension – should inform all stages of the work at tier 1 and 2. A similar dialogue with pastoral producers themselves should be part of this process, in recognition of the fact that they are often equally in the dark about the actual value of their own activities in the context of national economies. The dialogue with pastoral producers (which in the diagram below we call ‘producers engagement’ for lack of a better term) is also in recognition that the institutional acknowledgement of value is not a one-off undertaking, but rather feeds on permanent political negotiation.

Pastoral TEV three-tier strategy



Tier 2: Demonstrating value

Tier two, consists of quantifying the total economic value of the benefits, goods and services provided by pastoralism in order to support decision making in economic terms. Dialogue with the institutional circles here is critical to gain awareness of the accounting procedures and context-specific challenges and solutions already in use, and to ensure that the TEV work effectively engages with them. Dialogue with the producers is necessary for generating sound TEV data and for honing pastoralists' capacity to articulate and target their own interaction with government institutions on these matters.

Tier 3: Capturing value

Introducing mechanisms that incorporate TEV of pastoralism into decision-making. It is at this stage that the institutionalisation of pastoral TEV work is formalised. This might include adjusting the procedures used for agricultural GDP accounting, to allow for a better representation of the value in the pastoral sector (e.g. improving the coefficients and/or introducing new ones, or improving the capacity to track pastoral products across service and manufacturing sectors of the economy); introducing incentives to develop high-potential pastoral values; reforming the legacy of administrative and legal mechanisms that undermine pastoral systems and/or inhibit the growth of pastoral TEV; introducing taxation devices (e.g. allowances) to help counterbalance the current impact of this legacy; supporting and creating new markets for sustainable pastoralism.

Recognising value: the language issue

A clear definition of the actual focus of 'pastoral TEV' appears to be perhaps the most difficult challenge. This is where the work of re-qualification of existing data must start. One of the strengths of the IGAD studies is in the commitment to embark on a fresh look at the task of calculation; revisiting the sources and reworking the methods rather than simply locating and combining the official data or producing altogether new ones.

BOX 4: PASTORAL PRODUCTS CHANGE IDENTITY ALONG THE VALUE CHAIN

If, in statistics, milk or hides stop being livestock products as soon as they reach the factory, and become a product of the manufacturing industry, can we use value chain analysis to track their contribution? We need to be able to recognise the origin of pastoral products all along the value chain. Yet, it is important to keep in mind that value chain analysis is only a methodology and as such can be used to different purposes and in many different ways. We will need to identify the ways that effectively serve the purpose of TEV.

A comment at the pastoral TEV training workshop (IIED 2013)

In pastoral TEV, this approach starts from the definition of pastoralism. Definitions embed assumptions about what matters; that is, they embed theory. The IUCN studies focus on the production systems rather than the producers, emphasising the importance of livestock mobility and the fact that pastoral systems, beside producing beef, are also consumption systems and rangeland management systems (Davies and Hatfield 2007). Even so, the language of scarcity of the old pastoral development paradigm now and again still surfaces amidst the sophisticated understanding of more recent scholarship, for example in Hatfield and Davies: 'Pastoralism is an adaptation to marginal environments, characterised by climatic uncertainty and low-grade resources' (Hatfield and Davies 2006: 1); or SOS Sahel Ethiopia: 'Despite [Ethiopia's] large number of livestock population and its diversity, the benefits obtained from [it] is low compared to other African countries and the world standard [...] The productivity problems are linked to availability and quality of feeding resources, animal breeds and type of production systems' (SOS Sahel Ethiopia 2008: 1).

BOX 5: PASTORAL TEV LOOKING AT THE PRODUCTION OF FODDER?

It is important to understand first what is good fodder in relation to the production systems. In pastoralism, 'good fodder' can only be defined on the basis of the benefit received by a particular group of animals feeding on it at a particular point in time: 'quality' is not a trait of the fodder plant but rather of a certain relationship between animals and plant.

A comment at the pastoral TEV training workshop (IIED 2013)

Paradigm shifts are slow and not linear, but this is a dimension that has been evolving significantly in the last few years, including important levels of policy making. For example, the process of drafting the African Union Policy Framework for Pastoralism was also a process of refreshing the language on pastoralism. The emphasis on scarcity and fragility that was still present in the introduction to the September 2010 draft disappeared in the final version approved in January 2011. Along these lines, a government paper such as the recent National Policy for the Sustainable Development of Northern Kenya and other Arid Lands leaves behind traditional descriptions of pastoralism 'by subtraction' (see Section 1 above) and commits to the following definition:

The term refers to both an economic activity and a cultural identity, but the latter does not necessarily imply the former. As an economic activity, pastoralism is an animal production system which takes advantage of the characteristic instability of rangeland environments, where key resources such as nutrients and water for livestock become available in short-lived and largely unpredictable concentrations. Crucial aspects of pastoralist specialisation are: 1. the interaction of people, animals and the environment, particularly strategic mobility of livestock and selective feeding; and 2. the development of flexible resource management systems, particularly communal land

management institutions and non-exclusive entitlements to water resources (Republic of Kenya 2012: iii).

In pastoral TEV, all categories of value, but particularly direct values, depend heavily on the availability of reliable data on the livestock sector (including both primary production and marketing), where the proportion of people making use of pastoral production strategies can be disaggregated. It is crucial to keep in mind that such producers are not necessarily represented in the official definitions of pastoralism (for example in censuses). An important consequence of introducing a definition based on how pastoralists produce (i.e. moving away from the definitions by subtraction) is the possibility of recognising these production systems in relation to producers that traditional typologies classify as non-pastoral. For example, dryland farmers managing livestock according to pastoral production strategies (Krätli et al 2013b).

The cost-benefit of dismantling pastoral systems is not a problem for the future: in many cases the process is under way. Most pastoral systems have successfully continued to produce significant wealth but at a cost, to both the resilience of the system and to the environment.²⁴ As the 'health' of pastoral systems is not uniform, and data collection tends to focus on the vulnerable sections of pastoral communities (because vulnerable and impoverished pastoralists become less mobile and keep closer to urban centres, and are therefore easier to reach and cheaper to work with), extrapolation from sampling and existing sources will need careful scrutiny. Comparison of data across extremes of the gradient, with successful pastoral producers (i.e. mobile) as a control sample, is recommended.

Finally, pastoral TEV should give serious consideration to the issue of scale when mapping values and handling data. The capacity of pastoralism to produce value, as well as its resilience and sustainability are tightly associated with high scales: geographically, ecologically, socially and economically. The capacity for large-scale operations across several hundred kilometres (sometimes thousands), and across different geo-ecological zones, comes with mobility, and is therefore one with the definition of pastoralism. Data collected with methodologies that focus at lower scales than the optimal operational scale of pastoralism (when the system is not fundamentally distorted by external constraints) are likely to offer a misleading picture.²⁵

²⁴For example, by adopting coping strategies such as the commercial making of charcoal or the commercial collection of firewood and building poles, especially amongst the lower levels of livelihood security. Decisions concerning the inclusion of these activities in a pastoral TEV should bear in mind that – although these activities represent a direct economic contribution – they stem from processes of impoverishment rather than being a characterising element of the pastoral system as such.

²⁵'Large-scale' here is different from the 'large-scale' of national statistics, which is about the scale of data aggregation rather than the operational scale of the production system. More often than not, the data aggregated in national statistics concerned with agriculture are generated through methodologies designed for production systems that operate at much lower scale than pastoralism.

The gist of these considerations is that the definition of pastoralism is not only a precondition for clarity in pastoral TEV work, but can actually greatly influence its result. The pastoral TEV work will itself, unavoidably, produce new language to talk about pastoralism, either as a consequence of revealing values that are still unrecorded, or in the process of re-qualifying official tools for measuring values that are already on the map. The importance of this dimension should not be underestimated. The monitoring of the use of language around pastoralism and the ways it develops should be a core concern at all tiers of the TEV strategy.

Demonstrating value: options for researchers

If identifying economic value associated with pastoral systems is challenging, measuring it can be a real headache. Given their focus on different production systems and away from pastoralism, standard coefficients are rarely fit for purpose. Conventional large-scale surveys in pastoral areas have prohibitive costs. Focused case studies are more affordable, but need critical mass to make an impact; alternatively, if they are to achieve the level of generality required for consideration in policy-making processes, they need to lock into 'good enough' sets of existing data. Quantitative data on pastoralism that can help TEV calculations are rarely available in systematic sets: Those available are scattered throughout published and grey literature from various disciplines, and digging them out is a time consuming exercise. The calculation of each value usually requires several commensurable parameters. A good number of parameters relevant to calculating the value of the pastoral milk trade by species, for several countries in East and West Africa, can be found in Annex II of the IGAD study on Kenya (Behnke and Muthami 2011: 42–47).²⁶ In practice, pastoral TEV calculations have to adjust to work, often rather imaginatively, with the parameters that are available in a reasonably robust form. Also in this case, Behnke offers a wealth of solutions, already packed as formula (Behnke 2010: 38; Behnke and Muthami 2011: 56; Behnke and Osman: 52–3).²⁷

Annex 1 includes a range of operational data used in pastoral TEV calculation, organised by category of value. The categories for which no such parameters have been found have been included but left blank, to record the gap. The Annex is meant as a reference tool for pastoral TEV researchers. It is also meant as the

BOX 6: WHAT ABOUT TAXATION?

We often hear that pastoralists don't pay taxes, but there are two problems with this argument. First, while they may not pay an income tax as commonly known, they do pay taxes in other ways. In Sudan, for example, pastoralists pay taxes at markets and for moving their animals across administrative borders. But this is not recognised. Second, although pastoralists do contribute in taxes and levies, they rarely benefit from it as governments tend to use this revenue somewhere else.

A comment at the pastoral TEV training workshop (IIED 2013)

starting point for an online participatory data-base (on the principle of Wikipedia), to expand with the interest in pastoral TEV. If well advertised, such a setting could allow for significant growth in a relatively short time at a modest cost. It would also be simple to integrate 'methods' as well as parameters, of the kind presented in the previous section or as the formula developed for the IGAD studies.

The systematic collection and organisation of existing methods and operational parameters for pastoral TEV can also help in identifying strategic options for further work. Examples of options for future work, which would carry high comparative advantage, include research on:

- values or categories of values where significant data is already available but is not quite enough, and therefore strategic investment in research could complete the set of parameters necessary for calculating the value;
- values that have already been calculated with regard to the livestock sector as a whole (e.g. in one of the IGAD studies), where relatively little additional data would enable the disaggregation of pastoralism;
- values that carry a high-impact because they concern everybody's experience (e.g. the nyama choma study in Tanzania; employment created outside pastoralism, or the milk economy – greatly neglected and yet critical to any realistic comparison in productivity with other land-uses, especially ranches).
- repeating several case studies on the same value in order to generate critical mass.

²⁶Downloadable here: http://www.igad-lpi.org/publication/docs/IGADLPI_WP03_11.pdf

²⁷Behnke 2010: http://www.google.co.uk/search?client=safari&rls=en&q=The+Contribution+of+Livestock+to+the+Economies+of+IGAD+Member+States.+Study+Findings&ie=UTF-8&oe=UTF-8&redir_esc=&ei=Nc6gUM-L8Or0QX1pIDoCg; Behnke and Osman 2011: http://www.future-agricultures.org/publications/research-and-analysis/doc_download/1496-the-contribution-of-livestock-to-the-sudanese-economy

Capturing value: pastoral TEV for whom?

In its final stage, pastoral TEV work focuses on formally incorporating the value of pastoral systems, goods and services into national economic planning. For this to succeed, incorporation must be more than a final goal: it must be a process that starts at the same time as pastoral TEV work, and is woven into all dimensions of the studies. If pastoral TEV findings are to 'talk' to the policy-makers, and the technicians who inform them (starting from the accountants in the ministries of finance), initiating this communication at the beginning of the study is the best way to go. A good entry point is to understand their tasks and their ways of working, and the restrictions imposed on them by the scope of their work. What methods, procedures, accounting mechanisms and tools do they use? What is simply inherited from previous administrations and what changes are on the horizon?

Following the publication of the international guidelines for national accounting (UN Statistical Division 2008), with implementation started in 2012, uniformity across countries is expected to increase. A sound understanding of these procedures from an insider's perspective is a recommended first step also in pastoral TEV studies. The IGAD studies are a good example in this direction. They include descriptions of the way GDP are constructed in each country, and the procedures followed to calculate the livestock sector values, including an insight into the methodological challenges faced in the process, and the legacy of practical adjustments in the accountancy departments.

In a way, civil servants working on GDP in the ministries of finance in many developing countries are at the interface between two dimensions of the same problem. Mechanisms of appraisal at the national level fall short of capturing most of the value of pastoral systems because they operate with simplifications that focus on market exchanges and the formal economy. Similar simplifications also characterise the mechanisms of appraisal at the international level (e.g. standard procedures for building the GDP). In an exercise of comparative evaluation of economic performance (e.g. GDP) pastoral systems are penalised vis-à-vis production systems more visible to the mechanisms of appraisal. Similarly, countries with important informal economies are penalised vis-à-vis those where the

informal economy is smaller. The answer to this problem is usually to put pressure on those who are not visible, leaving it to them to increase their visibility with everything else remaining the same. In this approach, commercial-only animal production on privately owned land (ranching) would be less productive (per hectare) than the pastoral system in the drylands, but more visible to the current mechanisms of appraisal (with the consequence of appearing more 'performant'). The study by Behnke and Kerven (2013) on the comparative performance of pastoralism and sugar cane plantations in the Awash Valley in North-Eastern Ethiopia proves the same point for irrigated agriculture.

Finally, a word on the issue of engagement on the part of the producers. TEV work will have to talk to pastoral producers as much as to formal policy making circles. After decades of seeing themselves represented as backwards and worthless – and being taught so at school (Krätli and Dyer 2009) – pastoral producers can be as blind about the actual value of their own activities as the policy-makers in the city. There would be little point in producing information on such value without reaching those who secure it. Besides, if TEV work is to produce robust information on a significant scale, it will need to make roots amongst the producers as well as in the institutions of governance. Even with mechanisms for the recognition of pastoral TEV formally incorporated into national economic planning, pastoral producers will need the capacity to follow up on this matter more or less on a permanent basis, as the acknowledgement of value soon fades away if not fed through citizenship engagement and continuous political negotiation.

TEV is about making value visible to cost benefit analysis, especially the value of priceless assets that we might have grown accustomed to taking for granted and that remain unseen to market-based appraisals. When we talk about society and nature – or social-ecological systems (Berkes and Folke 1998) – we have passed the scale of the market economy, and are dealing with what the market economy stands upon. TEV can help market-based appraisal when its procedural blindness takes it beyond the boundaries of its native environment.²⁸ The use of TEV with pastoral systems provides a platform for expanding the efficacy of standard mechanisms of economic appraisal by reflecting on the diversity and intersection of values and exploring creative methods to capture them in the analysis.

²⁸For a recent discussion of the limits of self-regulating market vis-à-vis society and nature, Harriss-White 2011; and in the context of development, Chang 2003. For a layman's take on this issue, Chang 2011, Chapter 1: 'There is no such thing as a free market'.

Annex 1. Methods and parameters to calculate pastoral TEV

DIRECT VALUES			
LIVESTOCK TRADE			
VALUE		METHOD	SOURCE
Domestic	1	Number of animals sold at markets multiplied by the average price (by species). Better when data on demand are available disaggregated by category of buyer: butchers, exporters, sellers of grilled meat.	WISP 2006
	2	Total national livestock offtake divided by number of pastoralists or number of households.	Davies 2007
		Livestock offtake estimates at household level are determined by subtracting livestock purchase. <i>Challenge:</i> Should we use the price to the producer or the final price to estimate total value?	Behnke 2010
Exports		Number of animals exported by species multiplied by the price of export minus their price on domestic market. <i>Challenge:</i> Needs to include unofficial cross-border trade – usually from pastoral systems as only pastoral breeds can make the journey and retain value.	Behnke and Metaferia 2011

LIVESTOCK TRADE		
PARAMETER	OPERATIONAL PARAMETER	SOURCE
Proportion of pastoral livestock	<p>ETHIOPIA: Unknown (by 2010). Conventional assumption is 30% of cattle (48.2 million = 14.6 million) and sheep (24 million = 7.8 million), 70% of goats (26.1 million = 18.3 million) and 100% of camels (2.2 million). Total national herd, all species mixed = 100 million; total pastoral herd, all species mixed = 41 million [quoting PADS Vol. 2, Study 5, Animal Breeds].</p> <p>KENYA: ASAL have 70% of cattle; 87% of sheep; 91% of goats; 100% of camels and 88% of donkeys (2009 census). More than 80% of the beef consumed in Kenya is produced in pastoral systems.</p> <p>About 60% of livestock owners are pastoralists (i.e. ±8 million).</p>	<p>Behnke and Metaferia 2011</p> <p>Behnke and Muthami 2011</p> <p>Davies 2007</p>
Livestock offtake	<p>annual rate' ≠ 'progeny rate'.</p> <p>ETHIOPIA (lowlands): annual rates of 7–9% for cattle; 30% for sheep; 31.5% for goats and 20% for camels.</p> <p>KENYA (ASAL): cattle 15%.</p> <p>SUDAN: MARF assumes an extraction rate for <u>cattle</u> of approximately 15% of the total herd, with an average dressed slaughter weight of 146 kg for domestic consumption and 200 kg for export (supported by Behnke and Osman 2011). Camels: a mean of 16% annual. Sheep and goats: a mean of 25% annual (27% in South Sudan).</p>	<p>Behnke 2010</p> <p>McPeak and Little 2006</p> <p>Behnke and Osman 2011</p>
Annual livestock offtake for marketing	Estimated at 10%, compared to estimate 25% for ranches.	Evangelou 1984
Average carcass weight	KENYA: cattle: 150kg (over 250 live); camel 150kg (over 250 live); sheep 20kg (over 30 live); goat 20 kg (over 30 live).	Nyakiri 2004
Livestock exports	<p>ETHIOPIA: more than 80% of livestock exports supplied by pastoral systems.</p> <p>SUDAN: More than 80% of livestock exports supplied by pastoral systems.</p>	<p>Behnke and Metaferia 2011</p> <p>Krätli et al 2013b</p>

MILK TRADE		
VALUE	METHOD	SOURCE
Domestic	<p>1 In absence of empirical data, the calculation is from theoretical bio-economic parameters of herds (by species) and the average price of milk on local market in urban and semi-urban centres.</p> <p>2 Based on a critical assessment of existing empirical data from previous studies and aimed at quantifying the milk available for human consumption per abstract unit of livestock of a certain species: the proportion of milk-producing cattle in herds multiplied by the mean annual birth rate, multiplied by the mean milk offtake per lactation.</p>	<p>WISP 2006</p> <p>Behnke 2010</p>

MILK TRADE		
PARAMETER	OPERATIONAL PARAMETER	SOURCE
Energy value of cow milk	@ 750 kcal per litre (‘conventional’ whole cow milk with 3.5% fat is 610 kcal; under pastoral conditions, fat content varies with the season, reaching values of 5.5%-6 %).	Davies 2007 USDA – National Nutrition Database
Proportion of milking cows in herd	KENYA: 20% for Maasai. NIGER: 28% for Wodaabe in Niger (1985–2003 based on genealogical analysis).	Thompson et al 2000 Krätli 2007
Milk production	1 litre per day per milking cow (very variable). 240 litres pa per bovine equivalent (averaged across all ages and sexes).	Thompson et al 2000 Dahl and Hjort 1976
Milk Production: cattle	ETHIOPIA: 9,216 litres of milk for human consumption per 100 head of cattle per year (a mean output from 7 rural studies). KENYA: <u>Semi-arid zone</u> (2001): 378 lit/cow @28.75% of herd lactating or 108.67 lit per head/yr, or 10,845 lit/100 head of cattle. <u>Arid zone</u> (2004): 59 lit per head per annum.	Behnke 2010 Behnke and Muthami 2011
Milk production: camels	ETHIOPIA: Revised: 2293.8 (camel population * 1000) * .20 (lactating proportion of herd) * 1326 (litres per lactation) *5.5 (EB per litre). KENYA: Revised: 2,971,111 head * 186 lit/head = 552,567,224 litres of milk production or .553 billion lit (based on Musinga et al. 2008 with 34% of herd lactating and 547 lts/lactating camel/year).	Behnke 2010 Behnke and Muthami 2011
Milk production: goats	KENYA: The proportion of adult female in Rendille goat herds is about 40%. Output for 100 goats = 3160 litres per annum. From a recent study in Kenya, goat daily yield was 0.512 litres (± 0.176) for the Gabra and 0.417 litres (± 0.309) for the Rendille; annual birth rate is respectively 1.12 and 1.16; lactation period is 5 months, therefore an unweighted mean of 69.8 litres per lactation, times 1.14 (mean birth rate) = 79 litres per year per breeding female.	Behnke and Muthami 2011 Warui 2008
HH milk consumption	KENYA: 85% of production in Maasai HH. ± 1 litre per capita per day in Turkana.	Thompson et al 2000 Davies 2007
Cattle milk for butter	ETHIOPIA: MOFED: 48202.5 (cattle population * 1000) * .22 (lactating proportion of herd) * 326.5 (litres per lactation) * .5 (proportion of milk for butter) * .051 * 1.031 (conversion of fluid milk to kg of butter) * 49.8 (EB/kg of butter). Revised: 48202.5 (cattle population * 1000) * .206 (lactating proportion of herd) * 448 (litres per lactation) * .5 (proportion of milk for butter) * .051 * 1.031 (conversion of fluid milk to kg of butter) * 49.8 (EB/kg of butter).	Behnke 2010
Fluid residue of butter processing	ETHIOPIA: MOFED: 48202.5 (cattle population * 1000) * .22 (lactating proportion of herd) * 326.5 (litres per lactation) * .5 (proportion of milk for butter) * .95 (fluid residue after butter) * 1.9 (EB/litre of residue) = 3,124,802,979 EB.	Behnke 2010

MEAT TRADE		
VALUE	METHOD	SOURCE
Domestic	1 Data from monitored abattoirs, meat-processing industries, and meat-export control. <i>Challenge 1:</i> How to disaggregate figures for animals from pastoral systems? <i>Challenge 2:</i> There are no data for small abattoirs and slaughterhouses, especially in rural areas.	Hesse and MacGregor 2006
	2 Meat consumption at household level (domestic market only).	
	3 On a small-scale, if the pastoral origin of the meat is known to be predominant, survey of street grilled-meat business.	

MEAT TRADE		
PARAMETER	OPERATIONAL PARAMETER	SOURCE

HIDES AND SKINS TRADE		
VALUE	METHOD	SOURCE
Domestic	1 Official data (as usually available). <i>Challenge:</i> Identify data on artisanal market around this production: employment, cost of handicrafts and the scale of national and international market.	

HIDES AND SKINS TRADE		
PARAMETER	OPERATIONAL PARAMETER	SOURCE

SUBSISTENCE		
VALUE	METHOD	SOURCE
Consumption by herding household	1 Uses data on household consumptions from poverty evaluation studies (milk, meat, butter, yoghurt, and skins). Example: survey data from relatively wealth households in Turkana: number of pastoralists multiplied by the 'bovine equivalent' mean annual yield for human consumption (from previous studies in similar production system), plus per capita per-day consumption of meat, and blood, plus hides and skins for sleeping mats and roofing.	Davies 2007 (Nyakiri 2004)
	2 Disaggregates the proportion of milk produced under pastoral conditions from the total milk production, then divide by the number of pastoralists to obtain the per capita milk production per day. <i>Challenge:</i> In placing a monetary value to these subsistence benefits, should the market value of the good be used, or rather a replacement or proxy value?	Davies 2007

SUBSISTENCE		
VALUE	METHOD	SOURCE
Consumption by other groups	Focuses on exchanges in the course of pastoral migrations: loans, gifts and barter, based on data from sample surveys.	Behnke and Nakirya 2012
Retrieval and consumption of dead animals	Based on sample survey. Where practiced (e.g. Turkana and Karamoja), this might be an important value to calculate, as the practice turns an economic loss (livestock mortality) into an economic benefit.	

SUBSISTENCE		
PARAMETER	OPERATIONAL PARAMETER	SOURCE

EMPLOYMENT IN PASTORALISM		
VALUE	METHOD	SOURCE
Self-employed herders	1 Based on the principle that displacement of pastoralism results in unemployment, urban drift, migration and a host of issues that have very direct and tangible costs for the national economy (e.g. conflict). Uses estimates of pastoral population and proportion of 'adults of working age'. Also considers that both women and children secure key economic activities.	Hesse and MacGregor 2006
	2 Calculates labour costs for pastoralism in the same way as for cultivation based agriculture: labour inputs for herding and livestock management, labour inputs for other household activities.	Davies 2007 (<i>Untested</i>)
Waged labour in herding	Based on the principle that it absorbs unemployment amongst youths. <i>Challenge:</i> Absence of data. WISP 2006 uses a crude figure of 2 herders every 250 head, all species mixed.	WISP 2006

EMPLOYMENT IN PASTORALISM		
PARAMETER	OPERATIONAL PARAMETER	SOURCE

EMPLOYMENT CREATED OUTSIDE PASTORALISM		
VALUE	METHOD	SOURCE
Veterinarians and technical personnel	Number of jobs and the total of wages. <i>Challenge 1:</i> Should the taxes from wages also be considered? <i>Challenge 2:</i> Should be calculated for the proportion of pastoral livestock only.	
Sellers of street grilled-meat (nyama choma)	The estimated number of business multiplied by the estimated number of employees plus an estimated number of jobs supported along the supply chain for each nyama choma worker, with backward and forward linkages.	Letara et al 2006

EMPLOYMENT CREATED OUTSIDE PASTORALISM		
PARAMETER	OPERATIONAL PARAMETER	SOURCE
Employment: trade operators	SUDAN: Proportion of pastoral livestock in the national herd (80–90%?), ratio of 1/10 between traders and other market operators, with at least 1 trader every 1600 head of cattle at terminal markets.	Krätli et al 2013
Employment: transporters	SUDAN: Maximum 500 sheep per truck, a minimum team of 3 (1 driver and 2 shepherds), minimum 4 days per trip including rest. Number of sheep moved like this every year: at least 3 million.	Krätli et al 2013b
Employment: drovers	SUDAN: Minimum two drovers every 75 head plus one leader every 600 head. Maximum of four trips per year per team. Number of cattle moved on the hoof every year: at least 300,000 (those recorded at Omdurman market).	Krätli et al 2013b
Street grilled-meat industry (nyama choma)	TANZANIA: In Arusha (800,000 people in 2006), there were 601 nyama choma businesses in 2005, employing 5,600 people, with an estimated 25,000 dependents. An estimated 2.4 jobs are supported along this supply chain for each NC worker – involved with ancillary services in butchery, middlemen and of course primary beef production.	Letara et al 2006

TRANSPORT SERVICES		
VALUE	METHOD	SOURCE
Transport and animal power for the household	1 Uses a substitution value – kilometres travelled per year, multiplied by a vehicle rental costs from the same sort of services. <i>Challenge:</i> Could be subsumed within the system as a production cost, but much of the transportation is for household consumption – other systems would not subsume such costs under production.	Davies 2007
	2 Water extraction: calculate by proxy with mechanised water extraction, including technology, fuel and maintenance.	
Transport for commercial purposes	1 Production approach. An estimation of the annual volume of services provided by different categories of commercial transport animals, the number of operating animals under each category, and the prices charged for different types of services. Value added is then derived by deducting operating costs such as feed and water from estimates of gross output.	Behnke 2010
	2 Estimate number of pastoral households, multiplied by the estimate number of equines per household by species, multiplied by their local market price. Based on the principle that the relative sale values of equines are roughly proportional to their work outputs, assuming that equines have little value aside from their use for traction, transport and haulage.	Behnke and Metaferia 2011
	3 By species. Camels: estimate proportion of working animals (e.g. 20% in Ethiopia), multiplied by mean average earnings from one animal. Equines (based on household survey): Estimate annual value added from equines' work (horses, mules and donkeys) in a pastoral household, multiplied by the number of pastoral households.	Behnke and Metaferia 2011
	4 Number of carts in pastoral households, multiplied by the local cost of a cart.	Behnke and Metaferia 2011
	5 Cost of taking animals to markets multiplied by the number of animals taken to the market.	Behnke and Metaferia 2011

TRANSPORT SERVICES		
PARAMETER	OPERATIONAL PARAMETER	SOURCE
Market relative value of equines	ETHIOPIA: Assumption: the relative sale values of equines are roughly proportional to their work outputs. Commensurability across species: horse = 1.6 donkeys; mule = 3.1 donkeys.	Behnke and Metaferia 2011
Work output of equines	ETHIOPIA: Based on research in Hadiya and Gurage Zones of SNNP Region they estimate that on average households own 1.5 donkeys, 0.5 horses and 0.2 mules and realized a value added from these animals of 5323 EB in 2010. Using the relative market value: 2010 annual monetary work output by 1 donkey = 1810 EB, by 1 horse = 2980 EB; by 1 mule = 5590 EB.	Behnke and Metaferia 2011
Transport camel	ETHIOPIA: 20% of camel herds consists of working animals (40,000 animals at mid-altitude Ethiopia). a transport camel earns about 12,000 EB/year gross at 2009–10 prices. Hauling salt from the mines in the Danakil Depression at Reged in Berahle in 2010: 1210 camel rented at 20 EB per day for nine months a year.	Behnke and Metaferia 2011 (Aklilu and Catley 2011.

INFORMAL FINANCIAL SERVICES		
VALUE	METHOD	SOURCE
Livestock as savings and investment	1 <i>Explanation:</i> livestock remains one of the best investments available. Returns on investments in the herd are usually many times higher than bank returns. The number of livestock multiplied by their tradable value by species.	Hesse and MacGregor 2006 Behnke 2010
Livestock as credit	2 <i>Explanation:</i> the ability of livestock owners to to 'cash in' on the value of their animals for particular purposes at a time that they choose. The interest rate that stock owners would need to pay to obtain alternative sources of credit equal to the value of livestock output.	Behnke 2010
Livestock as private insurance	3 <i>Explanation:</i> in the absence of external insurance services, the size of a herd represents the risk profile of a pastoral family. The greater the number of animals owned by a family the greater their chances of addressing risks and surviving adversity. The annual cost that herd owners would need to pay to purchase insurance coverage equal to the capital value of their herd – looking at popular rural community-based insurance systems.	Hesse and MacGregor 2006 Behnke and Metaferia 2011
Livestock as collective insurance (risk pooling)	4 <i>Explanation:</i> livestock and livestock products have great value in most pastoral societies in cementing social relationships and reinforcing the complex customary institutions that make the system viable: 'poor pastoralists extract a level of support from the system that equals what richer pastoralists are willing to invest in order to maintain their reputation for generosity and thereby retain their right to call upon community support if they require future assistance.' The value of resource sharing within a pastoral community (from sample survey and existing data).	Behnke and Metaferia 2011

INFORMAL FINANCIAL SERVICES		
PARAMETER	OPERATIONAL PARAMETER	SOURCE
Livestock as savings and investment	No information.	
Annual rate of return for investment in livestock	The annual interest or the return on capital from this investment is a function of the profitability of herding enterprises (revenues net of costs) relative to the amount of the capital invested in it. ETHIOPIA: 25–30%, with reference to (Panin and Mahabile 1997; Panin 2000; Gryseels n.d.).	Behnke 2010
Livestock as credit	The interest rate that stock owners would need to pay to obtain alternative sources of credit equal to the value of livestock output [referring to Bosman and Moll (1995) and Moll (2005)] ETHIOPIA: calculate it at 100% per annum. KENYA: rural interest rate averages 6.3% annum. (Assumed to be the same for Sudan in absence of other data.)	Behnke 2010 Behnke and Metaferia 2011 Benke and Muthami 2011
Livestock as private insurance	The annual cost that herd owners would need to pay to purchase insurance coverage equal to the capital value of their herd. ETHIOPIA: 10% of the value of an average payout by proxy with the rural community-based insurance systems (<i>iddir</i>). KENYA: Estimated by proxy with the rate of the National Hospital Insurance Fund, annual cost is 0.0048% of the coverage provided.	Behnke and Metaferia 2011 Benke and Muthami 2011
Livestock as collective insurance (risk pooling)	ETHIOPIA : Equal to the value of resource sharing within a pastoral community: poor pastoralists extract a level of support from the system that equals what richer pastoralists are willing to invest in order to maintain their reputation for generosity and thereby retain their right to call upon community support if they require future assistance (10.5% from. Same in Kenya.	Behnke and Metaferia 2011

BASIC SERVICES AND INFRASTRUCTURES		
VALUE	METHOD	SOURCE
	<i>Explanation:</i> pastoral areas tend to be poorly served by basic services and infrastructures. roads, so pastoral communities take it upon themselves to secure overground communication. Where these infrastructure are provided by the state, this has a cost. The money saved by the state is the value of the service provided by pastoralists.	
Water	1 The 'per person' cost of providing water for people and agriculture in areas where citizens are reached by these infrastructures.	
Sanitation	1 The 'per person' cost of providing sanitation infrastructures in areas where citizens are reached by these infrastructures.	
Overground communication	The cost 'per mile of road' (building and maintenance) and the number of miles of road per square kilometre of 'territory' in other districts where citizens are reached by these infrastructures.	
Health care for people and animals	1 The cost per person and per animal of providing health care (training, personnel and running the service) over the number of people in pastoral areas.	

BASIC SERVICES AND INFRASTRUCTURES		
VALUE	METHOD	SOURCE
Security and justice	1 The cost per person of providing security and justice (training, personnel and running the service) over the number of people in pastoral areas.	
Education of children	2 The cost per person of providing vocational education (training, personnel and running the service) over the number of children working in pastoral production.	

BASIC SERVICES AND INFRASTRUCTURES		
PARAMETER	OPERATIONAL PARAMETER	SOURCE

DEVELOPMENT OF SKILLS AND KNOWLEDGE		
VALUE	METHOD	SOURCE
Local knowledge	Described in qualitative terms but without monetary value assigned.	

DEVELOPMENT OF SKILLS AND KNOWLEDGE		
PARAMETER	OPERATIONAL PARAMETER	SOURCE

USE OF NATURAL ENVIRONMENT		
VALUE	METHOD	SOURCE
	The estimation of most of these values is believed to require deep biophysical studies. At present, the following values have been identified, but data are poor on all of them: <i>Biodiversity of fodder plants; Number of water points created/maintained by pastoralists; Value of rainfed fodder; Medicinal plants; Honey</i>	

USE OF NATURAL ENVIRONMENT		
PARAMETER	OPERATIONAL PARAMETER	SOURCE

INDIRECT VALUES		
CONTRIBUTION TO TOURISM		
VALUE	METHOD	SOURCE
Direct tourist attraction	1 The number of tourist events, multiplied by an estimate of the mean revenue they generate, directly and indirectly.	
	2 The number of people coming to see particular events the continuity of which depends on the continuity of pastoralism (e.g. the annual transhumance), multiplied by an estimate of their mean expenditures as tourists.	
	3 The direct revenue accrued from tourism to people, groups and local governments (including benefit sharing), based on sample survey.	
Indirect tourist attraction	1 The supplementary income generated from tourism through the use of pastoral culture and heritage and pastoral landscape (e.g. in advertising).	Untested
The production cost of having large game	1 <i>Explanation:</i> most of the large game that attracts tourists is found on pastoral ecosystems. Proportion of tourism business depending on large game as a major attraction, combined with the proportion of large game depending on pastoral areas for its existence (or ex-pastoral areas now devoted to conservation).	Untested
The opportunity costs of converting pastoral land to conservation	1 <i>Explanation:</i> most conservation areas (parks, reserves etc) have been created from pastoral land, often the land of the best quality for the pastoral system. Calculating a local pastoral TVE <i>per hectare of pastoral land over a ten year period</i> ; multiply for the number of hectares devoted to conservation. Assuming that the result is lower than actual gains from tourism, also over a ten year period (minus the costs of running the conservation area), only the difference should be considered in the real value of the use conversion.	Untested

CONTRIBUTION TO TOURISM		
PARAMETER	OPERATIONAL PARAMETER	SOURCE
Returns to livestock and wildlife	Returns to livestock are 48% higher when wildlife is eliminated.	Norton-Griffiths and Butt 2006

CONTRIBUTION TO AGRICULTURE		
VALUE	METHOD	SOURCE
Livestock dung as fertilizer (manure)	1 Estimate use of 100kg of manure per hectare (in Mali), multiplied by the number of hectares (cereals only) farmed with manure from pastoralism, multiplied by the mean local price of manure or equivalent amount of chemical fertilizer.	WISP 2006

CONTRIBUTION TO AGRICULTURE			
VALUE		METHOD	SOURCE
	2	<p><i>Explanation:</i> the use of dung has traditionally played a role in maintaining social capital across pastoralist and crop-farming communities.</p> <p>The cost of managing the increase in violent conflict following from the breaking down of relationships of complementarity (e.g. manure contracts) between specialised livestock and farming communities.</p>	Hatfield and Davies 2007 (<i>Untested</i>)
Livestock dung as fuel (subsistence and trade)	1	Calculated by proxy with firewood (including costs of deforestation) for subsistence, and by volume of business and creation of jobs for trade.	<i>Untested</i>
Land development	1	<p><i>Explanation:</i> selective feeding by mobile pastoral livestock over time has developed the rangeland ecosystem (e.g. the distribution of trees, bushes and grasses) in ways that are functional to livestock keeping under pastoral conditions.</p> <p>This value could be calculated by proxy with the investments for maintaining pastoral landscapes in Europe (e.g. high nature value subsidies) including a methodological device to secure commensurability.</p>	Republic of Kenya 2012 Krätli 2008
Livestock dung in building industry	1	The value of the amount of livestock dung used in brick making and mud-wall coating, calculated by proxy with a replacement material or – if commercially irreplaceable – calculated as a proportion of the TEV of the business (including secondary markets and creation of jobs).	<i>Untested</i>
Reversing land degradation (including farmland)	1	An estimate of the size of the land involved, combined with the systemic value of such percent of rangeland in light of pastoral TEV.	
Animal power (traction)	1	The proportion of farming households owning an ox for ploughing (e.g. 60%); proportion of these animals from pastoral systems (e.g. 20%); proportion of the farmer's annual income increased by the use of animal traction (e.g. 6%) from a given baseline (e.g. 1,000 USD).	Behnke 2010
Animals sold to fund agricultural activities	1	Based on household budget surveys. Mean number of animals sold to fund agricultural activities (e.g. buying seeds, fertilizer, pesticides, labour) converted into a percent of a type of animal (e.g. 1.2 adult bovine) via a commensurable parameter (e.g. TLU), multiplied by the equivalent mean price of that type of animal on local markets.	WISP 2006
Market of failed crops and crop residues	1	<p>Based on household budget surveys. Herding households' annual expenditure on crop residue in a non-drought year, differentiated by livestock species and numbers.</p> <p><i>Challenge:</i> prices of crop residue and livestock requirements may change greatly from year to year as well as according to the area and the crop.</p>	Krätli et al 2013b
	1	Based on household budget surveys. Farming households' annual income from selling failed crops and crop residues to pastoralists; including frequency of crop failure.	<i>Untested</i>

CONTRIBUTION TO AGRICULTURE		
VALUE	METHOD	SOURCE
Domestic animal biodiversity ¹	<p><i>Explanation:</i> most domestic animal biodiversity is found in pastoral systems.</p> <p>The present and future cost of not being able to use this biodiversity (e.g. the strengthening of overbred Australian cattle by crossbreeding with Boraan cattle).</p>	<p>FAO 2007</p> <p>Zander 2005</p>

CONTRIBUTION TO AGRICULTURE		
PARAMETER	OPERATIONAL PARAMETER	SOURCE
Cattle draught power	<p>ETHIOPIA: Proportion of farmers using cattle draught power in cultivation: 80%. Highland farmers with one oxen may increase their net farm cereal production by 267 kg more than farmers with no oxen, gaining a further 186 kg on average if they owned a second ox.</p> <p>[Formula: .80 (percentage of farmers using cattle draught power in cultivation) * .33 (portion of crop output paid for cattle draught power in sharecropping arrangements) = .264 * the value of annual crops.]</p> <p>The value of cattle draught power as an input in crop production (could also be seen as intermediate cost): $\pm 26\%$ of the monetary value of cereal and pulse production.</p> <p>KENYA (<i>insufficient data</i>): 'A major shortcoming of the present analysis is our inability to assign a national monetary value to any form of animal power usage in Kenya'.</p>	<p>Behnke 2010</p> <p>Behnke and Muthami 2011</p>
HH using manure in crop farming	<p>KENYA: 24.3% in Kenya.</p> <p>100kg of manure per hectare, valued at 60 USD (Mali).</p>	<p>Nyakiri 2004</p> <p>WISP 2006</p>
Proportion of wet dung from cattle	<p>ETHIOPIA: <u>Official</u> estimate (National Energy Authorities) parameters for the proportion of wet dung ending up as fuel is 22%, resulting in 2.01 kg per day for dairy cattle, and 2.27 kg per day for non-dairy (per head of cattle, all ages mixed).</p> <p><u>Revised</u>: 48202.5 (cattle population * 1000) * .237 (tons of dung fuel per head of cattle per year) * 306 (EB/ton).</p> <p>SUDAN: Official estimate (MARF) is 1.3 kg of dry manure 'per head of cattle' (all ages mixed) per day. Feedlot operations in Omdurman handle 180,000 head of cattle per year for a minimum stay of 45 days.</p> <p>Dry dung = 40% of wet dung. Collected dung = 50% of output (MARF).</p>	<p>Behnke 2010</p> <p>Krätli et al 2013b</p>

CONTRIBUTION TO THE NATIONAL ECONOMY		
VALUE	METHOD	SOURCE
	<p>The contribution of pastoralism to GDP can be calculated using the estimates of the proportion of livestock that is produced under pastoral conditions but it requires separate analysis of each value. Here below are categories which would not be included in the construction of the GDP or that are not listed under the direct values.</p>	

CONTRIBUTION TO THE NATIONAL ECONOMY			
VALUE		METHOD	SOURCE
Taxes and levies	2	Looks at taxes on sales, mobility and abattoirs. Tax revenues can be assessed from local and national records, although records may be weak.	Davies 2007
Backward and forward linkages	1	Backward linkages: based on household budget surveys. Expenditure on goods and services by pastoralists.	Davies 2007
	2	Forward linkages (livestock product and input into manufacturing). Proposes a scaled-down satellite accounting framework on data from statistical surveys of manufacturing enterprises (see section on satellite accounting).	Behnke 2010
Inputs to dryland products	1	Looks at products that come from pastoralist lands but are not collected and marketed directly by pastoralists (as those would be direct values) but that represent a production system that requires or that can be enhanced by securing the continuity of mobile pastoralism – e.g. Arabic gum.	Davies 2007
Charcoal		Based on sample surveys. The proportion of marketed charcoal produced by pastoralists. <i>Challenge:</i> Charcoal burning becomes a significant activity in pastoral households as a consequence of impoverishment, therefore although it is a value produced by pastoralists it is associated with undermining the system rather than keeping it.	
Social-ecological (and economic) resilience		The cost of drought under conditions of undermined pastoralism, based on the principle that reducing the scale of operation of pastoral systems and undermining the specialisation of labour and livestock, lower resilience and greatly increases the risk of humanitarian and ecological disaster related to droughts.	

CONTRIBUTION TO NATIONAL ECONOMY		
PARAMETER	OPERATIONAL PARAMETER	SOURCE
Backward and forward linkages to national economy	NAMIBIA: 1.8 times the direct value of pastoral production.	Davies 2007
Auxiliary markets: crop residue	SUDAN (North Kordofan): Used by sheep producers during the hot dry season. Prices vary between areas and subject to the year and the crop. Roughly, producers were estimated to spend a minimum of 1,000 SDG per year on crop residues every 200 sheep (but up to 2,000 SDG in certain areas). All sheep systems in the state (including those officially 'sedentary') practice livestock mobility. Official estimate number of sheep in NK in 2010: 7.2 million (22.2 million according to a survey by IFAD quoted in Behnke and Osman 2011).	Krätli et al 2013b
Auxiliary market: water for livestock	SUDAN (North Kordofan): Water for livestock is bought at least for the 90 days of the hot dry season (but often from February up to the first showers in May-June). During those hottest 90 days, camels are watered at least 12 times, sheep and goats at least 15 times and cattle at least 30 times. Prices differ by species and between suppliers but the minimum cost for 100 head is 70 SDG for camels, 20 SDG for cattle and 10 SDG for sheep and goats.	Krätli et al 2013b

SOCIO-POLITICAL SERVICES

VALUE	METHOD	SOURCE
Governability of remote areas 1	<p><i>Explanation:</i> the social organisation and informal institutions of mobile pastoral communities help fill with society and citizenship the political space in remote areas that are poorly reached by the institutions of the state, making them more governable. Where pastoral systems recede, spaces that were governed are left open to potentially undesirable political forces.</p> <p>The value of this service could be calculated by proxy – based on land area – with the costs of securing what are considered ‘ungoverned spaces’, for example operations such as the US AFRICOM or the cost of the rebuilding Mali as per the estimate produced at the international donor conference on 15 May 2013.</p>	

SOCIO-POLITICAL SERVICES

PARAMETER	OPERATIONAL PARAMETER	SOURCE

CONTRIBUTION TO GLOBAL KNOWLEDGE-MAKING

VALUE	METHOD	SOURCE
Service of difference	<p><i>Explanation:</i> knowledge-making depends on perception and perception depends upon difference; difference is therefore a crucially valuable asset in knowledge making and the key precondition to the challenge of adapting globalised fundamental assumptions in a changing world. By using the environment in a way that is fundamentally different from the globalised agricultural tradition, pastoral systems provide the ‘difference’ that allows us to identify the otherwise invisible assumptions in globalised systems of food production.</p> <p>The value of this service can be estimated by proxy with the value of investment in risk and climate-change adaption research sprung from empirical observations of pastoral systems, for example the ‘New Range Ecology’ paradigm shift and the critique to ‘command and control’ strategies of food production, the important dimensions of the work on high-reliability systems and of the work on resilience.</p>	Scoones 1995; Roe et al. 1998 Thompson et al 2007

CONTRIBUTION TO GLOBAL KNOWLEDGE-MAKING

PARAMETER	OPERATIONAL PARAMETER	SOURCE

ENVIRONMENTAL SERVICES

VALUE	METHOD	SOURCE
Soil 1	<p><i>Explanation:</i> Increased fertility and carbon sink in improved savannahs: there is greater carbon accrual on optimally grazed lands than on ungrazed or overgrazed lands.</p>	Silvestri et al 2012 (Untested)

ENVIRONMENTAL SERVICES			
VALUE		METHOD	SOURCE
Water	1	Reduced evaporation, run off and sedimentation.	Silvestri et al 2012 (Untested)
Biodiversity	1	Invasion control, flora preservation (by controlling shrub growth, dispersing seeds etc, as 'complex ecosystems need gentle continual disturbance to flourish'); fauna preservation (higher variety of species in mixed livestock-wildlife systems than wildlife only); stimulation of grass tilling, improvement of seed germination, break-up hard soil crusts (Silvestri et al 2012). Exceptionally high levels of livestock feeding selectivity, complex diet and mobility makes pastoral systems (when allowed to operate according to their logic) particularly effective in promoting ecosystem biodiversity.	Silvestri et al 2012 (Untested)
Carbon sequestration	1	Grasslands have greater potential ability for carbon sequestration than forests.	Davies 2007
Improving water and mineral cycling	1	<i>Explanation:</i> by provision of labour and manure. Comparison between areas under different grazing arrangements, to highlight locally captured benefits. <i>Challenge:</i> hard to quantify.	Silvestri et al 2012 (Untested)
Value of dry and high forest	1	Contingent Valuation Method (CVM) and market analysis, to estimate the value that local residents and habitual users place over forest resources in supporting agricultural production, biodiversity conservation and climate amelioration.	Davies 2007 (IUCN 2005–2006 study in Turkana)

ENVIRONMENTAL SERVICES		
PARAMETER	OPERATIONAL PARAMETER	SOURCE

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The substantial value of pastoral systems remains largely invisible to local, national and regional calculations of economic performance (for example the construction of GDP). Official data continue to be used even when their reliability is known to be poor. A complementary framework in cost-benefit analysis, known as Total Economic Valuation (TEV), is increasingly being used by NGOs and regional bodies to help put onto the map the many aspects of economic value contributed by pastoral systems—contributions that are presently not counted. This Issue Paper provides a practical tool for those interested in carrying out work on the TEV of pastoralism.

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