



A GLOBAL PERSPECTIVE ON THE TOTAL ECONOMIC VALUE OF PASTORALISM:

Global synthesis report based on six country valuations

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A project of the Global Environment Facility, Implemented by UNDP and executed by IUCN
Nairobi 2008

Background to the study

Pastoralism is now widely acknowledged to be one of the most effective and economically rational ways of sustainably managing the drylands, yet this recognition seldom influences national policies. Alternative dryland uses are often proposed on the basis of weak valuation of the pastoral system they are supplanting or on the basis of no comparative economic valuation at all. The data available for valuing pastoral systems is often poor or difficult to adapt and national census data is seldom disaggregated to allow calculation of pastoral-specific figures. Furthermore, weak assumptions are still used to value the pastoral system, inappropriate comparisons are made between drylands systems and non-drylands systems, and key values of pastoralism are consistently overlooked.

In 2006, the World Initiative for Sustainable Pastoralism (WISP) published a Global Economic Review of Pastoralism, which highlighted some of the challenges in comprehensively valuing pastoralism and indicated some of the opportunities that were now available to improve understanding of different values. Based on that report, WISP identified 6 Civil Society partners that were interested in improving the valuations of pastoralism in their countries. Those partners attended a training workshop in Nairobi in February 2007 where a Conceptual Framework and a range of methodologies for Total Economic Valuation were presented. The six partners then conducted studies in their countries, primarily based on desk review and analysis of secondary data, though in some cases the partners carried out primary research to examine specific values. The six country-partners were mentored in their studies by the International Livestock Research Institute (ILRI) and this report, also prepared by ILRI, represents the global analysis of their findings.

The World Initiative for Sustainable Pastoralism

The World Initiative for Sustainable Pastoralism is an advocacy and capacity building project that seeks a greater recognition of the importance of sustainable pastoral development for both poverty reduction and environmental management. WISP is a global network that is designed to empower pastoralists to sustainably manage drylands resources and to demonstrate that their land use and production system is an effective and efficient way of harnessing the natural resources of the world's drylands.

WISP is currently funded by the Global Environment Facility (GEF), with additional financial support from the International Fund for Agricultural Development (IFAD) and Oxfam GB, and is implemented by UNDP and executed by IUCN (The World Conservation Union). WISP works through partnerships at global, regional and national levels to promote knowledge sharing that leads to policies, legal mechanisms and support systems for sustainable pastoral development. WISP provides the social, economic and environmental arguments for pastoralism to improve perceptions of pastoralism as a viable and sustainable resource management system.

For more information visit the web site at www.iucn.org/wisp

Acknowledgements

This project has relied heavily on the work of Ced Hesse and James MacGregor of the International Institute for Environment and Development (IIED), whose support in training the country partners was also highly appreciated. We are grateful to Luis Rodriguez, Mohamed Said and Robin Reid of the International Livestock Research Institute (ILRI) for their technical coordination of these studies. We also acknowledge the input of the technical resource people who attended the training workshop in Nairobi: Mike Norton Griffiths, Maryam Niamir Fuller (UNEP) and Eric Patrick (UNDP-DDC).

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Executive summary

This study on the Total Economic Value of Pastoralism is part of a global project to improve the knowledge base on pastoral economics and marketing. Six country studies were implemented using a knowledge management approach focused on collect available information, analysing it, and using the findings to provide arguments for policy support, research and investment in pastoral systems.

The country studies followed a conceptual framework prepared by the International Institute for Environment and Development. For practical reasons the framework was focused on the assessment of direct and indirect values of pastoralism because option and existence values were assumed difficult to quantify and hard to transform into practical policy tools. The different country studies show that availability and quality of the data at the country level is poor, and it is mostly focused only on direct values of animal production and commercialization although there is a clear recognition that many transactions in pastoral systems occur in informal markets where records are not kept. The studies also indicate that data about indirect values of pastoralism are scarce and predominantly qualitative, and information about the option and existence values of pastoralism is usually not available.

Contribution of pastoralism to country economies: The aggregate results of the studies indicate that despite the widespread opinion that pastoralism is not an economically viable or rational livelihood activity, it contributes significantly to the GDP of many developing country economies: for example, approximately 8.5% in Uganda, 9% in Ethiopia and 10% in Mali. These proportions are lower than the estimated contribution of pastoralism to the economy of Central Asian countries like Kyrgyzstan where pastoralism represents about 20% of GDP. The contribution of pastoralism to the country economy will depend on the relative importance of livestock and agricultural sector. For example, in a mineral export country like Peru, Alpaca pastoralism contributes only 1.5 % of the country's agricultural GDP. However policy makers should recognize that the largest share of the flow of benefits generated by pastoralism is obtained from marginal lands where other economic activities will usually provide lower returns.

In developed countries, where industrial production and services are the most important and dynamic economic sectors, contribution of pastoralism to national economies seems to be low. For example, the Spanish study indicates that pastoralism represents only 0.19% of the National GDP. That percentage is comparable to the figures obtained from other developed countries like Australia where pastoralism is important in terms of land use but generates only 0.2% of the Australian GDP. As in Peru, in these developed countries the analysis of pastoralist policies should be based on the expected returns of the alternative uses of the land rather than in terms of the contribution of pastoralism to the country economy.

The different country studies indicate that there is an urgent need to close a number of gaps in our understanding of the behaviour of pastoral systems. Filling these research gaps will improve the capacity of decision makers to formulate innovative policies for the sustainable use of the rangelands and improve the livelihoods of pastoralists. Some identified areas for further research or urgent action include:

- # Critical assessment of the way data on pastoralism is currently generated, the data that is used, and how it compares between countries. Researchers should identify minimum cost-effective indicators that could be of use to government to improve analysis of pastoralist economies, and input is needed to raise the capacity of different agencies to generate primary data about both direct and indirect values of pastoralism.
- # Research should incorporate a more comprehensive flow of costs and benefits from pastoralism into the national accounts. This should include opportunity cost analyses of pastoralism versus other forms of land use in pastoral areas, but taking a systems approach to the drylands as opposed to a hectare to hectare comparison: what is the overall opportunity cost to the pastoral system of changing land use on key resource pockets? This research should take into consideration the local environmental changes that are likely as a result of climate change.
- # Deep biophysical studies are required in order to estimate the joint production of environmental services in the grasslands, and to synthesize the information in GIS layers complemented with information of interest for policy and decision makers like poverty status, vulnerability and risk. Additional research is needed to understand how pastoralists manage grasslands in a way that promotes biodiversity and carbon capture, and contributes to ecosystem services, and the mechanisms that can be used to encourage such management practices.
- # Considering the circumstances of many pastoral areas, participatory valuation approaches provide a broader base for decision making and should be considered for further valuation studies. This should be integrated into a wider process of promoting public (pastoralist) participation in decision making.

Considering the limitations and assumptions used in the different country studies, the estimated trends and figures represent a starting point for policy dialogue and the recognition that pastoralism is a dynamic production system able to adapt to a broad range of disturbance in the environmental and socio-economic systems where the activity is embedded. Some key findings from the WISP country studies, and their policy implications, include:

- # Official statistics do not capture all the economic values associated with pastoralism. Even direct values captured by markets like animal and milks sales and hides production are not well recorded in countries like Ethiopia, Mali and

Iran. National Statistics Bureaus in the different countries should reform the frequency and content of data acquired from Agriculture and Livestock sectors to include the diverse direct values of livestock disaggregated by production systems, thus allowing decision makers to compare between pastoralism and other more intensive uses of the land.

- # Evidence from diverse pastoral sites suggests that the majority of market transactions are not recorded and the contribution of pastoralism to informal economy is enormous in terms of exports of live animals. Governments need to recognize cross-border livestock trade, and the benefits this has for their economy. Measures towards sanitary certification, promotion of investment, and review of existing taxation barriers should be considered in pastoralist areas.
- # Many pastoralists trade in both domestic and international markets, for live animals, milk, wool and hides. Nevertheless, the market chain analysis suggests that pastoralists still receive a small share of the total market value of the products. Livestock and Agriculture departments of the different countries should promote mechanisms to improve the access to markets and to reduce market distortions. Promotion of pastoralists associations might allow trading of products at larger scales, increase bargaining power of pastoralists within the market chain, or reduce excessive rent-seeking behaviour amongst middlemen, thus increasing the profits of the producers.
- # The use of animal power for agriculture is still a common practice in all the extensive production systems in developing countries, increasing crop yields and farmer's income. Livestock and Agriculture Departments should evaluate the cost-benefit of investments in animal traction equipment by agro-pastoralists operating under different production systems and property sizes. The use of animal traction should be promoted emphasizing the multiple uses of livestock and facilitating the access of agro-pastoralists to credit for purchasing ploughing equipment (existing incentives supporting the acquisition of mechanical devices might need to be revised).
- # Livestock manure plays a crucial role maintaining soil fertility in agropastoral systems. Considering that the greater the nutrient loss the lower agricultural value of the manure, Livestock and Agriculture Departments should complement the already active role of manure traders and the social institutions regulating the non-market based access and distribution of manure in pastoralist areas by building capacities for manure management to reduce the loss of nutrients through leaching, diminish the emission of gases and to avoid pollution to water sources.
- # Tourism in pastoralist areas is important for the regional economies and contributes to the pastoralist households but middlemen and other stakeholders capture the lion's share of tourism benefits. Tourism authorities should examine the demand for rural tourism in pastoralist areas where tourism is dependent on inputs from pastoral systems, and authorities should assist pastoralists to capture more of the benefits directly, through support for investment, creation of tourism associations, and training of local entrepreneurs. Increasing the level of organization of pastoralists could increase their bargaining power with major tourism operators and could enable pastoralists to achieve more equitable distribution of tourism revenues.
- # There are many environmental services that are provided by pastoralists and pastoralism that are poorly understood. National accounts generally do not capture them and most country partners in this study did not have the expertise to assess their values in quantitative terms. Livestock and Agriculture Departments should encourage biophysical studies in pastoralist areas to estimate the joint production of environmental services in grasslands, and the data should inform national accounting and national Statistics Bureaus. Strategic alliances between field practitioners and researchers are needed for the valuation of these environmental services in order to estimate the adequate payments for pastoralists and to design appropriate transfer mechanisms.

Introduction

Pastoralism is increasingly receiving attention for the environmental benefits that it confers on rangelands and mountain ecosystems. A growing number of countries are allocating resources to compensate pastoralists for the environmental services of pastoralism and legislation is beginning to favour transhumance and common property resource management, which are cornerstones of the pastoral economy. Yet awareness of the values of pastoralism remains poor and many countries have not taken such progressive steps to protect it, and indeed are implementing policies and laws that disadvantage pastoralists (see Little et al. 2007).

There are numerous motives behind government efforts to restrict pastoral mobility and to change pastoral systems into other land use systems, but a significant factor is the generally poor understanding of pastoral systems and of the realities of pastoral development. Widespread views amongst policy makers and development practitioners include the beliefs that pastoralism is characterised by economic irrationality, by low economic performance, by reluctance to engage in markets, and by unsustainable resource management. These opinions have been widely refuted in peer reviewed literature (e.g. Scoones 1995, Swift 2003, McPeak and Little 2006), yet they still influence decision making and resource allocation in pastoral areas.

These economic misunderstandings have an important impact on the environmental goods and services that pastoralism provides, since they lead to low and misdirected investment, poor service provision and promotion of less sustainable alternatives to pastoralism. Enabling pastoralists to sustainably manage their resource base and provide a range of environmental goods and services therefore requires a great improvement in the understanding of the pastoral economy, and this is the rationale behind the economic work that is being carried out by the World Initiative for Sustainable Pastoralism (WISP).

This particular study on the Total Economic Value of Pastoralism is part of a process of improving the knowledge base on pastoral economics and marketing, which was started in 2006 with a Global Economic Review of Pastoralism¹. The Global Economic Review highlighted the importance of pastoralism to the National Economy of many countries, yet emphasised that this contribution was achieved despite widespread neglect and underinvestment. The Review also illustrates the extremely poor state of knowledge of pastoral economies, the lack of data collection in some countries and the failure to disaggregate national datasets in others. Above all, the Review points out that there are a multitude of values attached to pastoralism, of which the majority are rarely considered at all.

As a follow up to the Global Review on the Economics of Pastoralism, WISP launched a series of country studies² to develop a deeper understanding of the Total Economic Value of pastoralism. This project has been guided by the work of The International Institute for Environment and Development (Hesse and MacGregor, 2006) and benefited from the technical input of IIED at a preliminary workshop with the project partners in 2007. The six country partners were identified more on the basis of their capacity to represent pastoralist interests in national policy debate than on the basis of their technical research capacities, and therefore the study has entailed a degree of capacity building and training. The partners were given the remit of collating the available information on pastoralism in their countries and analysing this to build up the most thorough picture possible of the Total Economic Value of Pastoralism in their context.

This study has been implemented using the Knowledge Management Approach of WISP. The aim was to make sense of the available information and put it to practical use, rather than to engage in extensive primary research, although some of the partners nevertheless engaged in original research, particularly to gauge local perceptions of indirect values. The principle aim of this project however is to provide arguments for greater policy support, research input and investment in pastoral systems. This global review is designed to bring the six country studies together, to piece together the state of knowledge regarding the multiple values of pastoralism around the world and to discuss the merits of different methodologies for assessing the diverse values of pastoralism. The report also provides policy recommendations that will enable governments to capitalise more effectively and sustainably on the economic goods and services of pastoralism.

The structure of this document is as follows: Section 1 presents an overview of values, valuation and the economics of pastoralism. Section 2 shows some trends in pastoral systems and background information about pastoralists and pastoralism in each country study. Sections 3 and 4 present the direct and indirect values of pastoralism across the different countries. Section 5 synthesises the contribution of pastoralism to the country economies and presents some policy recommendations.

Values, valuation and economics of pastoralism

Values are frameworks for identifying positive or negative qualities in events objects or situations. There are different ways in which individuals consider the values into their deliberation process and how they influence their actions. Decision making usually involves conflict between different values and interests, thus finding a common measure of values through which the gains and losses can be traded-off one with another is an operational response to the problem of value conflict which is the

¹ http://www.iucn.org/wisp/documents_english/global_review_of_the_economicsof_pastoralism_en.pdf

² Six countries were included in the project: Ethiopia, Iran, Kyrgyzstan, Mali, Peru, Spain. A list of country partners is presented in Annex 1.

basis of cost benefit analysis (see O'Neill 2007). Common utilitarian processes of valuation are welfarist, consequentialist and have an aggregative maximizing approach following a microeconomic model of institutional structure where the key unit of analysis is the individual. Individuals make choices via expression of preferences, and social welfare is defined by the aggregation of individual welfare. From this perspective valuation can be understood as the quantification of the change in welfare as a consequence of an action or event that generates price changes, quality changes or change in some public goods (Haab and McConnell 2002). However, it is now clear that individuals do not always follow a maximization behaviour based on economic drivers and many valuation studies have provided evidence that individuals can have ethical attitudes that give rise to lexicographic preferences (refusal to make trade-offs) or deontological attitudes in which individuals consider that decisions must be based on moral principles and that the process of achieving some goal can be judged wrong if a principle is violated i.e. there are constraints in performing certain kind of acts even through they may produce a better result in the form of higher individual utility (see McCain 1991).

The evidence that people's moral commitments can conflict with their welfare maximization behaviour and the tension between the rationality of individuality and that of social belonging (i.e. between the individual maximization on the one hand and the norms and moral reasoning on the other) as well as the empirical verification that some values are incommensurable (i.e. impossible to measure or compare) and theoretical inconsistencies of valuation approaches and cost benefit analysis suggest the need of refinements in the economic paradigm for valuation studies participatory valuation approaches providing a broader base for decision making seems to be an alternative for further valuation studies. These context specific approaches are based on criteria of justice and democracy that can be used as an alternative to promote public participation to deal with the problem of multiple values and uncertainty that cannot be addressed using standard economic approaches (e.g. De Marchi and Ravetz 2001).

Total Economic Value

Despite the theoretical and methodological limitations of valuation studies, an estimation of the total economic value of pastoralism might be needed in order to:

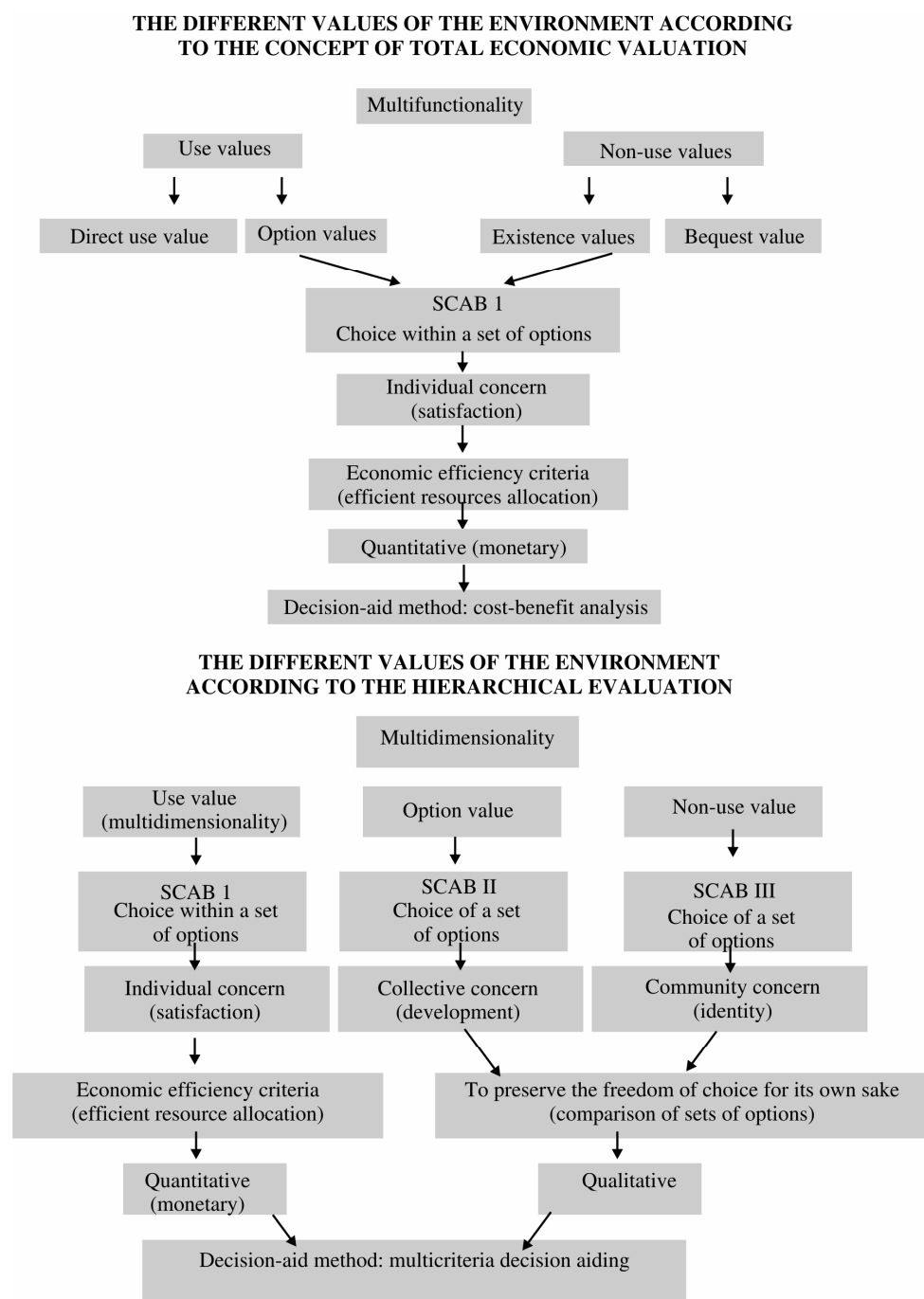
- # Provide support to the argument of pastoralism as a viable and sustainable resource management system.
- # Present evidence that many goods and services provided by pastoralist systems are not captured in national accounts since some of them are priced zero because of their public goods characteristics and market failures.
- # Supply facts and figures that generate best informed criteria for public investment and policies decisions in pastoralist areas.
- # Understanding the opportunity costs of alternative land uses
- # Ensuring that important, globally enjoyed, services are compensated and protected

Total economic value attempts to estimate the total value of the resources in so far as it affects human welfare. Different authors present different categories of values that need to be captured by different valuation techniques (e.g. Pearce and Warford 1993). The total economic value is then estimated by summing up the different value categories e.g. direct, indirect, option and existence but considering i) that the components are not mutually exclusive, ii) values should not be double counted (see Edward-Jones et al. 2002). The approach recognizes the existence of multiple dimensions and differences between values but finally they are all incorporated into a single currency unit that can be used in decision support methods like cost benefit analysis. Nevertheless it is difficult to integrate the multidimensionality of the values into a discussion of rational choice, since the total economic value from its utilitarian perspective can not take into account beyond the purely typological distinction, the different use, option and existence values; thus a complementary framework to assess the total economic value is required based on a hierarchical rationality of choices.

Total Economic Value within a hierarchical rationality

Plottu and Plottu (2007) based on decision theory; suggest that from a hierarchical perspective, the estimation of Total Economic Value rather than being mostly individual and utilitarian i.e. capturing mostly direct and indirect use values, should necessarily include the Option and Existence Value since some decisions transcend the individual horizon representing collective and community concerns to preserve the freedom of choice and the set of options. These option and existence values, usually captured in a qualitative way, could be combined with quantitative estimates of direct and indirect use values. This combined information captures the total economic value in multiple currency units and recognizes that agents can take decisions based on individual preferences or guided by norms that regulate social behaviour. Hence decision support methods such as multicriteria analysis can be appropriate (Figure 1).

Figure 1: Total economic value within a hierarchical rationality (Plottu and Plottu 2006)



Total Economic Value of Pastoralism

For pastoralist systems, the total economic value components can be grouped in four categories: direct, indirect, option and existence values

- # Direct values refer in general terms to the goods and services provided by pastoralism that are used directly by human being. They include both consumptive uses and non consumptive uses, e.g. milk, meat, skins, use of pastures etc.
- # Indirect values are derived from the services provided by pastoralist systems that provide benefits outside the system itself. They include for example inputs of pastoralism to agriculture, tourism and environmental services.
- # Option values are derived from preserving the option to use in the future goods and services provided by pastoralism that may not be used at present either by oneself (option value) or by others (bequest values).
- # Existence value refers to those values derived from the enjoyment people can experience by knowing that a good or service derived from pastoralism exist even if they never expect to use that resource directly.

Different techniques can be employed to assess those values. Table 1 shows some of these techniques as presented in the IUCN global economic review of pastoralism, while Box 1 presents them in the context of pastoralist studies.

Table 1: Summary of valuation approaches and techniques (IUCN 2005)

Approach	Technique	Nature of value	Advantages	Disadvantages
Stated preference	Contingent Valuation	All direct, indirect and non-use values	Can be used for all value types	Subject to many biases Large data requirements
	Choice Modelling	All direct, indirect and non-use values	Can be used for all value types No bias	Complex analysis Large data needs
	Participatory Economic Valuation (PEV)	All direct, indirect and non-use values	Can be used for all value types Small data requirements	Subjective
Revealed preference	Market price analysis	Direct values (extractives, inputs, Marketed products)	Reflect market prices More limited application	Large data requirements
	Cost-based methods	Indirect use values	Reflect market prices More limited application	Large data requirements
	Productivity methods	Indirect use values	Reflect market prices More limited application	Large data requirements
	Avertive or preventive expenditure	Indirect use values	Reflect market prices More limited application	Large data requirements
	Travel Cost Method (TCM)	Tourism values	Reflect market prices More limited application	Large data requirements
	Hedonic Pricing Method (HPM)	Use value associated with change in environmental qualities	Reflect market prices More limited application	Large data requirements
Benefit transfer	Use of other empirical studies	All direct, indirect and non-use values	Small data requirements Cost-effective	Inapplicability of existing studies

Hesse and McGregor (2006) presented a framework to assess the total economic value of pastoralism, which has been used in the different country studies. For practical reasons they were focused on the assessment of direct and indirect values of pastoralism because option and existence values were assumed difficult to quantify and hard to transform into practical policy tools. They argue that the calculation and aggregation of just direct and indirect components can be enough to inform, guide and direct government policy since the values are more local, tangible and easy to estimate. In consequence, in formal terms the framework rather than heuristically attempting to capture the total economic value of pastoralism, takes a purely utilitarian shortcut dropping the options and existence values. However, these values might capture the willingness of millions of people living not necessarily in pastoralist areas to contribute to the conservation of pastoralism and pastoralist systems, thus influencing the agenda of major donors involved in both conservation and development issues.

Box 1: The application of different valuation methods in pastoralist context

Market price method: is a tool able to value the changes in quantity or quality of goods or services provided by pastoralist systems that are bought and sold in markets based on the quantity supplied and purchased at different prices. **Limitations:** Market imperfections and/or policy failures generate that the true economic value of goods or services may not be fully reflected in market transactions. The method has limitations to assess changes that affect the supply of or demand for a good or service.

The production function approach: Might be used to estimate the impact of changes in the quantity or quality of goods and services derived from pastoralism that are factors of production for commercially marketed goods. **Limitations:** The method does not measure the value of non-marketed goods and services; hence the inferred value may understate the true value to society. Changes in productivity can be evidenced with spatial and temporal lags. Scientific knowledge is needed to estimate dose-response functions.

The hedonic pricing method: Might be useful to estimate the impact of changes in environmental quality, or in environmental amenities in pastoralist areas through the differences in market prices of real estates in areas with different impacts after controlling for other attributes under the premise that market prices reflect environmental and non environmental attributes and the consumer behavior can be revealed through surrogate markets. **Limitations:** The method capture only the direct consequences of quality changes that affect the price of real estates under the assumption that users can perceive the differences in quality, and given their income they can select the combination of features that prefer. However there are many sources of market distortions and the results are influenced by model specification.

The travel cost method: is a surrogate market tool that might be used to estimate the economic use values associated with pastoralist areas that are used for recreation. **Limitations:** The method cannot be used to measure nonuse values nor off-site values provided by the pastoralist system, and it is only suitable for goods and services recognized by the users. The method is not useful to estimate ex ante effects. Several problems defining and measuring the opportunity cost of the time while traveling, the effect of substitute destinations and multipurpose trips can generate that the results will be biased or overestimated. Additionally, the method is sensitive to the approach and functional form used to estimate the demand curve and the choice of variables included in the model.

Damage cost, avoided cost, replacement cost and substitute cost methods: It is a set of methods that might be used to quantify the value of good or services provided by pastoralism and pastoralist systems based on the costs of avoiding damages, purchasing substitutes or replacing the altered functions provided by the systems. The methods are developed under the common assumption that since people incur costs to avoid damage, or replace or provide substitutes for goods or services provided by pastoralism then those services must be worth at least what people paid to replace them, avoid the damage or acquire a substitute. However, these estimates do not represent the peoples' willingness to pay for the products or service, and the method does not provide strict measures of economic values. **Limitations:** The methods do not consider social preferences for the goods and services, or individuals' behavior in the absence of those services. These methods can underestimate or overestimate the benefits, since simplistic applications do not consider the degrees of substitution between the alternative and the pastoralist' good or service, nor their non-use values. The incurred costs may also serve other purposes and these external benefits are usually not considered in the analysis. The values of the alternatives to mitigate damage or avoid costs tend to be arbitraries and limited by the income, commonly not representing the social scarcity value of the resources.

Contingent valuation: This is a flexible tool, able to estimate use and non use values of goods and services provided by pastoralism and ex ante and ex post assessments of interventions in pastoralist areas through a direct question. **Limitations:** The major criticism of results of contingent valuation is a series of biases; these biases can be focused on two different aspects: Validity (Accuracy) and Reliability (Reproducibility). Several other sources of error might appear as a consequence of embedding, sequencing, information and elicitation effects, as well as hypothetical and strategic biases.

Contingent Choice or conjoint analysis: is a tool used to estimate both use and non use values of goods and services provided by pastoralism inferred from the hypothetical choices or tradeoffs that people make. **Limitations:** Lack of familiarity of respondents with some tradeoffs complicates the evaluation. Some biases can appear as a consequence of the complexity or the number of choices.

Table 2 presents the conceptual framework of Hesse and McGregor (2006) for the estimation of direct and indirect values of pastoralism. Based on three country studies in East Africa they identify a list of key values to be considered in further valuation studies, some of these values are usually measured and information about their importance might be available from secondary sources, while some others values are not measured or are underestimated and their importance in terms of contribution to pastoralism is often neglected and specific studies are needed for their proper estimation. A detailed description of the different value components is available at www.iied.org/pubs/pdfs/12534IIED.pdf

Table 2: Conceptual framework for assessing the direct and indirect values of pastoralism Hesse and McGregor (2006).

DIRECT		INDIRECT	
Measured	Unmeasured	Measured	Unmeasured
Livestock sales	Employment	Subsistence*	Ecological and rangeland services
Milk sales	Animal husbandry and dryland environmental management skill development	Inputs to tourism*	Agricultural services – including financial (insurance, investment, risk management) and labour
Other derivatives such as hides and leather manufacture		Input to agriculture*	Socio-cultural values Indigenous knowledge
		Other inputs to informal or quasi-formal economic activity* – butchers, traders, transporters, and other multipliers reliant on pastoral inputs	Option and existence values
		Local taxes and levies*	

*usually underestimated

WISP's approach to the economic value of pastoralism

The country reports commissioned by WISP largely rely on the collection and interpretation of secondary data rather than generating primary data, which creates some gaps and challenges. Despite some evidence confirming the importance of livestock and livestock products to national economies, the failure of government statistical services to recognise and capture the true contribution of pastoralism is a limitation for economic analysis and advocacy. In spite of its apparent simplicity and potential criticisms because of the transfer and aggregation of values from different locations and to different scales, (see Box 2) the reliance on secondary data presents serious challenges for country partners considering that:

- 1.# The information is scarce, usually of poor quality and the livestock sector is not disaggregated into pastoral and non pastoral contributions.
- 2.# Time series data is usually not available and the effect of climate and price fluctuations on pastoralist economies is rarely able to be estimated.
- 3.# Data available for distinct regions can be collected using different methodologies, thus once aggregated regional or sectoral inequalities can not be evident.
- 4.# Most available data is focused only on direct values especially animal production and commercialization.
- 5.# Many transactions in pastoral systems occur in informal markets and records are not kept.
- 6.# The contribution of subsidies to pastoralism is not disaggregated and estimations of the importance of the sector can be biased.
- 7.# Pastoralists are not a homogeneous group and some are involved in livelihoods diversification strategies unable to be captured in official statistics.
- 8.# Indirect values of pastoralism are not available or are anecdotal or based on unreliable sources.
- 9.# Option and existence value of pastoralism can also be expressed by non pastoralists and people living in non-pastoralist regions.

Box 2: Some sources of error of the values estimated by the knowledge management studies

- # Values are aggregated beyond the areas where they were original estimated. Values estimated at one scale cannot be expanded by a convenient physical index of area, such as hectares, to another scale., nor can two separate value estimates, derived under different contexts, simply be added together. For example, information about the value of pastures in one location should not be used to estimate the value of the pastures for the entire region by just a simple multiplication of the physical quantity for the unit ‘value’.
- # Values are transferred out of time and place. The values collected in one site in a particular year/season can not necessarily be the same in a different location/time. e.g. the value of pastures in site A where there is abundant grassland and low density of animals is not the same that in site B where pastureland is scarce and there is higher demand for the resource. The value of pastures in year X with normal precipitation pattern is not the same as the value in year Y when a drought happened.
- # Values are summed up using information from different years/season and then compared with the current national account figures without considering a discount rate. e.g. the value of milk in year X is added to the value of skins in year Y and the value of pastures in year Z and once summed up, the result is compared with the agricultural GDP of the country in year W.

The strengths of WISP’s approach are that it allows pastoral advocates to make sense and use of the information that is already available, and it enables policy recommendations to be built on what is already known, without a huge cost investment. The project implied a component of capacity building, to enable partners to develop strong arguments based on information that is already available in their countries, but is not understood, or is not receiving attention. The studies also allow WISP and its partners to identify knowledge gaps, and their relative importance, which then become elements of advocacy work.

Overview of the contribution of livestock and pastoralism to national economies

The contribution of livestock to food production and economic output is significant all around the world. Livestock production systems are influenced by the amount of available land and the size of agricultural workforce. Large areas of land in all the regions are used for raising animals, especially where natural conditions do not allow crop cultivation and in most regions more than half of agricultural land is permanent pasture (Figure 2). Aggregate national accounts figures indicate that the contribution of livestock to agricultural GDP is high, reaching values over 50% in developed regions such as Southwest Pacific (Australia and New Zealand), Europe and North America where intensive production systems are common (Figure 3).

Figure 2: Percent age of permanent pasture in total agricultural land

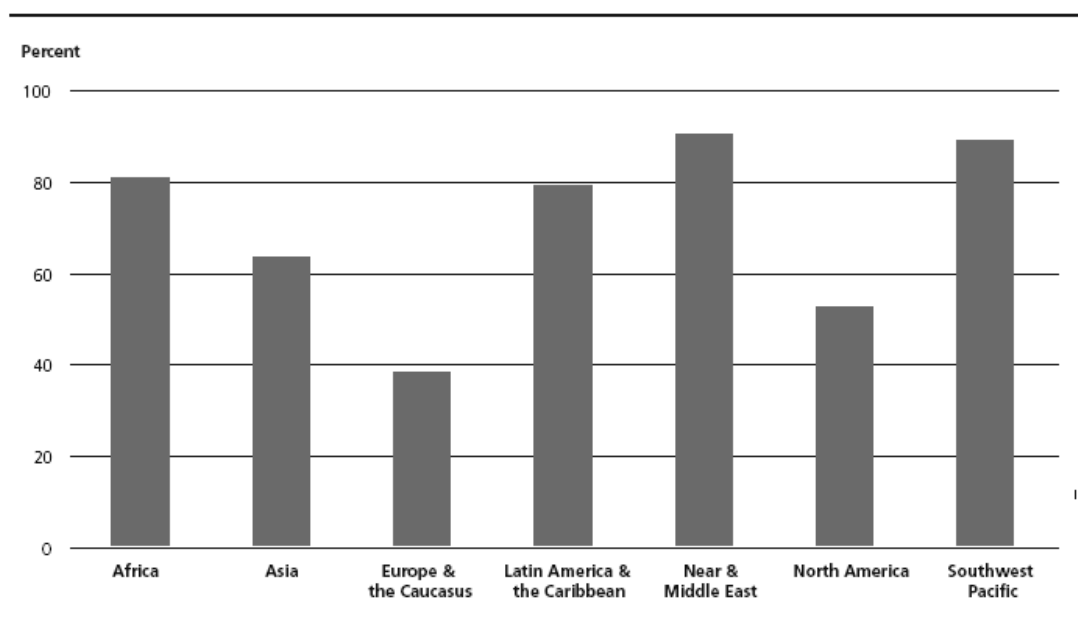
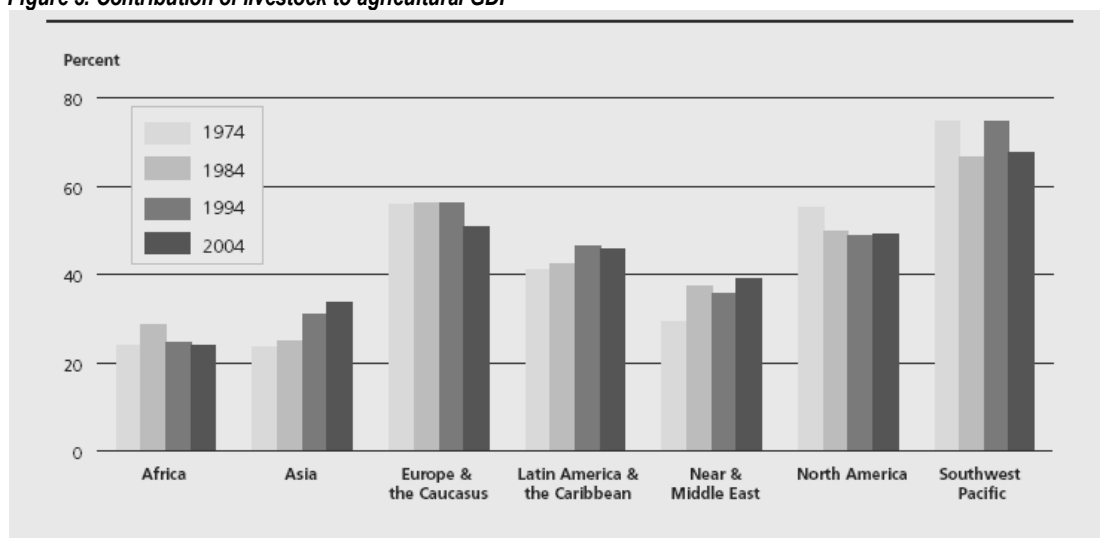


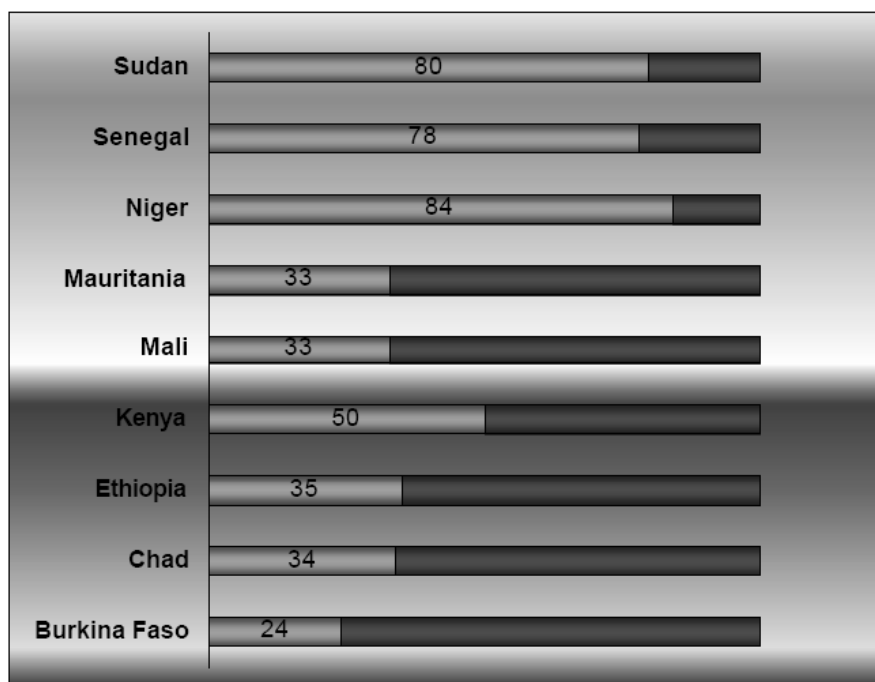
Figure 3. Contribution of livestock to agricultural GDP



However, these statistics do not capture the socio-economic significance of livestock keeping in systems where livestock and pastures play a crucial role in the livelihoods of million of people. Following Swifts (1998), those systems can be considered pastoralists if most households get more than 50% of their total gross household income from livestock related activities using unimproved pastures. Hatfield and Davies (2006) in their economic review of pastoralism highlight the fact that few countries have official agricultural data about the contribution of pastoralist systems to national accounts but in countries with a predominant agricultural sector it is not rare that the contribution of pastoralism to agricultural and national GDP might be important reaching values as high as 30% of National GDP in Mongolia or 80% of Agricultural GDP in Sudan where pastoralism is the predominant livestock production system. Figure 4 presents the contribution of pastoralism to agricultural GDP of several African countries. In addition, official statistics do not reflect the fact that pastoralism is usually the most rentable use of marginal lands and that productivity of pastoralist systems can be higher than other systems under the same conditions: in Africa pastoralism has been shown to be between 2-10 times more productive per hectare than ranching systems (Scoones 1995).

These figures are destroying the extended myths that pastoralism adds little to national economic activities and that sedentary cattle raising is more productive, and suggests that the opposite is the case. Worldwide, accumulated evidence is changing the view of pastoralism as an archaic form of production that disrupts the dynamics of natural systems and leads land degradation to a view of pastoralism as a viable economic system where increased market access and enhanced mobility can improve the livelihoods of millions and contribute to poverty reduction and environmental management.

Figure 4: Contribution of pastoralism to Agricultural GDP



Trends in pastoral systems

Pastoralism is a dynamic use of the land dependent on the trends of both the environmental and socio-economic systems where it is embedded. Both ecological and socio-economic systems are coevolving and different variables are changing at different rates. Ongoing changes in the way pastoralism is practiced reflect the adaptive response of this production system to the transformation of the natural and social environments over the course of time. Different variables affect the ecological and socio-economic system at distinct scales and magnitude, thus having distinct impacts on pastoral systems.

At a global scale, climate change is one of the most frequently cited threats to pastoral systems. Different models have predicted changes in the level of precipitations, temperature and biological productivity of pastoral lands for the coming 50 years (Thornton et al. 2006). The scenario analysis of changes in these factors proposes some expected global trends for pastoralism:

- # Reduction in the overall number of agro-pastoralists due to the negative impact of diminishing precipitation rates on their cropping capabilities.
- # Increase in the number of pastoralists because of the increasing number of former agro-pastoralists now focused mainly on animal production.
- # Increasing need of mobility in pastoral areas to make use of scarce resources.
- # Potential changes in animal species and breeds to adapt the production systems to different conditions.
- # Increasing protection of key strategic resources (wetlands, water points) by pastoral groups, with increasingly stringent rules of access, leading to privatisation and benefit capture by more influential individuals or groups.

Other global challenges facing pastoralists include: expansion of trade, integration of markets and increasing regional interconnectedness, together with high and increasing demand for animal proteins all over the world; a political setting defined by former Structural Adjustment Programs, state retrenching and economic liberalization, implying shifts towards decentralization, devolution and local participation; technological developments enhancing mobility and telecommunications, but also improvements in genetics, which enable 'new' animal and plant organisms; regional stability, security and geopolitical interests, which play an important role in determining pastoral livelihoods, as in the case of the 'war on terror' affecting pastoral lands in Afghanistan, Somalia, the Middle East and Saharan zones (Nori and Davies, 2007).

At a country scale: the WISP studies have provided evidence that changes in the socio-economic systems are having significant effects on pastoralism and influencing its trends for the future³. These changes and trends can be categorized as:

- # Structural changes: The most evident examples of massive structural changes in pastoralist systems are the shifts from socialism to free market economies among the former USSR republics and other states in its sphere of influence. In Kyrgyzstan, after the independence there were substantial changes in size of the pastoralist exploitations because of land subdivision of the former cooperatives. The loss of scale economy and the reduced access to veterinary services during the process of adjustment to the new economic system significantly reduced the number of animals, affecting the livelihood of Kyrgyz people. Currently, under a new regime, the population levels of domestic animals are recovering due to the continuous effort of the Kyrgyz smallholders. They represent the most dynamic sector of the pastoralist economy owning about 90% of the national herd and their contribution to the country exports of animal products is significant. The expected trend for the future is a pastoralist production system more integrated to the markets and consolidating its export position within Asian countries.
- # Responses to the dynamics of other sectors in the economy: Within the WISP case studies, Spain as a developed country exhibit a pastoral sector more vulnerable to the growing importance of other sectors of the country economy. The trends of pastoralism in Spain shows i) a decline in the importance of the activity within the Spanish agricultural sector due to the increasing contribution of intensive farm exploitations to the country economy, ii) a reduction in the number of pastoralists due to a) the existence of more profitable opportunities within the growing industrial sector and b) the reduction in labour demand among intensified farms. In addition, the increasing cost of labor makes some traditional practices e.g. wool production, economically unviable in comparison to other countries. The trends for the future consider a pastoralist sector based on the development and consolidation of niche markets for products with specific labels certifying best management practices or denominacion de origen as well as increasing recognition of the role of pastoralism in the conservation of European agro-biodiversity.
- # Responses to market signals: Market participation has been promoted as an effective measure to improve the livelihoods of pastoralist people. Increasing capacity of smallholders to access markets and respond to market signals is a common trend in all the country studies. A clear example is Ethiopia, where the pastoralist sector has been able to respond to clear market signals. The export of animals to neighbouring countries through formal and informal channels indicates the capacity of pastoralists to collect information and respond to price differences across

³ All the WISP studies will be published online at <http://www.iucn.org/wisp/wisp-publications.html>

the borders. The exports of animals to Middle East Muslim countries show an Ethiopian pastoralist sector able to respond to specific market demands in terms of animal management, slaughtering processes and health requirements. In addition, the increasing importance of the exports of hides and leather indicates the presence of a local emerging sector adding value to pastoralist products and able to reach the quality standards required by the European Union. The future trends should present a pastoralist sector in Ethiopia attempting to formalize the trade of animals across the borders, promoting income diversification and developing risk management systems to cope with environmental variability.

- # Institutional changes: Sedentarisation has been a common policy implemented in many countries with the aim to improve the access of pastoralist people to a range of services including education, health and market information. The process of sedentarisation in many cases disrupted local institutions and the norms and rules that regulate the use and access to resources. In Iran, the nomadic communities were considered a barrier to national development and modernization. The nationalisation of rangelands and forced sedentarisation undermined the social organisation and identity of nomadic tribes. Recently, there is increasing recognition among Iranians that customary forms of governance and management of natural resources can promote harmonious relationship among people, livestock, and the environment. The future trends in the Iranian pastoral systems look forward to the recovery of customary forms of governance but under a democratic and innovative power structure in which representatives elected within the local communities would run the Government Councils and speak for the least advantaged community members.
- # Globalization and trading of genetic resources: Animal trading for cross-breeding or stocking programs has been promoted in many countries as a way to improve productivity of local breeds or provide alternatives to enhance the livelihood of smallholders. In many cases, the consequence of these programs is the loss of indigenous breeds because of a substitution process guided solely by market forces focused on productivity traits. Peru is the largest world producer of Alpaca wool and also has the largest population of these animals. Recently, Peru has been exporting live alpacas to countries with similar environmental conditions such as Ecuador, or to developed countries such as Australia, Canada, USA and Switzerland. In few years, these countries have started to compete with Peruvian Alpaca wool in international markets. The Peruvian pastoralists consider that the future of Alpaca production is threatened because of the capacity of developed countries to make use of biotechnology to assist reproduction, initiate research programs to enhance the quality of fibre and start intensive exploitations with more homogeneous final product. The future trends of alpaca pastoralism in Peru seems to be focused on maintaining the country supremacy in the global market through a) the promotion of pastoralists association to enhance access to technical information and credits b) Control and regulate the exports and illegal trading of live animals and genetic resources i.e. embryos c) Implement mechanisms to certify the quality of the fibre.
- # Normative changes: Pastoralism is not a homogeneous production system. Pastoralist exploitations can be sedentary, sedentary with transhumance or nomadic in order to make use of the available resources. In Mali, there are clear patterns in the temporal and spatial distribution of pastures and water points. A significant proportion of pastoralists include mobility of people and animals as a livelihood strategy, specially in the regions of Gao, Mopti, Kayes and Tombouctou. In many regions, the access and use of these resources is regulated by local norms and customary mechanisms, however conflicts are not uncommon among the different involved agents especially during periods of scarcity. Recently, the Government of Mali designed a Livestock Policy and a Pastoral Decree in order to provide a national legal framework to regulate the mobility of animals, the free access to water resources, promote surveillance mechanisms and sanitary controls, as well as define priorities for the use of natural resources among different groups. The future of pastoralism in Mali expects the use and refinement of the new norms and legislations in order to implement more peaceful and transparent mechanisms for conflict resolution and to develop integrated management plans at national, regional and local scales to increase animal production, improve delivery of health services and enhance market access.

Direct values of Pastoralism

This study uses a framework developed by Hesse and McGregor (2006) in order to first facilitate the recognition of key elements to be ideally considered in the studies, and then collect and analyse information about each of these elements considering that some of them are usually not quantified in official statistics or not easily transformed to monetary terms (see Table 2). For pastoralist systems, the total economic value components can be grouped in four categories: direct, indirect, option and existence values.

Direct values refer in general terms to the goods and services provided by pastoralism that are used directly by human beings in the system. They include both consumptive uses and non consumptive uses, and most of those goods and services can be captured by markets because of their private goods characteristics. The list of elements to be included in the studies can be extensive and includes amongst other things the sale and consumption of milk, meat, skins, wool and blood as well as livestock and manure sales.

To capture these values at the country level, the different partners made use of secondary data from government agencies and official country statistics or extrapolated to the entire nation, baseline information collected by development projects in some specific pastoralist areas. Some countries e.g. Peru, Iran and Ethiopia collected primary information about some key values for their respective production systems. In the Peruvian case, because of the restricted geographical distribution of

the Alpaca pastoralism (not available country wide) the data collection was focused at the regional level in Puno, the most important production area of Alpaca on the planet.

The use of market prices to quantify the direct economic value of pastoralism is a recognized practice. Information about key values are usually captured at national level, but in most cases the data is not disaggregated by production systems, so the country partners made use of their knowledge of the country livestock sector to define a set of assumptions based on complementary information about a) property sizes, and b) geographic distribution of pastoralists to estimate the share of pastoralism within the available country figures. In a similar way, secondary data about pastoralists' values available at the local scale were extrapolated to a higher scale using a set of assumptions based on a) geographic distribution of pastoralist families and b) aggregation rules defined taking into consideration some production constraints for specific environments.

It is important to emphasise that the estimation of the direct economic values derived from pastoralism at a national level is not an easy task. Even in the ideal case, that information about the goods and services bought and sold in markets (based on quantities supplied and purchased at different prices) is available, it is well recognized that i) market imperfections and/or policy failures mean that the true economic value of goods or services may not be fully reflected in market transactions ii) not all the transactions in pastoralists economies are captured in the markets.

This section rather than provide a summary of the case studies, attempts to:

- # Present key findings and/or emerging patterns about selected direct values of pastoralism captured in the country studies.
- # Illustrate the diverse values of pastoralism with selected country examples.
- # Highlight the methodological approach used by the country partners to estimate the values
- # Identify gaps and new research questions for further studies.

This approach was preferred because valuation studies are site and time dependent and direct cross-country comparisons could generate biased findings considering the existence of differences between the pastoralists systems in the country studies in term of i) market access, livestock species and animal products, ii) the availability and quality of information about the values involved, iii) the distinct analytical capacity of the country partners and iv) differences in the scale of analysis and time of data collection.

Animal sales and consumption

The value of animal sales is consistently one of the highest direct values of pastoralism across the country studies. The analysis of the different countries present clear patterns in terms of the off-take rates of different animal species: small ruminants present higher marketing rates ranging from 34 to 36%, per year while larger animals e.g. cattle, camels, or yaks are sold at more modest rates averaging 6% of the herd size per year, but significantly higher as the need arises. The lower rates of sale of large stock is due to a combination of their longer reproductive cycle and their multiple roles in the pastoralist household, including milk production and capital assets.

The case studies, using average market prices for their respective countries, estimated that for the year 2006 the sales of livestock produced in pastoral systems reached values ranging between USD 192 million for Kyrgyzstan, a country with a total pastoralist herd size of about 1.8 million TLU, to over USD 2300 million for Spain, a country with a pastoralist herd size of about 8.6 million TLU. It is important to highlight that for some countries with similar herd sizes like Mali (8.4 million TLU) or Ethiopia (9.8 million TLU), the sales values are significant lower than the Spanish figures (USD 428.5 million for Mali and USD 364 million for Ethiopia). These disparities are explained by the price differences of the animals between Europe and Africa and because not all the transactions are recorded in the markets or official statistics. For example, the Kyrgyz study highlights the disagreement between the observed off take rate and the transactions registered in the available statistics, suggesting that unregistered sales could represent at least 50% of the total transactions. In Iran, the estimated value of animal sales represents USD 500 million but could be higher if informal transactions were incorporated. Similarly, in Ethiopia the unofficial trade and illegal cross-border sales were estimated at USD 138 million per year, i.e. about 38% of all the country animal sales.

Another interesting finding is the capacity of pastoralists to contribute to the export of animals. In Mali, the export of live animals amounted to USD 44.7 million during 2006. In Ethiopian pastoralist areas it has been estimated that at least 44% of the off take of cattle, 56% of the off take sheep and 30% of the off take of camel goes to export or to illegal markets. In Peru, the exports of live Alpacas is regulated by the state, however the case study highlights that illegal trade of live animals is an increasing problem although not quantified. The main quantified finding of the Peruvian study is that the value of sales and consumption of Alpaca meat in family exploitations exceeds 8% of the value of the Alpaca fibre displacing it as the main product of Alpaca pastoralism, representing about USD 30 million to the national economy. For Alpaca herders in South America, the consumed animals represent 37.5% of the off take, this figure is in concordance with the findings in Asian and African countries like Kyrgyzstan where the consumption of cattle within the pastoralist unit represents 35% of total off take, or Mali where the consumed animals represent about 30% of the offtake. It is important to mention that for the other countries in the study, the national off-take value data do not keep a record of the consumption of livestock within the pastoral community and specific research to generate consumption data is needed.

Milk sales and consumption

The country studies suggest that milk sales/consumption is an important direct value of pastoralism in developing countries but not in developed economies where the dairy sector is highly intensive and use specialized breeds. In those conditions, milk production from pastoralist systems is less competitive, although it is noted that some industrialised countries maintain a vibrant pastoral dairy sector through the production of niche products, such as organic cheese (e.g. Switzerland and France). In Spain, the total sales and consumption of milk and milk products from pastoralists represent USD 1215 million per year. This estimate seems high but is a result of the application of European market prices to the produced milk. These prices are significantly higher than for the other country studies. The analysis of the studies in developing countries show a clear pattern: the importance of the milk produced in pastoralist areas is considerable for both pastoralists and national economies.

Monetary figures are hard to ascertain considering the perishable character of the milk, differences in market access, yearly nutritional status of the animals and the existence of development programs in pastoral areas that could bias the real figures. For example, in terms of product contribution to the national offer, Iranian pastoralists contribute with over 470,000 tons of dairy products per year. In Ethiopia the milk produced by pastoralists represents about 65% of the national milk production, but the estimated total value of the milk produced in pastoralists systems in official statistics amounts to only USD 284 million, which is considered by Ethiopian experts a clear underestimation of the real figure. This underestimation problem is exacerbated by the fact that in Ethiopia the milk consumed by pastoralists represents about 77% of the total milk production and that amount is not captured by markets or statistics.

The country studies suggest that the level of consumption of milk within the pastoralist group seems to depend on different factors. For example in Spain, most of the bovine milk is consumed by the family farmers because it can not compete in the market with milk from specialized breeds, but on the other hand most of the milk from sheep and goats (species mainly kept in extensive pastoral systems) is sold to processors to produce expensive cheese with special labels, and only between 5% to 13% of the milk is self-consumed.

Market access and the capacity to add value to the milk is also guiding the level of consumption of milk among pastoralists in Kyrgyzstan. In the country's pastoralist areas, the per capita value of produced milk has been estimated at USD 144 per year, of which approximately 33 % of the cow milk and 43% of horse milk are consumed within the household, while the rest is marketed either fresh or as processed dairy products. There is an increasing capacity of Kyrgyz pastoralists to process milk and the country is now the only net exporter in Central Asian region. However, there may be big inequities within the value chain of the milk products and pastoralists currently receive about only 20% of the final market price. It is important to learn more about where value is added in the marketing chain, and the role of the service providers throughout that chain both in marketing products and in supplying information to pastoralists, before conclusions can be drawn in relation to the prices captured by the primary producer.

The existence of livestock based development programs in pastoral areas seems to have a significant impact on milk production. The official statistics for Mali, shows that the value of pastoralists milk production for the last 2 years is about USD 1000 million per year, these figures suggest that the sector has grown over 700% in the last 4 years as a result of interventions that enhanced animal health and improved management practices. Nevertheless, these figures for the last two years measure household consumption and most likely include also other sectors like peri-urban dairy systems which can be an intensive exploitation. Specific studies about the milk commercialization and consumption as well as the market chain in the different pastoral regions of Mali are needed. Specifically in the case of Mali, attention should be given to how the market has responded to cessation of powdered milk import from the EU until mid-2007, which was marketed at lower rates than pastoralist milk, to the extent that pastoralists themselves bought it.

The Peruvian study indicates that Alpaca pastoralists do not consume alpaca milk and the milk is not sold either. The reluctance to sell milk is not rare among some pastoralist societies (e.g. some Ethiopian tribal groups), but there are examples from places such as Afghanistan of these taboos changing in response to social change and market opportunities (Halbach and Ahmad, 2005). Further studies about the non use values associated with milk in pastoral systems might be needed.

Hides and skins sales and consumption

The findings of the different country studies show that the sales of hides and skins and its use in the pastoralist production unit is an important direct value of pastoralism. The trade of hides and skins is usually linked to the animals' sales for meat. So, it is not unexpected that the quantification of the amounts of hides and skins sold and consumed exhibit the same problems as the quantification of animal sales i.e. lack of transactions recorded in the markets. In addition, in Some pastoral systems, the animals lost to disease can provide skins for processing although the meat is not commercialized, thus creating a bias between the number of animal sold and the number of skins produced. Peru illustrates this point, where the average Alpaca producer sells 16 animals per year, which provides 16 skins for trade. However the average pastoralists also sell the skins of 11 alpacas from the dead animals in their herd. Thus, the total amount of produced skins could be 68% higher than the estimation using only animal sales.

In the Peruvian case, the income for the average pastoralist family from the skins sold/consumed represent about USD 135 per year, and once aggregated to the national level, the value of Alpaca skins amounts to USD 3.2 million. The number of skins kept for self consumption was not reported, however in other countries like Kyrgyzstan, the percentage of skins kept for consumption in the pastoralist family ranges between 3% for cattle, 12% for sheep and 5 % for horses out of about 1 million skins and hides produced per year. The skins and hides not used at the homestead are sold to processors. The value chain analysis show that Kyrgyz pastoralists receive between 42-50% of the price of skins and hides at the national market. However, a large amount of the products are finally exported to China at higher prices while the amount paid to producers is kept constant.

In terms of the overall monetary, Ethiopian hides and skins account for 85% of the country's livestock exports. The value of the export of skins and hides to the national economy was estimated in USD 600 million, however the estimated value of hides and skins for pastoralists amounts only USD 43 million. This amount is much less than expected considering that pastoralist herds represent over 30% of the total national animal population. Big differences between the price paid to pastoralists and the export price of hides seems to add to the disparity. Specific studies about the market chain of hides and skins in pastoralist areas are necessary to inform interventions aimed at enhancing commercialization channels and increasing the revenues of pastoralists. The country study in Mali indicates that the value of hides and skins produced in pastoralist areas amounts to USD 9.8 million. This figure, estimated using data from slaughterhouses, indicates that in the last 10 years, the production of hides and skins has increased by about 250%. However, analysis of the information indicates a lack of concordance in the official statistics in the last years. For example, the slaughterhouse data for 2006 show that the number of animal killed was half of the number of skins produced. In Spain, where the analysis also uses aggregated data from slaughterhouse records and national statistics, the production of hides and skins from pastoralists areas contributes USD 101 million to the Spanish economy and about 76% of the hides from cattle kept in pastoral systems are exported. However, that monetary figure considers that the price of one skin is about 53 dollars. The real price paid to pastoralists is more likely a fraction of that.

From the different country studies it is clear that some research is needed to 1) estimate the skins produced at informal slaughterhouses, 2) analyse the value chain of skins and hides 3) quantify in monetary terms the value of the final goods produced considering the importance of leather handicrafts in pastoralists areas.

Wool sales and consumption

Wool is another pastoral product that can be valued using market prices, so an accurate monetary quantification is subject to the constraints already discussed in the previous sections.

The country studies suggest as expected that the importance of the value of wool sales and consumption to the pastoralist economies depends of the composition of animal species in the herd, the composition of the market chain and the costs associated with the activity.

In Peru, Alpaca are farmed for wool and they are the most important domestic animals for the Andean pastoralists in high altitude areas. There are few livestock species able to survive and be productive in the conditions of Peruvian highlands and South American camels have evolved in those harsh conditions and are adapted to the natural environment. At lower altitudes in Peru other species, such as goats, are numerically more important but they do not produce wool. The herds of high altitude pastoralist include over 72% of Alpacas and other animal species are kept in variable proportion based on specific family needs. Alpaca is worldwide recognized because of the quality of its wool and the management of the herd allows that only 55% of the animals are shorn every year. The sales of the wool are the main source of cash for Peruvian pastoralists and about 10% of the wool is consumed within the production unit. The total value of Alpaca wool from Peru is estimated at over USD 26 million per year. For pastoralist families, the sales of wool could represent an income of over USD 880 per year. Pastoralists use part of the collected wool to make handicrafts that are sold at the local markets. The value of alpaca wool based handicrafts represents an additional income for the pastoralist family of about USD180. It is important to mention that Peruvian pastoralists sell the wool to intermediate tradesmen at about 7.2 USD per kilo but the price for the final consumer and export companies can be significantly higher.

Similarly, in Kyrgyzstan, wool is bought at between USD 0.5 and 1.3 per kilo from pastoralists, representing between USD 5.5 to 14 million per year. However, at the end of the market chain, the value of the wool amounts between USD 19.4 to 27 million that the value of the wool is 2-3 times more expensive when reaching the final consumer. The Kyrgyz case study also highlights the need to develop studies to improve the commercialization channels. Evidence suggests that large amounts of wool are not sold because of the lack of traders and poor access to markets.

The low price of wool and the growing importance of other natural and synthetic fibres are seriously affecting the traditional pastoralist economies. Wool production was among the most important sectors of the Spanish economy for centuries. However, in recent times because of the low wool prices and high cost of labour, production has become unprofitable. The price paid to pastoralists is about USD 0.5 per kilo and the Spanish report indicates that one average animal produces only 1.7 kilos, so the benefits are about USD 0.85 per animal per year. Nevertheless, the cost of shearing the wool is about USD 2 per animal, generating a loss of USD 1.15 per sheared animal. When aggregating at the national level, the balance of wool production in Spain indicates a deficit of about USD 12.5 million per year. In these conditions, wool shearing is just a management need rather than an income generating strategy by itself.

Manure sales/use

Manure is a product of pastoralism that could be categorized as a direct value if considered as a final commodity able to be valued using market prices, or as an indirect value if manure is considered as an input needed for some natural processes, e.g. nutrient cycling, or as a production factor for agricultural activities.

In this section we will focus on manure as a final commodity. Manure from different animal species can be collected, kept, dried and sold or used by pastoralists in order to complement their income or contribute to their livelihood. Peru and Spain present interesting cases of study regarding the direct values of manure. In Peru, at high altitude environments there is scarcity of fuel sources, and manure from Alpaca represents the main source of fuel for cooking and heating. Manure is collected during the dry season and stored in special rooms named parvas, where it dries and later can be sold or utilised. Peruvian studies estimate that each adult Alpaca produces about 8,000 kg of fresh manure per year. Pastoralists are able to collect about half of the manure in the fields, while the remanent naturally returns to the soil contributing to maintaining fertility levels and primary productivity of pasturelands. Using market prices, the study estimated that the value of the collected manure sold or consumed represents over USD 300 for the average pastoralist family. Considering the demand for fuel sources in high altitude areas and the lack of substitutes to manure, the figures can be realistically extrapolated to the national level suggesting that the value of Alpaca manure could be about USD 7.5 million per year. This value is low in comparison to the figures obtained in a Spanish study using market prices. In Spain, the use value of manure produced in pastoral areas could amount as much as USD 800 million. Nevertheless, that figure represents the upper limit and considering the losses in the field and demand size, a more conservative value could be one third of the estimated figure. Studies about the potential of manure sales to the growing organic farming sector are needed.

Transportation

The list of direct values of pastoralism can be extensive and depends on the livestock species kept in their systems. In some of the countries studied, livestock are kept for transportation purposes, yet the value of transportation was not reported by any of the studies, suggesting failures in capturing data or lack of capacity to quantify the importance of the service. The cost of transportation is high in pastoral areas and is one of the highest production/transaction costs and a major constraint for market access. The importance of the animals for the livelihood of the owners is significant, although rarely quantified in monetary terms. For example, in the drylands, is not uncommon that people use a pair of camels moving almost continuously in the route between the homestead and the markets to maintain a supply of grain to the household during the dry season.

Indirect values of pastoralism

For this study, indirect values were defined as those values derived from the services provided by pastoralist systems that provide benefits outside the system itself. They include for example inputs of pastoralism to agriculture, tourism, and environmental services. For this document, following the IIED framework, the option and existence values are considered within the indirect values of pastoralism although they are different value categories by themselves respectively representing a) the option to use in the future goods and services provided by pastoralism that may not be used at present and b) the enjoyment people can experience by knowing that a good or service derived from pastoralism exist even if they never expect to use that resource directly.

In general terms it is important to highlight that the different country studies conclude that the recognition of the indirect values derived from pastoralism to the national economies is poor. The lack of recognition of indirect values is usually attributed to the fact that most of these values correspond to goods and services that have public goods characteristics and in consequence there are no markets for them. This circumstance means that usually these goods and services are assumed as priced zero, then leading to the underestimation of pastoralism and often guiding biased policy interventions in pastoralist areas.

The estimation of the indirect economic values derived from pastoralism is a complex task that requires a proper design and the application of specific methodologies like those presented in Box 1. In the same way as for the estimation of direct values, the aggregation of indirect value figures to the country level and the extrapolation of results from studies designed to one site/scale to national level can be a source of error.

From the different country studies it is clear that:

- # Available data and official statistics do not consider indirect non-market values at the national level.
- # There is a clear increasing recognition of the importance of indirect values of pastoralism, but quantitative studies/information about indirect values of pastoralism are scarce or nonexistent.
- # There is a need for capacity building in order to generate primary data about indirect values of pastoralism. The current level of skills/expertise of the involved agencies is insufficient.
- # There is a need to generate information about option and existence values of pastoralism.

This section rather than provide a summary of the case studies, attempts to:

- # Present key findings and/or emerging patterns about the indirect values of pastoralism captured in the country studies.
- # Highlight the methodological approach used by the country partners or present an alternative one.
- # Identify gaps and new research questions for further studies.
- # Complement the research with published information for some values not estimated in the case studies.

Contribution of pastoralism to agriculture

The different country studies highlight the clear linkages between pastoralism and agricultural production. The relations are more evident in agro-pastoralist systems and basically the studies focused on a) the value of livestock for traction and b) the value of manure to agricultural production in pastoralist areas. The country studies collected information about these two values but in most cases the information is incomplete, site dependent, and the figures for the same value were estimated applying different assumptions and methodological approaches, thus creating obstacles for the replication of studies and cross-country comparison.

a) Animal traction: the use of animal power for agriculture is a common practice in all the extensive production systems. The country studies demonstrate recognition of the importance of livestock traction to agricultural production, yet there is a lack of statistical information to quantify it in monetary terms at the national level, considering that pastoralists are not a homogeneous group and differ in their cropping capabilities, production objectives and asset ownership. For example, in Ethiopia was estimated that about 42% of farmers do not have oxen for traction, although most of them have other livestock species. Nevertheless, these farmers can have access to oxen for ploughing their land by renting animals or making use of reciprocity relationships within their communities. In quantitative terms, the study suggests that about 20% of the animals used for traction in Ethiopia are provided by pastoralists.

In monetary terms, using oxen market values, a study from Mali estimated that under the assumption that only 10% of the farmers possess oxen, the value of these traction animals at a national level represents about USD 660 million. It is important to highlight that this USD 660 million is already included in the value of the national pastoralist herd and double counting must be avoided. In addition, this approach does not capture the value of traction and in terms of stock value might lead to an overestimation. Box 3 illustrates the point with a conjoint analysis done in Ethiopia for the value of the phenotypic character of traction. The study shows that pastoralists do not place importance on the traction suitability of bulls to derive the price of an animal and the benefit streams of animal traction should be measured as the value of increase in farm output.

Box 3: The value of traction, a phenotypic character

Zander (2006) using conjoint analysis estimated the economic value of different animal traits among pastoralists and agro-pastoralists in Ethiopia. Her results for traction suitability indicate that:

1. Pastoralists do not place importance on the traction suitability of bulls to derive the price of an animal.
2. Among agro-pastoralists, being suitable for traction seems to be the most desirable attribute for bulls. Their willingness to pay for one bull with this attribute is 37 Euros higher than for an animal unsuitable for traction.
3. In comparative terms, the willingness to pay of agro-pastoralists for a bull that is suitable for traction is 52 Euros higher than the willingness to pay of the pastoralist for this attribute.

These differences between production systems reinforce the fact that benefit streams of animal traction should be measured as the value of increase in farm output, and conjoint analysis is capturing most of the use values associated to the trait.

Using this methodology, an Ethiopian study showed that the use of traction could increase the farmers' income by 6%, from a baseline of about USD1060 per year. The aggregated figures suggest that considering a total of 10 million farming households and 20% of the traction power provided by pastoralists' animals, the contribution of traction power from pastoralism to the national economy could be about USD155.6 million.

The results highlight the economic importance of animal traction to agricultural productivity. Nevertheless animal traction has also associated costs and the economic returns of the investment should be estimated in order to define interventions based on promotion of animal traction in pastoralist areas. Box 4 highlights the results of an African study showing that traction can increase the yields by 21% and the internal rate of return of the investment would be 85%.

Box 4: Economic returns of animal traction

An ILRI study estimated the benefit streams of animal traction over the 10 year period measured as the value of increase in farm output over hoe farming.

Under the main assumption of yield increase only, the 10-year income projections reflected a substantial increase in performance for animal traction providing an average annual increase of 21% over the income from hoe farming (assuming that the net benefits from hoe farming would be constant throughout the period of analysis). The estimated internal rate of return of investing in animal traction was estimated in 85%.

Despite the difficulty to sort out the animal traction effect on total crop revenue, since there are other factors, such as labour and fertilizer use, which influence crop yield, the results of a regression analysis carried out to estimate factors influencing crop yields clearly indicated that the animal traction effect on total crop output is relatively greater than any other factor included in the model.

Through its labour-saving effect animal traction enables households to improve on agronomic practices (such as timely and deeper ridging, mulching and thorough weed control) which are crucial to improving the crop output of a given unit of land.

b) Manure and agricultural productivity: Use of livestock manure is one of the major methods used throughout history to maintain soil fertility and it is still a common practice in many production systems. From the country studies the recognition of the importance of livestock manure to agricultural production is clear. Mali and Ethiopia illustrate the value of the use of manure to agricultural production, although the different case studies adopted different approaches. For Mali, using substitute costs, the study estimated the value of manure for the 2,464,305 ha used for cereal cropping in the country under the assumption that manure will substitute chemical fertilizers. The final figure amounts about USD 73 million. This figure could be an overestimation considering that the study did not take into consideration the real size of the demand for chemical fertilizer in the cropping area, and the equivalences of nutrient content between manure and fertilizers.

Ethiopia took a different methodological approach based on a production function where manure is considered an input into the agricultural activity and then the increase in yield as result of the application of manure was estimated using market prices for the crop. The study indicates that the use of manure could increase the national production of wheat by 1.29 million tons. Using market prices to quantify the increment in monetary terms, the final figure suggests that the value of manure from pastoral systems to Ethiopian agriculture should be about USD 160 million per year. Nevertheless this figure could be an overestimation considering that the extra supply of 1.29 million tons of grain could certainly reduce the market price used in the calculation. In Bhutan, manure supply by yaks to the alpine pastures and grazing lands helps to maintain the grasslands essential for both domestic and wildlife. Manure production in this ecosystem was estimated to be around 11,200 t valued at Nu. 46 million (Gyaltsen, 1996), though this could be valued as an environmental service of pastoralism and double counting needs to be avoided.

It is important to consider that the contribution of manure to agricultural productivity and soil fertility are not necessarily linked to markets. Box 5 presents the social mechanisms linking manure exchange, soil fertility and crop yields.

Box 5: Manure trading and soil fertility

Ramish (2005), using a set of participatory methods in Mali, concludes that observable social phenomena such as exchanges of manure explained more variability in nutrient balances, yields, and the inequality of input application than that related to distance from the home compound.

His research indicates that exchanges made to obtain manure or the means to transport it to household fields have the greatest impact on soil fertility.

The most common arrangement was for households borrowing a donkey cart to “pay” half of the transported manure to the cart owner’s fields. Many cart owners actively sought out households that had manure or household wastes to transport, to profit from such a deal. Similarly, households with full manure or compost pits often viewed this arrangement as a way to empty these pits, preferring to use part of this manure supply as payment in lieu of scarce cash.

Arrangements were also made between transhumant Fulani, who needed somewhere to camp in the dry season, and households that wanted to manure their fields. These arrangements were monopolised by the most senior and socially influential village households whose fields all had wells where the Fulani would water their calves and draw household water.

Contribution of pastoralism to tourism

The country studies indicate that official statistics do not capture the contribution of pastoralism to the tourism industry. The fieldwork and analysis of available data indicates that tourism in pastoralist areas is important for the regional economies and contribute to the pastoralist households but middlemen and other stakeholders capture the lion's share of tourism benefits. For example, in Peru, the contribution of tourism to pastoralist families based on the manufacture and commercialization of Alpaca handicrafts represents only one third of the final price paid by tourists at retailer centres.

In East Africa, although the tourism industry provides employment and small payments to pastoralist groups to conserve wildlife in their land, the owners of large tourism facilities are often outsiders and most of the profits are transferred outside of pastoralist areas. In these conditions, Tanzanian pastoralists are now either reducing their support to tourism or starting locally owned facilities with donor's help in order to capture a larger fraction of the USD 6 million tourism industry in traditional pastoralist areas in Northern Tanzania. There is great inequity in the distribution of tourism revenue and data from East Africa shows that some pastoralists can receive about USD 20,000 per year from tourism related activities whereas the average pastoralist receives less than USD 300 per year.

At a country level, the analysis of Ethiopian official statistics and visitor numbers indicate that pastoralist areas located at the Lowlands and Rift Valley support the largest share of Ethiopian tourism economy. Using a series of assumptions, the country study estimated that the contribution of pastoralist regions to the Ethiopian tourism should represent over USD 300 million per year, very close to the USD 340-500 million of the Kenyan tourism industry that represents 13% of the country's GDP. Nevertheless the Ethiopian figure might be an overestimation and does not indicate the contribution of pastoralism to the national tourism industry, representing just the share of tourism benefits coming from areas where pastoralism is predominant.

In Mali, a more conservative study using official data, estimated the contribution of pastoralism to the national tourism at USD 5 million per year mostly based on the number of visitors to pastoralist related events and festivities. However the analysis did not estimate the share of the tourism revenues that returns to pastoralist themselves. The participation of pastoralists in tourism related activities has been suggested as an income diversification strategy that could significantly contribute to their livelihood.

Evidence from diverse countries suggests that the revenues from tourism are usually small. In addition, the distribution of payments is usually implemented based on the area of land owned or managed by each pastoralist households. As a result, payments usually reinforce the position of local elite groups maintaining or increasing inequity within pastoralist communities (see Lamprey and Reid 2004). In other regions where pastoralists are recognized users but not owners of the land, tourism as an income diversification strategy is constrained severely and special permits must be purchased to allow pastoralists to be involved in tourism related activities (Box 6).

Box 6: Diversification permits in pastoral land

In Australia, land under a pastoral lease may only be used for pastoral purposes. If a leaseholder wishes to use the land for another purpose, a permit is required from the government. It is an offence to use the land for another purpose or sell any product of a non-pastoral use of the land without a permit.

Diversification permits allow pastoralists to enter into activities to assist in providing economic support through difficult periods, such as drought or low commodity prices, thus maintaining the long-term viability of the pastoral industry.

Many pastoralists already conduct diversification activities, including station stay tourism, horticulture, aquaculture and growing fodder for feeding in stockyards.

Diversification permits for pastoral-based tourism

Under the current legislation, activities for proposals for tourism permits in pastoral lands must be pastoral-based. The leaseholder must describe how the tourism activities are linked with or include some aspect of the pastoral activity undertaken on the pastoral land and define a number of visitors for the property.

Permits cannot be granted for tourism activities which have no such connection and all pastoral-based tourism permits have a standard condition stating that the permit does not authorise or permit any tourism activities that involve observing activities or cultural works of Aboriginal peoples, as such actions are not permitted under the Native Title Act 1993

Pastoralism and environmental services

The predominant discourse on pastoralism and the environment concerns the degradation caused by pastoralists rather than the services provided by pastoralism, which usually go un-valued. However, there are many environmental services that are provided by pastoralists and pastoralism that are poorly understood and that national accounts do not capture, and most country partners in this study did not have the expertise to assess their values in quantitative terms. The most serious

challenge for the valuation of environmental services provided by pastoralism is their joint provision, as in the case of grasslands, where livestock grazing can contribute to maintaining healthy vegetation, which captures carbon, reduces erosion, maintains soils and facilitates water holding capacity. Biophysical studies are required in order to estimate the joint production of these services to avoid double counting and then to assess their relative value in terms of contribution to human wellbeing. In spite of the difficulty, some attempts to estimate individual environmental values in grasslands have been made, providing an idea of the order of magnitude of the value of these services and thus offering a starting point for further studies and policy development, as discussed below.

Carbon sequestration: Grasslands store approximately 34% of the global stock of CO₂ yet a global valuation study assigns just USD 7 per hectare for the gas regulation function of this biome (Costanza et al. 1997). Nevertheless available literature indicates that the value of carbon sequestration show some expected variation between regions and type of species in the grasslands. For example a Scottish study estimated the value at about USD20 per hectare (Williams et al. 2003) while studies in the grasslands of China estimated the value of Carbon sequestration in about USD 15.6 per hectare, with grassland species from alpine desert ranges exhibiting the highest capacity for carbon sequestration.

There were no quantitative estimates of the value of carbon sequestration in grasslands from the country studies and specific studies should be implemented to investigate the role of grasslands as carbon sinks. Additional research is also needed in order to understand the tradeoffs between carbon sequestration in the grasslands and the flow of greenhouse gases generated by animal production of ruminants. For example, the Spanish WISP study estimated that the impact of greenhouse gases generated by livestock could be higher than their contribution to the country GDP.

Large pastoralist areas like tropical savannas and rangelands represent a great (actual and potential) carbon store and pastoralism can be used effectively to promote that potential. There is plenty of evidence that effective animal grazing generates biodiversity and promotes biomass production in the rangelands (e.g. Voisin, 1959; Savory, 1999; Frank and McNaughton, 1993) and therefore a very important knowledge gap remains between understanding the value of rangelands as carbon sinks, and understanding how pastoralists can increase soil carbon load through their livestock management practices. Additional research is needed to understand how to manage grasslands to promote carbon capture and which mechanisms can be used to encourage such management practices.

Maintenance of Biodiversity: Effective grazing management has been shown to improve biodiversity and can be a tool to prevent land degradation and desertification. Grazing and animal impact can stimulate pasture growth, reduce invasive weeds and may improve mulching and mineral and water cycling, although knowledge on the true assessment of these impacts remains contested (e.g. Sanderson et al. 2004). The country studies did not provide information about the value of biological diversity in their systems. However, it is clear that rangelands ecosystem health and integrity are much greater where mobile livestock keeping continues to be effectively practiced (Niamir Fuller, 1999). In quantitative terms, Yu et al. (2005) estimated the value of maintenance of biodiversity in grasslands in about USD 7.5 per hectare per year. However, this figure might show variation between sites, considering the inclusion of animal species living in the grassland and the willingness to pay of people living outside pastoral areas to conserve biodiversity as an option value.

Water holding: Water holding capacity has an important role in several grassland ecosystems. Water availability and distribution are essential for pastoralists. Worldwide there are rules and institutional arrangements regulating the use and access to water resources in pastoralist areas. In several developed countries there are well defined markets for water with allocations for trade among the different users including farmers and pastoralists, and where the water price follows the rule of supply and demand. However, that situation is not found in most pastoralist areas of the world.

The country studies recognized the importance of water resources as a driver for transhumance in the drylands of Mali and other African countries, as well as the impact of mineral exploitation on the water quality in pastoral areas of the Peruvian Andes, yet there was little discussion of the value of pastoralism in improving water cycling. Nevertheless, there are a number of claims that effective pasture management can improve infiltration of water, reduce run off, and thereby raise water tables. Considering that each millimetre of additional rainfall captured represents 1 litre more usable water per square meter, or 1,000,000 litres more water per square kilometre, it is worth investigating the role of livestock in water capture and the value of that to both pastoralists and to downstream users.

In quantitative terms, an analysis in China (Yu et al. 2005) could provide an idea of the order of magnitude of the value of the water holding service. The study estimated the quantity of water held by different grassland types using soil moisture data, thermal inertia information, and thickness of the surface layer. Applying shadow prices for water, the research estimates the value of water holding of the grasslands in the Qinghai-Tibetan Plateau at USD 1524 Ha per year. Although this figure appears surprisingly high, due to possible overestimation by a valuation approach that just considers the flow multiplied by the unit price of water, the magnitude of the figure suggests that the role of pastoralism in maintaining water cycling in healthy rangelands warrants significant attention in future, particularly given the international significance of many drylands watersheds. In many developing countries there is not enough quantitative information to assess the water holding capacity of pastoral system and the value of the service, so decision making is usually done with a high level of uncertainty.

Maintaining soil: Vegetation cover reduces soil loss and it is one of the most important environmental services in pastoral areas. The country studies did not assess the value of this service although they recognize the importance of vegetation cover. Moreover, different studies have accumulated evidence that pastoralism does not necessarily generate overgrazing

and land degradation because of the specific dynamics of the dryland systems and the existence of collective action institutions regulating the access to the resources (see Mearns 1996). On the contrary, numerous studies show that pastoralism plays an important role in many rangeland ecosystems, maintaining ecosystem health and resilience, promoting water and mineral cycling, and protecting biodiversity, and as a result pastoralism can protect against soil erosion. Under-grazing can lead to encroachment of trees and shrubs into grasslands and can actually lead to greater risk for the soils (see Huss 1996). In monetary terms, utilising GIS data for vegetation cover, soil loss models and assuming the net income of stock raising is equivalent to the value of the soil loss after consuming the vegetation, a regional study in the grasslands of China estimated that the value of soil maintenance in USD 3 per hectare per year (Yu et al. 2005).

Value of pastures: Food provision is an important service provided by pastoralist areas. The Kyrgyz study using market prices of substitute forage estimated that the annual value of the service of pasture provision by natural systems is equal to USD 499 million. A similar study in Mali estimated the value of the service at USD 1400 million. These studies indicate the enormous importance of natural grassland for the livestock sector as inputs for animal production. Nevertheless recent studies aimed at estimating the value of grasslands indicate that their market value is usually higher than just the value of livestock production and non livestock factors such as scenic beauty, recreation and biodiversity explain most of the land value (Box 7).

Box 7: The value of grazing permits

During the 1960's capitalized market income explained the value of grazing permits in North American lands. However, more recent studies suggest that the market value of the permits is inflated above that justified solely from livestock production.

Extensive cost-of-grazing studies by different researchers have shown that ranchers, on average, are currently spending as much per unit of forage on public lands (current fees plus costs of use – travel, herding, salting, and so on) as is paid for forage on private lands. Economic theory suggests, therefore, that the value of permits for grazing public lands should be zero, but that is not the case. This suggests that ranchers benefit from more than forage through the use of the grazing permit.

Torell et al. 2007 using hedonic models estimated that livestock income accounted for less than 16% of marginal values of grazing permits in New Mexico, and non-livestock factors explained the majority of land value for all types of ranches studied, including those ranches dominated by public lands. Researchers have noted that many ranches are purchased for recreation use and that income from livestock explained very little of ranchland value since public lands are desired for recreation activities such as fishing, hunting, and observing the flora and fauna of the timber and range country. Prices escalate as the perceived quality of the surroundings increases and public lands can effectively create a semiprivate use area.

Collection of goods: Pastoralist systems provide humans with a broad set of environmental goods such as firewood, gum, incense, and wild fruits. In spite of their importance to the wellbeing of pastoralists, most of these products are undervalued and not considered in economic analysis of pastoralism. The quantification of these goods is hard because of the seasonal availability of some products and because the use of market values for the products or their closest substitute could overestimate the value if the demand size is unknown. Recent studies indicate that goods collected from pastoralists could significantly contribute to the country economy. For example the study in Ethiopia estimated the value of the goods collected from pastoralist areas in over USD 390,000 per year. Nevertheless, evidence suggests that among pastoralist households there are big distributive differences in terms of the collection of wild fruits, collection of firewood, construction material and the use of fodder resources. For example, a study in Botswana (Kerapeltswé and Lovett 2001) found big inequities between the poorest 20% and richest 20% of the sample. Findings suggest that the largest share of the income of the poor is largely derived from the collection of wild fruits, vegetables and firewood, while the richest appropriate more of the grasslands resources because of the higher return of livestock in comparison with the other alternatives. Inequity in the livestock ownership explain the different patterns of environmental income, the use of natural resources in pastoralist areas and the pathways in the accumulation of wealth (see Ellis 2000). Considering the heterogeneity of pastoral households additional distributive studies are needed in order to target better policy interventions in pastoralist areas.

Observations and recommendations

Quantification of key direct and indirect values provided by pastoralism or pastoral areas is important to understand the real importance of the activity and its contribution to the country economies. Without recognising the associated values of pastoralism it is difficult to design and implement cost-effective interventions in pastoralist areas. Despite the widespread opinion that pastoralism is not an economically viable or rational livelihood activity, it contributes significantly to the GDP of many developing country economies: for example, approximately 8.5% in Uganda, 9% in Ethiopia and 10% in Mali. These proportions are lower than the estimated contribution of pastoralism to the economy of Central Asian countries like Kyrgyzstan where pastoralism represents about 20% of GDP. Yet this study indicates that even these figures may be significantly underestimated and if the different flows of goods and services from pastoralism are considered into the

national accounts, the contribution of pastoralism to the agricultural GDP and country GDP will be higher. If these values are given appropriate recognition they will help to generate better informed decisions and influence sectoral policies.

The contribution of pastoralism to the country economy will depend on the relative importance of livestock and agricultural sector. For example, in a mineral export country like Peru, Alpaca pastoralism contributes only 1.5 % of the country's agricultural GDP. However policy makers should recognize that the largest share of the USD 76 million generated by Alpaca pastoralism is obtained from marginal lands where other economic activities will provide lower returns.

In developed countries, where industrial production and services are the most important and dynamic economic sectors, contribution of pastoralism to national economies seems to be low. For example, the Spanish study indicates that pastoralism represents only 0.19% of the National GDP. That percentage is comparable to the figures obtained from other developed countries like Australia where pastoralism is important in terms of land use but generates only 0.2% of the Australian GDP (NLWRA 2001). As in Peru, in these developed countries the analysis of pastoralist policies should be based on the expected returns of the alternative uses of the land rather than in terms of the contribution of pastoralism to the country economy. The results of the economic valuation of pastoralism provide a good starting point to influence policy makers to consider pastoralism as an economic and environmentally feasible production system.

Demonstrating the flow of benefits from pastoralism is only one step in enabling pastoralists to strengthen their livelihood base and more effort is needed to increase their capture of those benefits. This could be through improving marketing channels, enabling pastoralists to use those channels effectively, increasing investment in processing of pastoral products, creating payments for the environmental services provided by pastoral lands, through market-based initiatives, such as carbon trading, and through encouraging private entrepreneurship, such as enabling pastoralists to engage in tourism operations. Policy support and appropriate incentives may be required in all these areas and much more work is needed to improve pastoralist livelihoods through i) valuation of the environmental services in order to estimate adequate payments and appropriate transfer mechanisms for beneficiaries, ii) enhance the production and processing of pastoral goods and improving their access to markets and commercial channels.

Knowledge Management and TEV approach

The WISP country studies followed a knowledge management approach in order to collect, analyse and present information about the direct and indirect values of pastoralism using the framework developed by Hesse and McGregor (2006). This framework although operative lacks the capability to include option and existence values in spite of their potential importance for both pastoralists and non pastoralist groups.

Data availability and limited analytical capacity of the country partners represent a challenge for the implementation of the knowledge management approach, especially in those issues related to indirect values of pastoralism. In formal economic terms, the methodology is weak because of the aggregation and extrapolation of available figures, however further research needs were identified and some key findings from the different studies seem to be useful for policy recommendations.

Research gaps

The different country studies suggest that there are urgent research gaps in our understanding of the behaviour of pastoral systems. Filling these gaps will enhance the capacity of decision makers to formulate innovative policies for the sustainable use of the pastoral areas and improve the livelihood of pastoralists. Some identified areas for further research or urgent action are presented below:

- # Critical assessment is needed of the way data on pastoralism is currently generated, the data that is used, and how it compares between countries. Researchers should identify minimum cost-effective indicators that could be of use to government to improve analysis of pastoralist economies, and input is needed to raise the capacity of different agencies to generate primary data about both direct and indirect values of pastoralism.
- # Research should incorporate a more comprehensive flow of costs and benefits from pastoralism into the national accounts. This should include opportunity cost analyses of pastoralism versus other forms of land use in pastoral areas, but taking a systems approach to the drylands as opposed to a hectare to hectare comparison: what is the overall opportunity cost to the pastoral system of changing land use on key resource pockets? This research should take into consideration the local environmental changes that are likely as a result of climate change.
- # Deep biophysical studies are required in order to estimate the joint production of environmental services in the grasslands in order to avoid double counting and then assess their relative value in terms of contribution to human wellbeing.
- # Additional research is needed to understand how pastoralists manage grasslands in a way that promotes biodiversity and promotes carbon capture and what mechanisms can be used to encourage such management practices.
- # Considering the circumstances of many pastoral areas, participatory valuation approaches provide a broader base for decision making and may be an alternative for further valuation studies and promoting public participation in decision making.

Policy recommendations

Considering the limitations and assumptions used in the different country studies, and the weakness of the knowledge management approach for the aggregation and extrapolation of values, the estimated trends and figures although rough and imprecise represent a starting point for policy dialogue and the recognition that pastoralism is a dynamic production system able to adapt to a broad range of disturbance in the environmental and socio-economic systems where the activity is embedded. Some key findings from the WISP country studies are presented below together with some policy implications:

- # The different studies indicate that official statistics do not capture all the economic values associated with pastoralism. Even direct values captured by markets like animal and milks sales and hides production are not well recorded in many countries like Ethiopia, Mali and Iran. National Statistic Bureaus in the different countries should reform the frequency and content of data acquired from Agriculture and Livestock sectors to include the diverse direct values of livestock disaggregated by production systems, thus allowing decision makers to compare between pastoralism and other more intensive uses of the land.
- # Evidence from diverse pastoral sites suggests that a large share of market transactions is not recorded and the contribution of pastoralism to informal economy is enormous in terms of exports of live animals. Governments need to recognize cross border livestock trade, and the benefits it has for their economy if formalized. Measures towards sanitary certification, promotion of investment, and review of existing taxation barriers should be designed and implemented in pastoralist areas.
- # Many pastoralists have gained access to domestic and international markets, for live animals, milk, wool and hides. Nevertheless, the market chain analysis suggests that pastoralists still receive a small share of the total market value of the products. A deeper analysis is needed of the value chain to understand the roles of different brokers, agents and processors, before meaningful conclusions can be drawn over whether what change is desirable. Nevertheless, Livestock and Agriculture departments of the different countries need to increase access of pastoralist products to markets and reduce market distortions.
- # The use of animal power for agriculture is still a common practice in all the extensive production systems in developing countries, increasing crop yields and farmer's income. Livestock and Agriculture departments should evaluate the cost-benefit of investments in animal traction equipment by agro-pastoralists operating under different production systems and property sizes. If adequate, i) the use of animal traction should be promoted emphasizing the multiple uses of livestock and facilitating the access of agro-pastoralists to credit for purchasing ploughing equipment; and ii) existing incentives supporting the acquisition of mechanical devices might be revised
- # Livestock manure plays a crucial role maintaining soil fertility in agropastoral systems. Considering that the greater the nutrients loss the lower agricultural value of the manure, Livestock and Agriculture Departments should complement the already active role of manure traders and the social institutions regulating the non-market based access and distribution of manure in pastoralist areas by implementing capacity building activities focused on management of manure to reduce the loss of nutrients through leaching, diminish the emission of gases and avoid pollution to water sources.
- # Tourism in pastoralist areas is important for the regional economies and contributes to the pastoralist households but middlemen and other stakeholders capture the lion's share of tourism benefits. Tourism authorities should examine the demand for rural tourism in pastoralist areas where tourism is dependent on inputs from pastoral systems, authorities should assist pastoralists to capture more of the benefits directly, through support for investment, creation of tourism associations, and training of local entrepreneurs. Increasing the level of organization of pastoralists might increase their bargaining power with major tourism operators and might define mechanisms for increasing equity in the distribution of tourism revenues.
- # There are many environmental services that are provided by pastoralists and pastoralism that are poorly understood, the national accounts did not capture them and most country partners in this study did not have the expertise to assess their values in quantitative terms. Livestock and Agriculture Departments should develop biophysical studies in pastoralist areas to estimate the joint production of environmental services in grasslands. Later, strategic alliances between field practitioners and researchers are needed for the valuation of these environmental services in order to estimate the adequate payment amounts for pastoralists and design appropriate transfer mechanisms for beneficiaries. National Statistics Bureaus should reform the content of data acquired from Agriculture and Livestock sectors to include information about the value of the environmental services provided by pastoral areas and synthesize the information in GIS layers complemented with information of interest for policy and decision makers like poverty status, vulnerability and risk.

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