IGAD Centre for Pastoral Areas and Livestock Development (ICPALD)

Total Economic Valuation of Pastoralism in Uganda

STUDY REPORT

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Disclaimer

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FOREWORD

Total Economic Valuation (TEV) is one of the most widely used and commonly accepted frameworks for assessing value of an ecosystem to provide evidences for decision making. As a land-based system, pastoralism remains invisible to market-based appraisals, yet it has multiple dimensions and benefits. Applying the total economic valuation framework can help us to show the economic logic of pastoralism to policy makers, development practitioners, planners, and investors or businesses. These are the people who often make decisions based on financial rationale.

In the Arid and Semi-Arid Lands (ASALs) of the IGAD region, pastoralism and agro-pastoralism represent the major livelihoods and production systems which employ the largest percentage of the population. In Uganda, both pastoralism and agro-pastoralism remain central to the provision of means of livelihoods in the cattle corridor rangelands, and contribute immensely to the local and national economies.

In recognition of the multiple functions and benefits of pastoralism in Uganda, and issues of its under-valuation due to lack of empirical evidence, the IGAD Centre for Pastoral Areas and Livestock Development (ICPALD) commissioned a study on total economic valuation of pastoralism. The study results were presented at a national workshop and further enriched with inputs from relevant stakeholders. It was planned that the evidence from this study would provide useful information for decision makers and various stakeholders concerned with pastoral development and advocacy.

More specifically, the economic valuation approach, data and information can be used in the design, formulation and implementation of policies, strategies and investment interventions at different levels.

Dr. S. J. Muchina Munyua
Director, ICPALD

ACRONYMS AND ABBREVIATIONS

NNP	Net National Product
GNP	Gross National Product
TLU	Tropical Livestock Units
WTP	Willingness to Pay
IUCN	International Union for Conservation of Nature
ILRI	International Livestock Research Institute
UNECA	United Nations Economic Commission for Africa
SEA	Small East African
NGO	Non-Governmental Organisation
IIED	International Institute for Environment and Development
ITC	International Trade Centre
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
UBO	Uganda Bureau of Statistics
ASAL	Arid and Semi-arid Land
AU	African Union
CELEP	European Lobbies on *Eastern African* Pastoralism
DIIS	Danish Institute for International Studies
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
ICPALD	IGAD Centre for Pastoral Areas and Livestock Development
IGAD	Intergovernmental Authority on Development
RPLRP	Regional Pastoral Livelihoods Resilience Project
TEV	Total Economic Valuation
WISP	World Initiative for Sustainable Pastoralism

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EXECUTIVE SUMMARY

Pastoralism remains key to sustainable development of the rangelands in Uganda. It contributes hugely to the use and non-use values. However, emphasis in Uganda is often given only to livestock and marketed use values. This has resulted in the underestimation of the values associated with subsistence and non-use values of rangeland products and services. Total Economic Valuation (TEV) has increasingly become an important tool for valuation of nature-based resources to support policy and advocacy for best practices. Despite the contribution the Ugandan (pastoral and ago-pastoral production) rangelands make to the national economy; not much tangible and sufficient evidence is available to inform budgetary allocation and development.

In most cases, assessment of the value of pastoralism is conducted through the national accounts process. This focuses on marketed products while paying no or limited attention to non-market products that contribute immensely to the national economy and the environment. With this background in mind, this study aims to use a landscape approach to shed light on the total economic value of pastoralism in Uganda. It will take into consideration the livestock and non-livestock related products and services so as to provide a knowledge base in support of the sustainable development of pastoral and agro-pastoral areas.

In additional to secondary data, this assessment involved collection and analysis of primary data from three different regions that comprise cattle corridors representing different types of rangelands. These were Mbarara District in the Western Region, Karamoja Region in northern Uganda and Nakasongola District in the Central Region. Secondary data was collected from the national bureau of statistics, statistical abstracts, national and district development plans and previous research studies covering a five-year period (2013 to 2017). Primary data was collected through administering questionnaire surveys and expert consultations. A total of 419 households were interviewed. Among these, 208 were from Karamoja Region, 85 from Mbarara District and 126 from Nakasongola District.

The study results show that the TEV of pastoralism in Uganda is about UGX 20.4 Trillion (US$ 5.4 Billion). The livestock asset as a capital resource for pastoral

production and a key component of the pastoral system was valued at UGX 9.577 Trillion (US$ 2.573 Billion). Additionally, the annual value addition through livestock products (meat, milk and manure) is estimated at UGX 3.04 Trillion (US$ 0.822 Billion). Thus, the livestock products and services combined together was estimated at UGX 12.48 Trillion (US$ 3.34 Billion), constituting 61 per cent of the pastoral economic worth.

The value of non-livestock products and services from the rangelands were estimated at UGX 8.05 Trillion (US$ 1.08 Billion) constituting 39 per cent. These products and services include fish, honey and wax, crop, fire wood, medicinal plant, tourism and minerals from the rangeland. Annual live animal offtake and milk offtakes constitute about 48 and 50 per cent of the total value addition by pastoral and agro-pastoral livestock respectively. Tourism was the greatest contributor (88 per cent) to the non-livestock pastoral annual value addition followed by crops (6.5 per cent).

Therefore, the inclusion of non-livestock products and services such as firewood, honey, medicinal plants and minerals to the national accounts system is essential in ensuring total valuation of pastoralism, and in recognising the potential opportunities for the extra values the pastoral landscape offers. This is only possible when there is availability of consistent and reliable data over time. Further, development efforts in pastoral areas need to strengthen livestock production and its value chain especially since livestock still remains the core livelihood in the rangelands. Additionally, it is necessary to put in place effective coordination and concerted efforts among actors and stakeholders, so as to understand the interconnectedness of pastoralism and its landscape, for the different national sectors.

The landscape approach to valuation of pastoralism sheds light on different sectors. They include agriculture, tourism, water and natural resources, and therefore this gives rise to the need for effective consultative platforms and dialogue. It is also important to encourage a shift from focusing on livestock and market values alone, to an integrated pastoral landscape approach where all benefits associated with the ecosystem are documented and evidence provided at the national and regional levels for experience sharing and learning. In addition, it is useful to integrate TEV as a planning tool in land use decisions for sustainable management.

1. INTRODUCTION

1.1 Pastoralism

Pastoralism is a central production system in the drylands of Africa. It contributes significantly to the Gross Domestic Product (GDP) of many developing economies. Pastoralism is a low-input system. It is extremely adaptable to particular environments. However, pastoralists are often marginalised. They lack proper political and institutional support (Amwata *et al.,* 2015a). Pastoralism contributes to the livelihoods of millions of people across dryland Africa, and is characterised by marked rainfall variability and associated spatial and temporal variability of water and rangelands feed for animals. It contributes between 10 and 44 per cent of the GDP of the African countries (IRIN, 2013; ICPALD, 2017). It is a critical source of economic activity in dryland areas, where other forms of agriculture are limited.

The contribution of pastoralism to GDP in the IGAD Member States cannot be gainsaid. For instance, pastoralism provides 90 per cent of the meat consumed in East Africa, and accounts for 19 per cent, 13 per cent and 8 per cent of GDP in Ethiopia, Kenya and Uganda, respectively (UNECA, 2016; Jenet *et al*, 2016; MacGregor and Hesse, 2013; Davies and Hatfield, 2007). These proportions are lower than the estimated contribution of pastoralism to the economy of Central Asian countries like Kyrgyzstan. Here, pastoralism represents about 20 per cent of GDP (IUCN, 2008). The contribution of pastoralism to a country's economy depends on the relative importance of the livestock and agricultural sector. For example, in a mineral export country like Peru, Alpaca pastoralism contributes only 1.5 per cent of the country's agricultural GDP. With this in mind, policymakers should recognise 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.

Uganda's total area is 241,550.7 Km^2 of which 197,065 Km^2 is landmass while water and swamps cover approximately 43,942 Km^2 (UBOS, 2017). Rangelands on the other hand cover about 42 per cent of Uganda in total area; it is commonly referred to as the *cattle corridor* (Byakagaba *et al*., 2018). The cattle corridor runs from the South to the Northeast direction i.e from the Rwanda border to the South Sudan and Kenya borders. The Uganda rangelands support about 90 per

cent of the national cattle population, mainly kept by pastoral and agro-pastoral communities. An earlier study found that about 85 per cent of the total marketed milk and beef in the country is produced from indigenous cattle which thrive on natural rangelands pasture (Kisamba-Mugerwa, 2001). Livestock contributes substantially to the 70 per cent employment generated by the agricultural sector (Republic of Uganda, 2010ab; ICPALD, 2013). Livestock constitutes a crucial part of Uganda's food production, accounting for roughly one third of the total value of agricultural output.

The pastoral and agro-pastoral rangelands of Uganda also provide multiple non-livestock products and services to pastoralist and national economy. In 2014, for example, four major national parks (Murchison Falls National Park, Queen Elizabeth National Park, Bwindi Impenetrable National Park and Kidepo Valley National Park) that are located in the rangelands accounted for 77 per cent (156,341 tourists) of the total visitors that the country registered (Beyeza-Mutambukah, 2016). Furthermore, rangelands provide economically important wild plants like *Aloe vera* and Shea butter tree. The *Karamoja* area in the Northeast already has operational exploitation of gold, marble and limestone (Republic of Uganda, 2009). This has made Uganda's rangelands to increasingly attract investors in the mining industry.

Despite all the great contributions of the pastoral and agro-pastoral rangelands to the national economy, quite often, these contributions have been understated or ignored due to factors such as inadequate or unreliable data. Globally, several declarations have been drafted to support the pastoralists' way of life and various initiatives established to strengthen the voice of pastoralists. For example, Pan-Africa Policy Framework for Pastoralism has been established to secure, protect and improve the lives, livelihoods and rights of African pastoralists through mobilizing and coordinating political commitment to pastoral development in Africa (African Union, 2010). Likewise, in the Horn of Africa, specialized institutions, such as the IGAD Centre for Pastoral Areas and Livestock Development (ICPALD) have been created to support pastoralism and its economy in the region. These declarations and institutions need to be pushed forward through international and national policy influencing agendas. In spite of all these efforts to promote pastoralism, there is a paucity of data on its total economic value.

Several studies have highlighted the contribution of pastoralism in different countries in Africa (Nyariki and Ngugi, 2002; Nyariki, 2004; Hesse and MacGregor, 2006; Mdoe and Mnenwa, 2007; Beyeza-Mutambukah, 2016; ICPALD, 2017). Take for instance in Kenya, ICPALD (2017) used the landscape approach and estimated the economic worth of pastoralism in that country at US$ 0.95 Billion. Livestock and related products accounting for 90.5 per cent (US$ 0.86 Billion) of the total value. However, the contribution of pastoralism to the national economy of Uganda has not been comprehensively documented. Studies emphasise livestock as the value linked to pastoralism. A few studies such as, Mdoe and Mnenwa (2007), King-Okumu *et al.* (2016) and ICPALD (2017) have adapted the landscape approach in estimating the economic worth of pastoralism.

The current study aims to shed light on the total economic value of pastoralism in Uganda. It will take into consideration both livestock and non-livestock products and services in order to provide a knowledge base in support of sustainable development in pastoral areas.

1.2 Study Objectives

To achieve the above objective, the specific objectives were to:

1. Depict a conceptual framework of analysis for TEV of pastoralism,
2. Collect primary and secondary data related to direct and indirect benefits of pastoralism including environmental values, and
3. Provide detailed insights about the total economic value of pastoralism in Uganda using some appropriate valuation methods.

The central assumption of the study is that limited information on the economic value of pastoral systems is responsible for the inadequate policy and institutional support for the systems. Lack of recognition of pastoralism as an important option in socio-economic development has led to the marginalization of the pastoralists, thereby deepening the severity of poverty in pastoral areas. Data and information is therefore critical to build evidence on the multiple benefits of pastoralism, taking into consideration direct and indirect market and non-market values. These scientific facts will help to deepen the understanding of the total economic value of pastoralism and advocate for policy and institutions to support the pastoral production system.

2. TOTAL ECONOMIC VALUATION OF PASTORALISM

2.1 Economic Valuation

The concept of Economic Valuation evolved from sustainability and capital theory concepts (Mdoe and Mnenwa, 2007) that have been used in economic valuing of natural resources, biodiversity and ecosystems. Most governments and development agencies have used conventional measures of national income such as Gross Domestic Product (GDP), Gross National Product (GNP) and Net National Product (NNP) in decision making and development planning. These measures were designed principally to monitor temporal changes in aggregate economic activities. They never intended to be measures of wealth and societal welfare, since they do not account for the value of natural resources and changes in the environment upon which production depends. For this reason, they may not be credible and are often misleading (Prato, 1998; Peskin, 1991; Hassan *et al.* 1998). Moreover, the conventional national accounts measures treat gradual wear of physical capital as depletion rather than income; hence respond poorly to depletion of natural resources (El Serafy, 1989). The main argument regarding natural resource accounting is to have proper measurement of values to guide consumption and investment in order to maintain a constant or increasing level of income (Santos and Zaratan, 1997).

This approach may not apply in the pastoral systems because the national income accounts neglect subsistence activities and focus on the production of market goods and services (Hassan *et al.,* 1998; Peskin, 1989), and thus miss the benefits derived from the use of tangible and intangible non-market goods and services. These benefits include the value of firewood collected directly by households, the carbon sink function of standing forests and watershed protection, and other services offered by various eco-systems (Hassan *et al.,* 1998).

Given the above shortcomings, the concept of total economic value (TEV) was born. It captures all the economic values for man-made capital assets and natural resources, while incorporating non-marketed goods and services such as values of eco-systems in economic analysis. The total economic value of an ecosystem consists of its use values and non-use values. The use of TEV enables a holistic assessment of all the critical values of eco-systems and is an important tool for generating information for policymakers and overall framework for decision-making and pro-pastoralist policy dialogue.

2.2 Total Economic Value (TEV) Approach

The concept of TEV underpins that pastoralism is a way of life. It adapts to marginal environments, characterised by climatic uncertainty and seasonal variability of water and feed resources. It has considerable economic value and latent potential in the drylands, and is central to the livelihoods and wellbeing of millions of people. However, the state of knowledge regarding this sector of the economy is weak. In addition to livestock, the rangeland provides a wide range of services and products that are nationally and globally valued, such as biodiversity, tourism and raw materials. Therefore, there are multiple and extensive set of values associated with pastoralism—some are tangible but many are not, some can be measured but many cannot, and those that can be measured are often underestimated.

Total economic valuation (TEV) is a tool, originally developed for cost-benefit analysis, to deal with the 'priceless' assets that would otherwise escape standard procedures of appraisal (Krätli and Swift, 2014). The concept is increasingly being used as a framework for valuing pastoralism (Barbier *et al.*, 1997; Nyariki, 2004; Davies and Hatfield, 2006; Davis, 2007; Krätli and Swift, 2014). Studies using the concept have demonstrated that the economic benefits associated with pastoralism, which extend beyond the direct use values to subsistence, non-market values, ecological functions and non-use benefits singly or in combination. This study adopts the TEV analysis by ICPALD (2017) and Nyariki and Amwata (2019) as its overall approach for data collection and analysis. Economic valuation seeks to attach a monetary amount to pastoralism and associated services. This can be done in two ways. (i) There are pricing approaches which make use of 'real world' market-derived data to establish this monetary value. This is relatively easy for goods and services that are traded in commercial markets. (ii)There is the TEV approach which uses a variety of techniques to assign a monetary value where one cannot easily be obtained from 'real world' markets. ICPALD (2018) has synthesised and summarised the evidence from several studies (e.g. Davis, 2006; MA, 2005; Nyariki, 2019) to develop a more comprehensive conceptual framework on the different methods and tools for valuing the use and non-use values of pastoralism.

In general, this TEV assessment focuses both on livestock related goods and services and other rangeland products and services. The values of livestock and

its products include meat, milk, hides, skins and blood. The non-livestock pastoral values refer to those provided by pastoral landscapes such as beekeeping, crop farming, tourism and fishing.

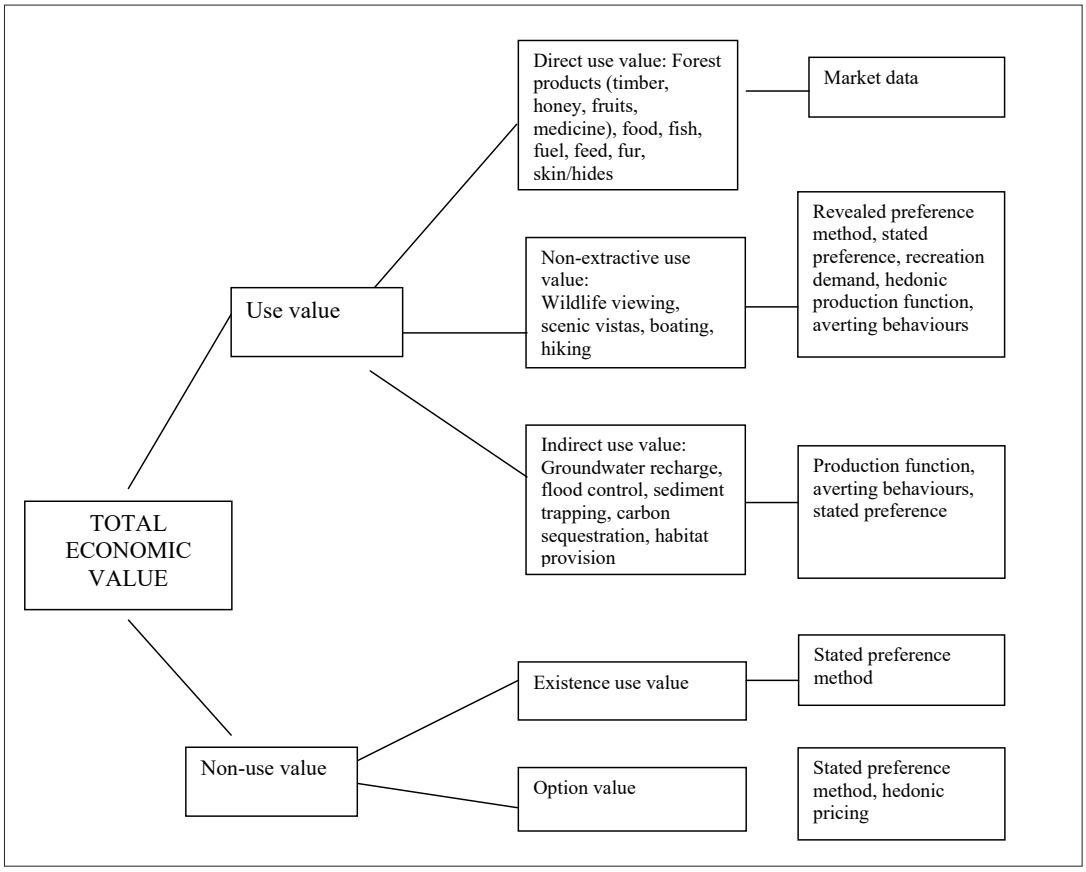

Figure 2.1: A Conceptual Framework and Approaches to Economic Valuation of Pastoralism

Source: ICPALD (2018)

The methods used in the economic valuation of natural resources, biodiversity and ecosystems revolve around sustainability and capital theory concepts (Mdoe and Mnenwa, 2007). The choice of the valuation method generally depends on the type of service, availability of resources, time and data for the study as well as its purposes. Some of the commonly used valuation methods to quantify or estimate the different value components of TEV are shown in Figure 2.1. Direct use values tend to be the easiest to account for. They are often part of formal markets. Non-use values are particularly challenging as they are the most difficult to quantitatively measure, and have the greatest uncertainty attached to them (Defra, 2007).

3. RESEARCH METHODOLOGY

This study used two different approaches to achieve the objectives, namely desk review and primary data collection using unstructured and structured interviews. The whole assessment was consultative with detailed discussions at the local, national and regional levels. Stakeholders were consulted on: a) the areas to be sampled for household surveys; and b) appropriateness of data collection tools for different stakeholders.

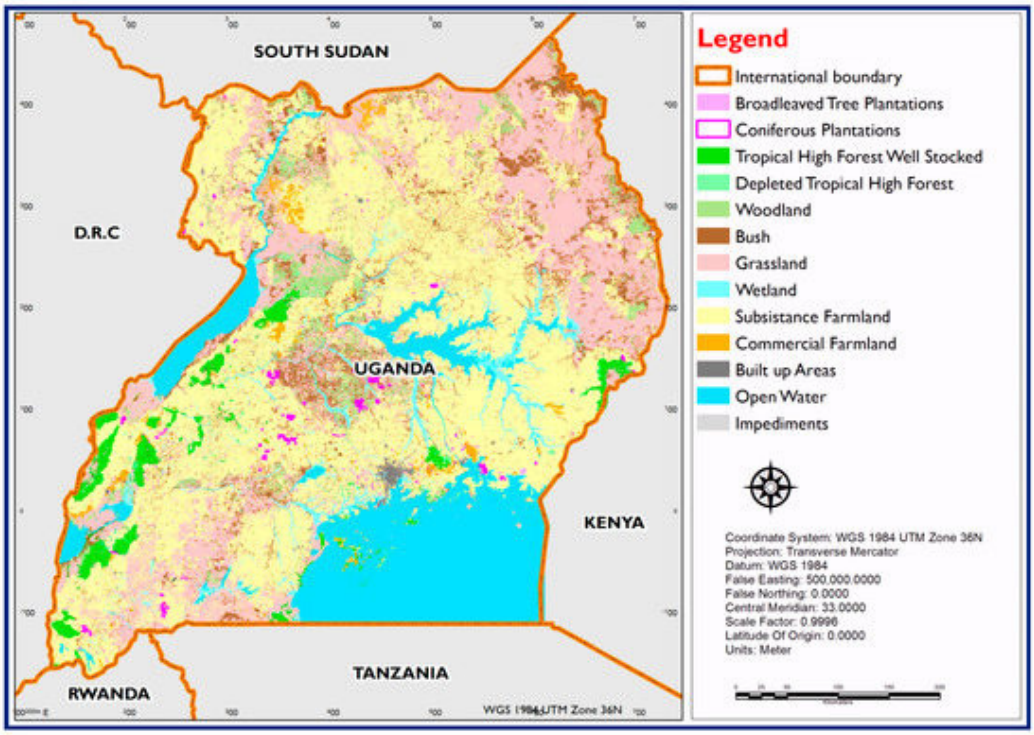

Figure 3.1: A Map of Uganda Land Cover

Source: Mwanjalolo et al. 2018

3.1 Desk Review and Stakeholder Consultation

This task involves a review of literature on methodological approaches for assessing and measuring economic values of various activities. The objective of this review was to establish the theoretical and methodological explanation of TEV pastoralism. For instance, a review of the theoretical background of economic valuation was important prior to delving into the subject matter, i.e. the valuation of pastoral goods and services. The review covers the economic

valuation concepts, methodologies for measuring economic valuation, the emergence of the TEV approach, and the application of the approach. This guided the development of a questionnaire, interviews and focus group discussions.

The stakeholders were identified after undertaking literature review to conduct key informant interviews. Stakeholders consulted included District Government Officials, District Agricultural Officers, Ministry of Agriculture, Animal Industry and Fisheries (MAAIF), non-governmental organisations like the Uganda Land Alliance and Action Aid-Uganda, and the local communities.

3.2 Data Collection and Analysis

Secondary data was collected at three levels-national, District and household levels. A wide range of the available secondary data was collected from relevant government and non-governmental entities at the national and district levels for the period 2013-2017. Within this period, there had been available and consistent data for the study areas. National level livestock statistics, agricultural census data, trade and export of live animals and livestock products were collected from the National Central Bureau of Statistics, Ministry of Agriculture, previous research reports, development project reports, and databases of the international and regional organisations such as FAO, IFPRI and World Bank. District level data on livestock statistics and livestock trade was collected from District reports obtained from the Departments of Agriculture, Livestock and Fisheries in Mbarara, Nakasongola and Karamoja during the field visits in August to October, 2019. In addition, data from the Uganda Central Bureau of Statistics was filtered to complement the secondary data from relevant ministries' reports. Data was also collected on revenue from tourism and sale of natural goods and services such as honey, wax and wildlife.

Primary data was gotten through field surveys and stakeholder consultation. Field surveys were conducted in selected three pastoral and agro-pastoral areas (cattle corridor) representing pastoralist system in Uganda. The field surveys entailed the following: a questionnaire developed and validated by relevant stakeholder; and expert consultations at various levels. The questionnaires were administered in Mbarara, Nakasongola and Karamoja pastoral areas. The total number of households interviewed was 419. Among these, 208 were from

Karamoja Region, 85 from Mbarara District and 126 from Nakasongola District. Three sites were sampled, namely Karamoja area to represent the Northern Region, Mbarara District to represent the Western Region and Nakasongola District to represent the Central Region.

3.3 Data Analysis

The analysis involved descriptive statistics and included information and data collected from field and secondary document review. Averages were used as a measure of central tendency to assess the national growth or decline of livestock and the associated pastoral products.

4. Total Economic Valuation of Pastoralism in Uganda

The economic worth of pastoralism in Uganda was estimated by categorising the pastoral values into two-livestock related value and non-livestock value (Nyariki and Amwata, 2019). The livestock related values include live animal and livestock products such as milk, meat and manure while non-livestock pastoral products include rangeland products and service such as honey, firewood, gum resin, tourism and fishing.

4.1 Livestock of Pastoral and Agro-pastoral in Uganda

Livestock plays an important role in the Ugandan economy. The official government statistic shows that pastoralism contributed 4.3 per cent to GDP in 2017/18 compared to 4.2 per cent in 2016/17 (UBOS, 2017). However, the accuracy of the estimation depends on accurate livestock numbers and what is accounted in the calculation. In this study, an average of a five-year period (2013 to 2017) livestock population was used to estimate the livestock population of 2019. The proportion of the pastoral herd as a percentage of the national population has been reported by UBOS (2009) as follows: cattle 93.6 per cent, sheep 99.2 per cent and goats 98.7 per cent. Table 4.1 below presents the summary.

Table 4.1: National Livestock Population in Relation to Pastoralist Herds, 2013-2017

Year	Cattle		Sheep		Goats		Camels	
	National (000)	Pastoralist (000)	National (000)	Pastoral (000)	National (000)	Pastoral (000)	National (000)	National (000)
2013	12,986	12,155	1,968	1,952	14,614	14,424		
2014	13,623	12,751	1,921	1,906	14,011	13,829		
2015	14,172	13,265	1,927	1,911	13,979	13,797		
2016	14,805	13,858	2,074	2,057	15,336	15,136		
2017	15,393	14,408	2,059	2,042	15,667	15,463	40	40
Average	**14,196**	**13,287**	**1,990**	**1,974**	**14,721**	**14,530**	**40**	**40**

Source: FAOSTAT (2013 to 2017); Uganda National Bureau of Statistics (2013-2017)

a) Pastoral Cattle Herd in Uganda

Cattle are the most important livestock sub-sector in Uganda. In 2019 the country's cattle population was estimated at 14.2 million. 13.3 million were located in pastoral and agro-pastoral rangelands. Cattle farming provides income, food, draft power, insurance and savings, social capital, and other goods and services to the population. Knowledge of herd structure is an important parameter in accounting for the economic value of livestock. In the 2013-2017 period, the livestock herd structure of cattle in Uganda constituted 27.9 percent bulls, 26.9 per cent adult females, 17.1 per cent heifers, 15.8 percent steers (young males), 6.9 percent male calves and 5.4 percent female calves as shown in Table 4.2.

Table 4.2 Cattle Herd Structure of Pastoral and Agro-pastoral in Uganda, 2019

Year	Number	Proportion	TLU
Cows	3,574,391.3	26.9	2,502,000
Bulls	3,707,073	27,9	3,707,159
Heifers	2,272,077	17.1	1,590,491
Steers	2,099,346	15.8	1,679,516
Male Calves	916,803	6.9	275,047
Female Calves	717,498	5.4	215,254
Total	**13,287,700**	**100%**	**9,969,467**

Note: TLU conversion used bull 1, steers 0.8, cows and heifers 0.7, calves 0.3

Source: Computed Using Data from UBOS (2013-2017) and FAOSTAT (2013-2017).

Using the livestock herd structure as presented in Table 4.2, the Uganda pastoral herd was converted into TLU to standardise the livestock species into a common unit. The conversion factors for tropical livestock units: a bull 1 TLU, cows and heifers 0.7, calves 0.3, sheep 0.1, goats 0.1, and steers 0.8 (Mbuza *et al* 2014; Peden *et al* 2002). The pastoral livestock average total cattle TLU in 2019 was estimated at 9,969,467 as shown in Table 4.2.

b) Pastoral Goats and Sheep in Uganda

The national sheep flock is predominantly indigenous. It comprise three main nondescript breed types;the Masai, the East African Black Head, and the East

African Long Tailed. Their respective flock compositions are 22% per cent, 50 per cent and 27 per cent respectively. Over 99 per cent of the goat population comprises the indigenous breeds. There are three main breed types with respect to goats: the small east African (SEA), Mubende goat and Kigezi goat. They comprise 53.2, 35.6 and 11.2 per cent of the total population respectively. Other goat strains include the Karamoja and Sebei, named according to the communities that keep them (MAAIF, 1999). Pastoral and agro-pastoral sheep and goats herd structure is presented in the Table 4.3 and Table 4.4.

Table 4.3: Pastoral and Agro-pastoral Sheep Herd Structure in Uganda, 2019

Year Group	Sheep number and proportion		
	Total Number	Male	Female
< 1 Year	732,231	307,892 (15.6)	424,339 (21.5)
1-2 Years	414,470	114,473 (5.8)	299,997 (15.2)
2-3 Years	371,049	80,920 (4.1)	290,129 (14.7)
>3 Years	455,918	55,263 (2.8)	400,655 (20.3)
Total	**1,973,668**	**558,548 (28.3)**	**1,415,120 (71.7)**

Source: FAOSTAT (2013-2017); UBOS (2013-2017); Modified from Otte and Chilonda (2002)

Table 4.4: Pastoral and Agro-pastoral Goats Herd Structure in Uganda, 2019

Year Group	Goats number and proportion		
	Total Number	Male	Female
< 1 Year	4,925,639	1,714,529 (11.8)	3,211,110 (22.1)
1-2 Years	2,949,572	958,974 (6.6)	1,990,598 (13.7)
2-3 Years	2,600,854	610,256 (4.2)	1,990,598 (13.7)
>3 Years	4,053,845	610,256 (4.2)	3,443,589 (23.7)
Total	**14,529,910**	**3,894,016 (26.8)**	**10,635,894 (73.2)**

Source: FAOSTAT (2013-2017); UBOS (2013-2017); Modified from Otte and Chilonda (2002)

Using values in Table 4.2, Table 4.3 and Table 4.4, the pastoral and agro-pastoral livestock population of Uganda is presented in Tables 4.5, in numbers and TLU.

Table 4.5: Livestock Population of Pastoral and agro-pastoral in Uganda, 2019

Livestock Species	Livestock Population of Pastoral & Agro-pastoral	
	Numbers	TLU
Cattle	13,287,700	9,969,467
Goat	14,529,910	1,452,991
Sheep	1,973,668	197,367
Camel	40,000	56,000
Total		**11,675,825**

Note: TLU equivalent sheep 0.1, goats 0.1

4.2 Economic Value of Pastoral and Agro-pastoral Livestock Assets

To estimate the value of pastoral and agro-pastoral live animals in Uganda, the total TLU of each animal species was multiplied by UGX 800,000 (US$ 215), the average price for a TLU (an animal weighing 250Kg) in the pastoral areas. The total economic value of pastoral and agro-pastoral livestock asset in Uganda is estimated at UGX 9.578 Trillion (US$ 2.573 Billion). This estimate is only for cattle, goats, sheep and camels. This is the capital stock of pastoralists and agro-pastoralists involved in livestock production in Ugandan. Cattle forms the greatest proportion (83.3 per cent) of livestock assets, followed by goats (12.5 per cent) and sheep (1.7 per cent).

Table 4.6: Economic Value of Pastoral and agro-pastoral Livestock Assets By Species in Uganda, 2019
Market Price

Livestock Species	TLU	Total Monetary Value		Per cent
		UGX 10^{12}	US $ 10^{9}	
Cattle	9,969,467	7.976	2.152	83.3
Sheep	197,367	0.158	0.043	1.7
Goats	1,452,991	1.162	0.314	12.5
Camels	56,000	0.045	0.012	0.5
Total	**11,675,825**	**9.341**	**2.521**	**100**

Note: Exchange rate of 1 US$ to UGX 3705, November 2019

4.3 Annual Value Addition by Pastoral and Agro-pastoral Livestock in Uganda

4.3.1 Annual Total Live Animal Offtake from Pastoral and Agro-pastoral

Live animal offtake refers to the percentage of the current year's herd that is removed through sales, deaths, gifts, home-slaughter or even theft (Nyariki and Amwata, 2019; King-Okumu, 2016). This kind of offtake is calculated from the total herd size kept within a year. Many offtake rates have been reported for Uganda. For example, in 2002, FAO estimated annual offtake rates for goats at 30.8 per cent and for sheep at 36.2 per cent. Uganda National Panel Survey (UNPS) 2015-2016 estimated offtake of 33 per cent for goats and 22 per cent for sheep. The International Trade Centre (ITC) estimated the offtake rates of the different species of livestock in Uganda in 2015 as: cattle 16.9 per cent, sheep 32 per cent and goats 35 per cent. Therefore, the current study adopted a combination of two rates by FAO and International Trade Centre.

The live animal offtake rates applied in the current study are as follows: cattle 16.9 per cent sheep 21.6 per cent and goats 21 per cent. These rates were found to be slightly higher compared to those for other countries such as Kenya, where the pastoral livestock offtake rates were reported as 12.5 per cent for cattle, 1.85 per cent for camels, 10.1 per cent for sheep and 10.4 per cent for goats (King-Okumu *et al.,* 2016; Nyariki and Amwata, 2019). The high offtake rate is also an indication of high death rate due to prevalence of animal disease in Uganda pastoral and agro-pastoral areas. The annual offtake for different livestock species is shown in Table 4.7. Since camel's offtake rates were unavailable for Uganda, offtake rates for Kenya were applied, i.e. 1.85 per cent per annum (King-Okumu *et al.* 2016; Nyariki, 2004; ICPALD, 2017).

Table 4.7: Total Annual Live Animal Offtake and its Value from Pastoral and agro-pastoral Uganda, 2019 Market Price

Livestock Species	Total Livestock Population, TLU	Annual Offtake, TLU	Value of Annual Total Offtake	
			UGX Billion	US$ Million
Cattle	9,969,467	1,684,840	1347.87	363.80
Sheep	197,367	42,631	34.10	9.20
Goats	1,452,999	305,128	244.10	65.88
Camels	56,000	1,036	0.83	0.224
Total	**11,675,825**	**2,033,630**	**1626.90**	**439.1**

Producer price of livestock per TLU = UGX800,000 and exchange rate is US$1 =UGX 3705

Source: Calculated from FAOSTAT (2013-2017); Statistical Abstract (2013-2017)

Taking a five-year (2013-2017) average for cattle, goats and sheep, and two-year (2016–2017) average for camels, the offtake rates translate into 2,033,630 TLU, which are removed from pastoral herds annually. This offtake includes loss as a result of death, not exactly transpired into income. The contribution by species is 1,684,840 TLU for cattle (82.8 per cent), 305,128 TLU (15 percent) for goats, 42,631 TLU (2.1 per cent) for sheep, and 1,036 TLU for camels (0.05 per cent). The total annual offtake includes animal death due to different reasons. The value of total annual offtake, applying market price of UGX 800,000/TLU, is UGX 1.63 Trillion or US$ 439 Million (Table 4.7).

4.3.1.1 Volume and Value of Offtake for Subsistence and Market from Pastoral and agro-pastoral Uganda, 2019 Market Price

The number and value of live animal offtake for market and domestic from pastoral and agro-pastoral areas is presented in Table 4.8. To convert live animal into meat equivalent, the carcass weight at slaughter by species were applied. In the pastoral systems, the carcass weight (bone-in) for the adult cattle is about 115Kg, sheep 14Kg and goat 12Kg. Each kilogram is then valued at UGX 7,000 (approx. US$ 2.6) for cattle, goats and sheep (Asizua *et al*., 2009; USAID, 2017). The carcass dressing weight is between 52 and 77 per cent for camel (Kutznekov, *et al*. 1972) and therefore, an average of 64.5 per cent was applied. Thus, the carcase weight for camel is 216Kg with a kilogram of camel meat valued at a price of UGX 17,000.

Table 4.8: Average Value of Annual Offtake for Market and Domestic Use from Pastoral Herds in Uganda, Market Price 2019

Species	Average Weight		Average Annual Offtake		Annual Value	
	Live (kg)	Carcass (kg)	Live Animal (Numbers)	Meat equiv. (Tonnes)	UGX (Billion)	US$ (Million)
Cattle	250	115	1,505,390	173,120	1211.8	327.08
Sheep	25	14	228,944	3,205	22.43	6.055
Goats	20	12	2,629,913	31,559	220.91	59.62
Camels	350	226	740	167	2.843	0.81
Total			**4,364,987**	**208,050**	**1466**	**395.65**

Exchange rate was US$1 =UGX3,705 in November 2019

Source: Nyariki and Amwata (2019); USAID (2017); FAO (2005);

The pastoral and agro-pastoral of Uganda annual live animal supply for market and domestic use are estimated to 1.5 million cattle, 2.6 million goats and 228,944 sheep for domestic slaughter and market. It is equivalent to 208,050 tonnes of meat from the various livestock species with annual value of UGX 1.46 Trillion (US $ 395.6 Million). The figure is about 34.3 per cent more than the 154,968 tonnes estimates for Kenya by Nyariki and Amwata (2019). The total annual value of camel meat is UGX 3 Billion or US$ 0.81 Million.

The Ugandan population was estimated at 41,166,588 people in 2017 (UBOS, 2017). The per capita consumption of meat in Uganda is currently 6Kg/person/year. Therefore, the amount of meat consumed annually in Uganda is about 246,999 tonnes. To this, the pastoral areas contribute about 208,050 tonnes or 84.2 per cent of the total national consumption. In another study, Kisamba-Mugerwa (2001) had estimated the population of pastoralists at 20 per cent of the national population. Using the 2017 human population estimate of 41.5 million people by the UBOS (2017) and the same percentage to estimate the current population of pastoralists, we obtain about 8.3 million people that would consume 49,800 tonnes of meat. This means that out of the total meat offtake from pastoral herds, about 25 per cent is consumed locally. The rest is a surplus which goes to support the rest of the country's population. Consequently, 75 per cent of live offtake accrues as direct monetary income that goes to meet pastoral household requirements-clothing, shelter, health, fees and miscellaneous.

4.3.2 Pastoral Milk Production in Uganda

Milk is mainly produced from cattle, goats and camels in pastoral and agro-pastoral areas of Uganda. To calculate the volume of milk production, we used the following rates (following Nyariki 2004; McPeak and Doss, 2004; Behnke and Muthami, 2011; and King-Okumu et al. 2016): cattle—59 litres per lactating cow per year. For camels 186 litres per lactating animal per year, estimated 34 per cent of the total herd lactating (Musinga *et al.,* 2008) and for goats, 51.2 litres per lactating head per year, assuming 40 per cent of the flock are does or adult females, each producing 0.351 litres per day (Field, 2005).

The average annual national pastoral and agro-pastoral milk production in 2019 was estimated at 1,287,430 tonnes. That is about 72.5 per cent of the national

milk (1,774,880 tonnes). Cattle contributed 93.7 per cent of the total pastoral milk. Annual pastoral goat milk is estimated at 62,828 tonnes. It constitutes about 3.54 per cent of the national milk. Also, camel milk in pastoral areas is estimated at 17,748 tonnes (Table 4.9).

Table 4.9: Annual Milk Production by Pastoral and Agro-pastoral in Tonnes and its Value in 2019 Market Price

Livestock Species	Total Livestock	Number of Lactating Animal	Annual Milk Production (Tonnes)	Value of Milk	
				UGX, Billion	US$, Million
Cattle	13,287,000	3,875,758	1,206,864	1,448.20	390.887
Goats	14,530,000	5,812,000	62,828	62.83	16.958
Camel	40,000	13,600	17,748	17.74	4.790
Total			**1,287,430**	**1,528.77**	**412.635**

Note: November 2019 exchange rate of 1 US$ to 3705 UGX is used

The quantity of milk produced was valued in monetary terms. The farm gate price for a litre of cattle milk was UGX 1,200 (UBOS, 2017). This gave an estimate of UGX 1.4482 Trillion (US$ 390.887 Million); goat milk value was estimated at 62,828 tonnes*1000/litre = UGX 0.0628 Trillion (US$ 16.958 Million); and camel milk valued at UGX 0.0177 Trillion (US$ 4.78 Million). This summed the total national value of UGX 1.5287 Trillion (US$ 412.635 Million). Therefore, in terms of monetary value, cattle milk constitutes 94.5 per cent of pastoral milk, while goat milk and camel milk constitute 4.1 per cent and 1.4 per cent respectively. The total value of pastoral milk in Uganda of US$ 412.6 Million is one and a half times higher than the value of Kenya's pastoral milk, which is estimated at US$ 283 Million (Nyariki and Amwata, 2019).

It is reported that Uganda's annual average milk consumption per capita is 58 litres (Mbowa *et al*., 2012) which is far below the 200 litres consumption per capita recommended by the World Health Organization. However, overall milk consumption is growing at an average rate of 8 per cent per annum (DDA, 2008). According to Agriterra (2012), since 2001, milk consumption in Uganda increased steadily to more than double by 2011. To estimate the amount of pastoral milk consumed and sold, the per capita milk consumption was calculated. Using the per capita milk consumption of 58 to 65 litres/per year (Mbowa *et al*., 2012) and

a population of the pastoral community of 8.3 million gives a total per capita milk consumption of 481,400.4 tonnes/year of the average annual pastoral milk production of 1,287,440 tonnes. Thus, 37.4 per cent of pastoral milk produced is consumed while the remaining 62.6 per cent is offered for sale to meet other household needs and wants. This shows increase from previous studies that reported 80 per cent of the milk produced in Uganda as having been marketed while 20 per cent consumed by the households (UBOS, 2017; FAO, 2005; Kisamba-Mugerwa, 2001).

4.3.4 Volume and Value of Manure from Pastoral and Agro-pastoral Livestock in Uganda

Manure for fertilizer is not consistently used by pastoralist and agro-pastoralist in Uganda. It is therefore not sold in most communities and does not have an established monetary value. Even though manure is rarely used or sold in the pastoral areas of Uganda, it was important to estimate its value. This is because it is one of the pastoral resources that remain to be exploited. Based on the previous report by ICPALD (2015) and Owusu and Banadda (2017), we estimated the daily manure production by animal species as follows: cattle - 2.27Kg/head/day, goats 0.33 Kg/day/head and sheep 0.3Kg/head/year. We used 3Kg/head/day for camels. Using this daily estimate, we estimated the total annual livestock manure produced in pastoral and agro-pastoral areas of Uganda as 13.02 million tonnes.

Table 4.10: Annual Livestock Manure Production and Estimated Value for Pastoral and Agro-pastoral of Uganda, 2019

Livestock Species	Total Livestock	Manure Kg/ head/day	Annual Manure Production (Million Tonnes)	Value of Manure	
				UGX, Billion	US$, Million
Cattle	13,287,000	2.27	11.008	289.90	78.245
Goats	14,530,000	0.33	1.750	46.09	12.44
Sheep	1,974,000	0.30	0.216	5.69	1.536
Camels	40,000	3.00	0.044	1.15	0.310
Total			**13.018**	**342.83**	**92.531**

Based on primary data collected from the Karamoja, Nakasongola and Mbarara Sites, the average value of manure per tonne is estimated at UGX 26,336. Therefore, the total tonnes of manure (from cattle, sheep, goats and camels) produced in pastoral areas of Uganda is 13.02 tonnes/year with estimated potential economic value of UGX 342.83 Billion (US$ 92.5 Million). In Uganda Nanyeenya et al. (2008) estimated that, at best, farmers used only 15 per cent of the manure their herds produced. Thus, actual manure used by agro-pastoralist is 1.95 tonnes and its economic value is UGX 51.4 Billion (US$ 13.89 Million)

4.4 Pastoral and Agro-pastoral Rangeland Products and Services in Uganda

4.4.1 Fish Production in Uganda

Fish is one of the high value commodities in Uganda. It contributes a great deal to economic growth of the country. Fish is Uganda's second major non-agricultural foreign exchange earner and benefits the livelihoods of close to 1.5 million people, or about 4 per cent of the population (Fish Site, 2009). Total fish production in 2014 stood at 562,000,000 tonnes. 18,077,000 tonnes of which were exported. The fish sector targets to increase annual production to 674,028,000 tonnes by the end of 2020 which translates to a value approximated at US$ 6.4 Billion. Annual exports are projected to increase to US$ 200 Million (MAAIF 2017). More than 80 per cent of Uganda's exported fish comes from Lakes Victoria, Kyoga, Albert, and Edward.

The bulk of the River Nile basin in Uganda falls within the rangelands. The river is a big source of fish with a catch of 5,390,000 tonnes from the Albert Nile alone comprising 1.167 per cent of the national catch in 2014 (Beyeza-Mutambukah, 2016). The amount of fish and fish products in Uganda was 396,200,000 tonnes in 2015, valued at US$ 1.62 Billion (at a price of US$ 2.17/kg) (MAAIF, 2017). This means that the rangelands contributed an average of UGX 82 Billion (US$ 22 Million) annually.

The annual per capita fish consumption of Uganda is 8-10 kg (FAO SOFIA, 2016). To calculate per capita consumption of fish in the rangelands of Uganda, we consider the population of the pastoralists estimated as 20 per cent of the national population. Using the 2017 human population estimate of 41.5 million people

and the percentage estimate of the population of pastoralists, we concluded that there are about 8.3 million people living in pastoral areas. However, fish consumption is majorly in the urban centres which constitute 28 per cent of the pastoral population, i.e. 2,324,000 people that would consume 20,916 tonnes of fish. This then implies that out of the total fish produced in the pastoral landscape, about 16.24 per cent is consumed locally while the rest is a surplus (83.76 per cent) which goes to support the rest of the country's population.

4.4.2 Tourism in the Pastoral Landscape

Uganda has 12 national parks and three active game reserves that offer a wide range of tourism products. They include gorilla tracking, nature guided walks, village walks, butterfly and bird watching, and rare fauna and flora species (UBOS, 2017). The contribution of tourism to the Ugandan economy has been rising from 2012 to 2018. World Travel and Tourism Council (2013) and World Bank (2013) estimate the direct contribution of tourism to the GDP at about 3.7 per cent in 2012, which compares to 4.8 per cent of GDP in Tanzania, 5 per cent in Kenya, and 5.7 per cent in Madagascar. Further, they estimated the overall impact of tourist expenditures in 2012 as having contributed 38 per cent of exports, including indirect taxes amounting to 0.5 per cent of the GDP.

In 2014/2015, the tourism earning was estimated at US$ 1,366 Million (UGX 3.55 Trillion), constituting 4.3 per cent of GDP and 26 per cent of total exports (Uganda Investment Authority, 2016). The direct contribution of tourism to GDP in 2017 was UGX 2.7 Trillion (2.9 per cent of GDP) while the total contribution including wider effects from investment, the supply chain and induced income impacts was UGX 6.9 Trillion in 2017 (7.3 per cent of GDP), up from UGX 6.17 Trillion in 2016. In terms of contribution to employment in the economy, tourism generated 229,000 jobs directly in 2017 (2.4 per cent of total employment) (UBOS, 2018; https://budget.go.ug/).

The number of tourists visiting Uganda national parks and reserves has increased from 214,000 in 2013 to 286,000 in 2017 representing a 34 percent change. On average, the number of visitors to Uganda in the five-year period is estimated to be 233,000, accruing US$ 1.256 Billion in terms of foreign exchange earnings. In the year 2014, four major national parks, all located in the rangelands accounted

for 156,341 visitors to parks, making 77 per cent of the 202,885 that the country registered (Beyeza-Mutambukah, 2016). Using the estimates, 77 per cent of the revenue from tourism is generated from parks and reserves in the rangelands of Uganda (Uganda Investment Authority, 2016). Therefore, the economic value of parks and reserves in the rangelands is projected at US$ 967 Million.

Additionally, other values accruing from pastoral tourism include the wages and salaries as a result of the jobs that the sector created which is estimated at 27.8 per cent of the value added (US$ 1.26 Billion) (US$ 349) and 9.7 per cent (US$ 122 Million) as indirect taxes of the value added (World Bank, 2013). In total, the total economic value of tourism in the pastoral landscape is estimated at UGX 7,074 Billion (US$ 1.73 Billion).

Table 4.11: Visitors to National Parks and Reserves in Uganda from 2013 to 2017

Year	Tourist Visits to Uganda		Tourist Visits to Pastoral Landscape	
	Numbers	Earnings in Billion US$	Numbers	Earnings in Million US$
2013	214,000	1.00	165,000	772
2014	203,000	1.08	156,000	835
2015	216,000	1.37	166,000	1,052
2016	246,000	1.37	189,000	1,056
2017	286,000	1.45	220,000	1,119
Average	**233,000**	**1.26**	**179,000**	**967**

Source: Government Annual Performance Report, 2014/15 by Office of Prime Minister; UBOS (2013-2017)

4.4.3 Economic Value of Minerals in the Pastoral and Agro-pastoral Landscape

Uganda produces a number of minerals including limestone, cobalt, wolfram, tin, kaolin and pozzolana. Hundred per cent of the minerals found in Uganda come from the pastoral and agro-pastoral rangelands.. The proven oil and gas reserves are all traced back to the Western Rift Valley dryland areas. Karamoja area in the Northeast already has operational exploitation of gold, marble and limestone. Figure 4.1 shows the value of mineral production for selected minerals in Uganda from 2012 to 2016. The five-year average income from minerals produced is UGX 176 Billion (US$ 47.6 Million).

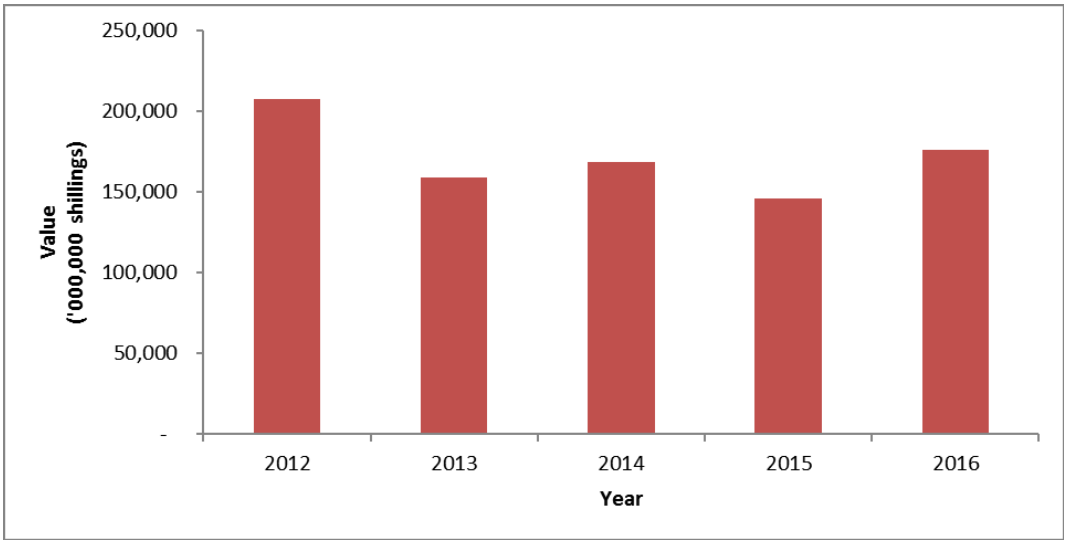

Figure 4.1: Mineral Production in Pastoral Landscape (Million UGX)

Source: UBOS (2017)

4.4.4 Volume and Value of Firewood use in the Pastoral and Agro-pastoral Uganda

The energy sector in Uganda is dominated by biomass. Biomass contributes over 90 per cent of the total expendable energy. Herein firewood and charcoal contribute more than 85 per cent. Biomass energy is mainly used for cooking and/or heating either as firewood or charcoal by local households (Dastan *et al*., 2017). Egeru (2014) has established that fuelwood consumption in rural Uganda is 542.32Kg per household per year.

To calculate the fuel wood energy demands in pastoral areas, the average fuelwood consumption per household (542.32Kg) is applied. The total pastoral and agro-pastoral human population are divided by the average number of people per household (4.7 persons) (UBOS, 2017) so as to obtain the number of households in the pastoral and agro-pastoral areas (which is 1,765,957). Thus, the annual fuel wood use from the pastoral and agro-pastoral landscape is estimated by multiplying the number of households with annual household fuel wood consumption. Therefore, the annual fuel wood use from pastoral landscape is estimated at 957,713,000Kg (957,713 tonnes).

The price of firewood is averagely UGX 3,000/bundle (about US$ 0.80/bundle) based 2019 market price. Nyariki (2019) estimates a bundle of firewood to weigh 20Kg. This therefore gives 957,7130,000Kg/20Kg bundles*UGX 3,000/bundle, earning UGX 143.657 Billion (US$ 38.77 Million).

In Uganda, just like the rest of Sub-Saharan Africa (SSA), the vast majority of households depend on wood energy; firewood and charcoal for their daily energetic needs. Such consumption trends are expected to remain a common feature of SSA's wood energy production and supply chains, at least in the short—to medium-terms. Notwithstanding its importance, wood energy generally has low priority in SSA national policies. Therefore, there is need to sensitize communities and join hands with relevant departments to promote policies for sustainable fuelwood production.

4.4.5 Volume and Value of Honey Production in Pastoral and Agro-pastoral Uganda

Uganda has a production potential of over 500,000 metric tonnes of honey annually. But it produces only 5,000 tonnes. Ugandan honey, if well produced, is rated as one of the best in the world (Horn 2004; Nadelman et al. 2005). About 87 per cent of the national honey comes from traditional beehives that are in the rangelands of Uganda (UNDP, 2012). The rangelands where honey is produced include Bushenyi, Bugisu, Nakasongola, Kabarole and West Nile region. The price per Kg of unprocessed honey is UGX 8,000. The pastoral and agro-pastoral areas produce an estimated 4350 tonnes of honey and its value is UGX 34.8 Billion (US$ 9.393 Million). Uganda's unexploited potential of honey production is estimated at UGX 4 Trillion (US$ 1.067 Billion) of which the potential value of honey in the rangelands is estimated at UGX 3.48 Trillion.

4.4.6 Wax Production

Beeswax is a valuable product that can provide a worthwhile income yet it is often neglected in some areas of East Africa, including Uganda. To calculate the quantity and value of wax produced, values of honey produced as a proportion of wax were used (FAO, 2010). For every 8Kg of honey produced, a kilogram of wax is formed. So as to estimate the monetary value of wax, the market price for 2019 was used (UGX 35,000/Kg of wax). Therefore, out of the 4,350,000Kg of

honey produced in Uganda rangelands, 543,750Kg of wax can be produced at an approximate value of UGX 19.03 Billion (US$ 5.14 Million).

4.4.7 Medicinal Value of Pastoral Areas of Uganda

The flora and fauna in the pastoral areas of Uganda are used as herbs and for medicinal purposes to treat both human beings and livestock. For example, Nalule *et al.* (2011) established the traditional practices using medicinal plants against helminthiasis and other livestock diseases in Mpigi and Gulu Districts of Uganda. Similarly, Gradè *et al*. (2008) documented the most common medicinal uses for treatment against anaplasmosis to include *Balanites aegyptiaca*, *Carissa spinarum, Warburgia salutaris* and *Harrisonia abyssinica*. This shows that herbal medicine plays an important role in the management of health of humans and livestock.

To estimate the medicinal value of pastoral landscape, the use of medicine from pastoral landscape was generated through household surveys. For instance, about 28.2 per cent, 71 per cent and 76.4 per cent of the households in Mbarara, Nakasongola and Karamoja areas of Uganda respectively used pastoral landscape for medicinal purposes. Further, it was estimated that in Mbarara Uganda, on average, the value of medicinal plant was UGX 2,633.3/household/year; for Nakasongola it was estimated at UGX 5,662/year and UGX 4,704/year for Karamoja Region. These percentages were used to estimate the medicinal value of rangelands in Uganda. On average, 58.53 per cent of households use pastoral rangelands for medicinal value at an average value of UGX 4,333.1 / household. Therefore, overall, the medicinal value of pastoral landscape was estimated as UGX (1,765,957*0.5853*4333.1) = UGX 4.478 Billion (US$ 1.209 Million).

4.4.8 Value of Crop Production in the Pastoral Areas of Uganda

Agro-pastoralist and part of the pastoralists are involved in crop farming albeit on a small scale. The value of crops in the study sites were estimated through household surveys. It established that only 11 per cent, 19 per cent and 73 per cent of households in Karamoja, Nakasongola and Mbarara Sites were involved in crop cultivation. It was predictable that the average values of annual value crop production per household were: UGX 635,254; 792,848 and 1,128,220 for

Karamoja, Nakasongola and Mbarara Sites respectively. This estimated the value of crop production in the pastoral Uganda, on average 34.3 per cent of households are involved in crop production, and the average annual value of crop production is estimated at UGX 852,107/household. The total number of pastoral and agro-pastoral household is 1,765,957 of which only 34.3 per cent practice crop cultivation. Using these values, the annual value of crop production is estimated as (1,765,957*0.343* 852,107) UGX 516.14 Billion or US$ 139.31 Million per year.

4.4.9 Value of Child Labour

Child labour cannot be ignored in the pastoral households. It is therefore important to estimate its economic value. The pastoral value of child labour was estimated using approximations from the three study site surveys. In Karamoja, Nakasongola and Mbarara 33% 22% and 27% respectively of the households employed child labour respectively. On average, 27.3% of pastoral households engaged in child labour with an average of UGX 34,380/household in value. At pastoral level, there are 1,765,957 household pastoralists with 27.3% engaging in child labour. Calculated at a rate of UGX 34,380/household/year (1,765,957*0.273*UGX34,380), the total cost of pastoral child labour stands at UGX 16.57 Billion (US$ 4.47 Million) at the time.

4.5 Overall Total Economic Value of Pastoralism in Uganda

In summary, the total economic value of pastoral and agro-pastoral production in Uganda is shown in Table 4.12. Livestock as a capital resource for pastoral and agro-pastoral communities and a key component of the pastoralism was valued at UGX 9.58 Trillion (US$ 2.52 Billion). Moreover, livestock generate annual value addition through live offtake for meat, milk and manure as fertiliser. The annual value addition from livestock products is estimated at UGX 3.01 Trillion (US$ 822 Million. Of this, live offtake constitutes 48.5 per cent and milk constitutes 49.8 per cent of the pastoral economic annual value addition. The contribution of manure was insignificant due to very low use of fertiliser and very low prices per tonne. The pastoral and agro-pastoral livestock asset economic worth in Uganda is estimated at UGX 12.38 Trillion (US$ 3.34 Billion).

The rangeland products and services contributed UGX 8.05 Trillion (US$ 1.086 Billion). Tourism contributed the highest value addition (88 per cent) to the non-livestock value followed by crops (6.5 per cent). In general, the total economic value of pastoralism in Uganda is estimated at UGX 20.4 Trillion (US$ 4.4 Billion) which includes both livestock and non-livestock products and services.

Table 4.12: Overall Total Economic Value of Pastoralism in Uganda, 2019

Category	Total Value	
	UGX	US$
a) Livestock Assets	1.341 Trillion	2.52 Billion
b) Annual Value Addition by Livestock		
Livestock Products	UGX, Billion	US$, Million
Live animal offtake	1,466	395.65
Milk	1,529	412.63
Manure	51.4	13.89
Sub-total	**3,046.4**	**822.17**
C) Annual Value Addition from Rangeland Products		
Honey and wax	53.83	14.54
Firewood	143.6	38.77
Minerals	176	47.6
Tourism	7,074	962
Fish	82	22
Crop production	516.14	0.139.3
Medicines and herbs	4.5	1.21
Sub-total	**8,050**	**1,086**
Annual total value addition from pastoralism (b+c)	**11,387.85**	**1,986.93**
TEV pastoralism (a+b+c)	**20,437**	**4,428**

However, it is important to note that this total economic valuation estimate has not included all products and services because of lack of data. For example, among animals, equine and poultry are not included, draft and transport animals' services, carbon sequestration, artisanal mining, gum and resin, and watershed value were not calculated due to data limitation. The study was also limited to farm gate level and thus vale additional along value chain was not measured.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Pastoralism is an important land-use practice in the cattle corridor of Uganda. It contributes significantly to the livelihoods of Ugandans and socially benefits the local communities. It is also a huge revenue contributor towards the national economy. For us to comprehensively capture all these contributions in our evaluations, there is need to shift from livestock and market values approach to an integrated pastoral landscape approach. This will ensure all benefits associated with the ecosystem are documented and evidence provided.

Total Economic Valuation (TEV) approach provides a convenient framework for organising the different classes of value that might be associated with pastoral landscape including livestock and non-livestock products and services. Accordingly, in economic valuation of pastoralism, rather than concentrate on only livestock products, it is important to also focus on products and services from the pastoral landscape such as artisanal mining, beekeeping, gum and resins, medicinal plants, carbon sequestration, watershed value, fishing, wood for domestic energy use, and the like. These products have been ignored in the past hence undervaluing the contributions of pastoralism. This in turn has led to government not allocating adequate budgetary resources for pastoralism. Besides this, the subsistence value of pastoralism is known but rarely valued by the national accounts system that places emphasis on marketed value of livestock.

Some of the challenges in conducting the analysis of TEV of pastoralism include inadequate data and information on pastoral components. This study is not an exception. Future work shall focus on filling the gaps related to livestock not covered (poultry and equine), subsistence use of bush meat, carbon sequestration, animal draft and transport services, artisanal mining, and the like. Furthermore, the valuation has focused on farm gate price and has not considered contribution along value chain.

6.2 Recommendations

The main policy recommendations stemming from the findings of this study include:

1. Development efforts in pastoral areas should be geared towards the importance of strengthening livestock production and its value chain, since livestock still remains the core livelihood in the rangelands. However, there is also need to explore opportunities of non-traditional and emerging sources of value such as firewood, tourism, manure, honey and wax, which are increasingly becoming an integral part of the pastoral landscape.
2. There is need to integrate TEV as a planning tool for the sustainable management of pastoralism, natural resources and environmental management. Therefore, it is useful to develop training modules on the necessary steps and processes of conducting TEV to ensure consistency in generating the information for decision making and dialogue.
3. The Government should commit to multi-year contribution to critical pastoral aspects such as generation of data and information based on sound methods for decision making. Also fundamental are policy and legislative frameworks and programmes for strengthening of national and local institutions for sustainable development.
4. It would be important to strengthen the existing linkages with development partners, regional bodies and governments in order to invest more in sustainable pastoral development that emphasises the landscape approach, taking into consideration traditional and non-traditional pastoral values.
5. It would be useful to strengthen policies and legislation that integrate the institutional, economic, cultural and social interests of the pastoralists and agro-pastoralists.

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7. APPENDIX

7.1 Definition of Terms

The definitions of some terms in the analysis of total economic value (TEV) are provided below.

- *Total economic value (TEV)*: A concept in cost-benefit analysis that refers to the value derived by people from a natural resource, a man-made heritage resource or an infrastructure system, compared to not having it. It appears in environmental economics as an aggregation of the (main function based) values provided by a given ecosystem.
- *Direct use value*: Obtained through a removable product in nature (i.e. grass, timber, fish, water, medicinal herbs, traditional veterinary plants, and other non-wood rangeland products).
- *Indirect use value*: Obtained through a non-removable product in nature (i.e. sunset, waterfall).
- *Non-use value*: Values for existence of the natural resource or passive use. For example, knowing that micro-organisms exist in the wild, even though you may never see them.
- *Option value*: Placed on the potential future ability to use a resource even though it is not currently used and the likelihood of future use is very low. This reflects the willingness to preserve an option for potential future use.
- *Bequest value or existence value*: Placed on a resource that will never be used by current individuals, derived from the value of satisfaction from preserving a natural environment or a historic environment (i.e. natural heritage or cultural heritage) for future generations.

7.2 The Different Approaches and Methods for Economic Valuation

a) *Cost-based approaches* to valuing environmental goods and services consider the costs incurred in providing environmental goods and services, observed directly from markets. These include opportunity cost, cost of alternatives, and replacement costs. However, this method is based on costs, and therefore does not strictly measure utility; thus it is a non-demand curve method and needs to be used with care.

b) *Pricing approaches* refer to approaches that use observed market prices either as direct measures of economic value of an ecosystem service (e.g. market prices, avertive or defensive expenditure, and damage costs avoided) or as a proxy for the value (referred to as cost-based approaches).

c) *Benefit transfer* is the transfer of existing estimates of non-market values to a new study which is different from the study for which the values were originally estimated. Though usually cheaper to conduct, the National Research Council suggests that benefit transfer is generally considered a "second best" valuation method because benefit transfers involve reusing existing data, and a benefit transfer does not provide an error bound for the value in the new application after the transfer.

d) *Stated preference (SP) methods* use carefully structured questionnaires to elicit individuals' preferences for a given change in a natural resource or environmental attribute. In principle, SP methods can be applied in a wide range of contexts and are the only methods that can estimate non-use values which can be a significant component of overall TEV for some natural resources. The main options in this approach are contingent valuation and choice modelling. The contingent valuation method typically focuses on estimating the value of one particular environmental change scenario. Choice modelling and or conjoint (choice) analysis is typically used to estimate values over changes to a set of attributes of an environmental amenity. The benefits and limitation of these various valuation methods are summarised in Table 2.1.

e) *Revealed preference methods* rely on data regarding individuals' preferences for marketable goods which include environmental attributes. These techniques rely on actual markets. Included in this approach are market prices, averting behaviour, hedonic pricing, travel cost method, and

random utility modelling. Market prices and averting behaviour can also be classified under pricing techniques. They take advantage of observed choices that individuals make in relation to natural assets and of the prices of related traded goods to assess the value of changes in the environment.

f) *Non-economic valuation (deliberative or participatory) approaches* tend to explore how opinions are formed or preferences expressed in units other than money. The choice is not a case of either economic or non-economic valuation methods but of using a combination of both, as required by the context of the decision.

7.3 Summary of Economic Valuation Methods- Benefits and Limitations

Valuation Method	Element of TEV Captured	Ecosystem Service(s) valued	Benefits of Approach	Limitations of Approach
Market prices	Direct and indirect use	Those that contribute to marketed products, e.g. timber, fish, genetic information	Market data readily available and robust	Limited to those ecosystem services for which a market exists
Cost-based approaches	Direct and indirect use	Depends on the existence of relevant markets for the ecosystem service in question. Examples include man-made defences being used as proxy for wetlands storm protection; expenditure on water filtration as proxy for value of water pollution damages	Market data readily available and robust actual value	Can potentially overestimate
Hedonic pricing	Direct and indirect use	Ecosystem services that contribute to air quality, visual amenity, landscape, tranquility, i.e. attributes that can be appreciated by potential buyers	Based on market data, so relatively robust figures	Very data-intensive and limited mainly to services related to property
Production function approach	Indirect use	Environmental services that serve as input to market products, e.g. effects of air or water quality on agricultural production and forestry output	Market data readily available and robust	Data-intensive and data on changes in services and the impact on production often missing
Travel cost	Direct and indirect use	All ecosystem services that contribute to recreational activities	Based on observed behaviour. Generally limited to recreational benefits	Difficulties arise when trips are made to multiple destinations
Random utility	Direct and indirect use	All ecosystem services that contribute to recreational activities	Based on observed behaviour	Limited to use values
Contingent valuation	Use and non-use	All ecosystem services	Able to capture use and non-use values	Bias in responses, resource intensive method, hypothetical nature of the market
Choice modelling	Use and non-use	All ecosystem services	Able to capture use and non-use values	Similar to contingent valuation above

Source: ICPALD (2018); Defra (2007); Eftec (2006)

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FOR MORE INFORMATION, PLEASE CONTACT DIRECTOR,
P.O. Box 47824-00100 Nairobi, Kenya,
Email:icpald@igad.int