

The Potential Of  
Nature-Based Enterprises  
In The Arid And Semi-  
Arid Lands Of Kenya:  
Case Studies In Loima  
And Turkana West Sub-  
Counties, Turkana  
County

**Patrick Mwirigi**

*Research Scientist, Department of Kenya Forestry Research Institute, Turkana Forestry Research Sub-Centre. P.O. Box 53-30500, Lodwar, Kenya*

**Jesse Owino**

*Senior Research Scientist, Departments of Kenya Forestry Research Institute, Rift Valley Eco-Region Research Programme, P.O Box 382-20203, Londiani, Kenya*

**Jackline Kemboi**

*Research Scientist, Department of Kenya Forestry Research Institute, Turkana Forestry Research Sub-Centre. P.O. Box 53-30500, Lodwar, Kenya*

## ABSTRACT

The pastoral communities in Kenya solely depend on livestock and livestock products for livelihood. This study sought to assess the potential of alternative sources of livelihood through case studies of three bio-enterprises established in Loima and Turkana west sub-counties in Turkana County. Participatory Rural Appraisal (PRA) method was employed to determine the particular needs of the communities and suitable bio-enterprise. Purposive sampling method was used in selection of the target communities and the communities were on the entire value chain of the three bio-enterprises: pasture production, *Aloe turkanensis* and beekeeping production. For beekeeping, Lochor angikalalio registered 88% of hive occupancy within 30 days while Namoni-Ankaala and Naipa registered 32% and 15% respectively. For pasture production, the pasture farm at Lochor angikalalio produced the highest amount of grass seeds under rainfed regime with 40kgs of *Cenchrus ciliaris* seeds and 42 bales of hay per acre while Naremioto produced 15kgs of *Cenchrus ciliaris* seeds and 32 bales of hay per acre. On the *Aloe turkanensis* enterprise, the soap detergent had a higher gross profit margin of 79%. Aloe soap had the least gross profit margin of 37% while Aloe shampoo had a gross profit margin of 78%.

**Key words:** Nature-based enterprises, Pasture, Bee keeping, *Aloe turkanensis*

## 1. INTRODUCTION

Pastoralism as the only livelihood option is no longer tenable in the Arid and Semi-arid lands (ASALs) of Kenya because of several underlying factors namely: population pressures, changing land tenure and land use and the effects of climate change resulting in variability of rainfall pattern, recurrent droughts and severe environmental and climatic conditions (F. Opiyo, Wasonga, Nyangito, Schilling, & Munang, 2015; Yirdaw, Tigabu, & Monge, 2017). The pastoral communities in Kenya solely depend on livestock and livestock products for livelihood. They are also the most affected in terms of access to basic needs and services in comparison to the general public (Wren, 2012). These challenges necessitate a paradigm shift and a search for innovative ways and methods in the ever-challenging quest for the balance between conservation and development and at the same time ensuring sustainable management and utilization of the natural resources in these fragile ecosystems. The term dryland sends notion of environmental, social and economic incapacity, however, understanding how pastoral communities adapt to and cope with extreme climatic conditions is important in addressing the situation of the already marginalized environment (F. Opiyo et al., 2015). In ASALs the situation is acute and pastoralism can no longer provide enough food and income for the ever increasing populations pressure (Swift, 2011). According to Opiyo *et al.*, (2015), the ASALs are expected to experience frequent climatic extremes, increased water stress, increased aridity and increased food security and malnutrition. Despite the fact that these regions experience low productivity due to low precipitation and high evapotranspiration, there is a greater degree of diversity of medicinal plants, fodder, wild foods and fruits (Adhikari, 2011), which have great potential for reducing poverty and generating economic growth.

Kenya has had a long and arduous journey towards achievement of the balance between conservation and development with regards to dryland resources utilization and management starting in the early 1950s in what was known as community development trusts that were abandoned a decade later giving way to the ideologies of equality and community participation (Wondie, 2010). These did not work due to conflicting interests and the poorly crafted community based integrated conservation development programs that adopted top down approaches (Malo, Odera, & Ochuodho, 2007). Studies have shown that enforcing laws and conducting patrols in an effort to protect forest, provokes indigenous people resulting into conflicts between them and law enforcers (Nguyen, Lawler, Goldoftas, & Le, 2019). These top-down approaches have created widespread and permanent underclass-these are poor unemployed, unemployable, ill-educated and ill-nourished communities. On the contrary the approach that is gaining momentum among the development partners and policy makers is the micro-economic development model that taps into poor people's capacity for enterprise and their enormous reservoir of felt needs for economic security (Bhattacharyya, 2004). This model is increasingly being recognized as a relatively low cost, bottom up approach for economic development that is particularly suited for low income communities (Mary Emery, Wall, & Macke, 2004).

Nature-based enterprises from non-timber forest products (NTFPs), for instance, bee keeping for commercial honey production, commercial production of pasture and growing and developing products from aloe species provide an alternative if not a better and more stable and sustainable source of livelihood and help pastoralists cope with hardships and confer an additional source of income stream (Mbuvi & Boon, 2009). In fact a whopping 80% of the inhabitants of the developing countries rely on wild products for food and medicine, a clear indication that NTFPs play a critical role as a safety net against agricultural shocks (Mujawamariya & Karimov, 2014). The ASALs environment is well captured in the concept of 'dryland syndrome' describing these populations as the most socially, economically and politically marginalized. It is therefore paramount that the inhabitants of these regions develop knowledge and expertise in dealing with these constraints. However, due to the diverse nature of drylands, they have very few opportunities for diverse economic activities. This thus reinforces the perception of negative images of desertification to a forward-looking perspective on the human activities in the drylands (Reynolds et al., 2007).

The quest for alternative livelihood in the drylands is also attributed to climate change. It is obvious today that ASALs will bear the greatest negative consequence of climate change resulting from changing weather patterns such as floods and drought especially for the few available productive regions within the ASALs, this is as a result of low water availability and high evapotranspiration (Shitanda, Mukonyi, Kagiri, Gichua, & Simiyu, 2013; Thomas, 2008).

Largely, the concept of alternative livelihood has received less attention than deserved. However, some theoretical underpinnings do exist that set precedent with regard to which of these alternatives should be grounded in a principle of deviation from traditional sources of livelihoods. These alternatives must be in sync

with the concept of environmental sustainability. There is need for development of alternative livelihood strategies that can withstand environmental shocks. These alternatives must also be in tandem with the culture, resources and prevailing climatic conditions of the target communities (Bennett, 2010). Recognizing the failure of past approaches in addressing both poverty and environmental degradation, current development approaches have attempted to devise initiatives for both poverty alleviation and environmental sustainability in the context of economic systems and community (Gutierrez-Montes, Emery, & Fernandez-Baca, 2009). Moreover, It is also important to ensure that anti-poverty programs and approaches developed are not only sustainable but are also as comprehensive as possible while putting into consideration community values (Bradshaw, 2007). These approaches should adopt a wealth building value chain that gradually builds wealth for the communities by targeting economic development efforts that have shown to lead system-wide changes and poverty reduction (Rahe & Hause, 2020). One of the methods or approaches of creating wealth is through community entrepreneurship. Community entrepreneurship concept basically utilizes cultural assets that are unique to the community to build wealth (Fortunato & Alter, 2015).

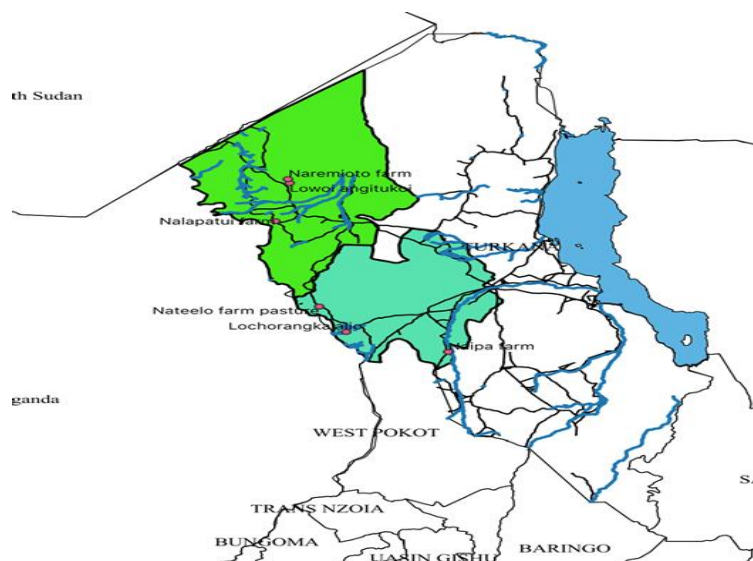
## **2. MATERIALS AND METHODS**

### **2.1 STUDY SITES**

The study focused on 4 communities in Turkana West and Loima sub-counties. These communities are: Naremioto and Nalapatui in Turkana West Sub- County; and Naipa and Lochor Angikalalio in Loima sub county, Turkana County (Figure 1). Turkana County is an arid and semi-arid county, characterized by dry and hot climate conditions most of the time. The night time Minimum temperature ranges between 24.2°C to 26.0°C and the day time Maximum Temperatures oscillates between 35°C to 36.0°C. The rainfall pattern and distribution are erratic and unreliable both in temporal and spatial. The rainfall amounts range between 40mm and 250mm with a climate mean of 200mm. The seasonal rainfall distribution across the county is not both spatially and temporally distributed in the entire county. The surface runoff and potential evaporation rates are extremely high. Drought episodes in the county occur in every 3-5 years (F. E. O. Opiyo, Wasonga, & Nyangito, 2014).

The main economic activity of the communities in the study area is pastoralism, however, most of them are sedentary pastoralist and engage in small-scale agricultural production. Different farm sizes for experiments were provided by community and fenced as follows: Lochor angikalalio (6 acres), Naipa (12 acres), Naremioto (40 acres) and Nalapatui (2 acres).

Figure 1: Map showing study sites in Turkana County



Source: Author's own

## 2.2 METHODOLOGY

This paper assesses the potential of alternative sources of livelihood to pastoralist communities through assessment of case studies of three bio-enterprises established in six sites across two sub-counties in Turkana County, Kenya. The challenges therein are identified and analyzed to form a basis for replication of these enterprises in other regions. In this study the target communities were first trained on entrepreneurial skills and knowledge in tandem with community interaction field theory using the enhancing, developing and growing entrepreneurs (EDGE) model to provide grounded business skills and enhance community synergy through formation of coalitions and inculcating ownership. The training adopted Farmer field school approach to increase sustainability by creating champions within the community.

Participatory Rural Appraisal (PRA) and community capital framework coupled with Appreciative inquiry methods were employed to determine the assets available and the particular needs of the communities and suitable bio-enterprises. Based on the community needs assessment, three bio-enterprises were given priority namely: pasture production, beekeeping and domestication and value addition of *Aloe turkanensis*. Purposive sampling method was used in selection of the target communities in Turkana west and Loima sub-counties. Community group members were trained on the entire value chain of the three enterprises: pasture production, *Aloe turkanensis* and beekeeping production.

## 3. CASE STUDIES

### 3.1 CASE STUDY 1: BEE KEEPING ENTERPRISE

#### 3.1.1 PROJECT DESIGN AND SKILLS TRAINING

The potential of Apiculture was tested in three locations: Lochor angikalalio, Naipa, and Namoni-Ankaala in Loima Sub-County. Experts from KEFRI, KALRO and Turkana County Government trained the target

communities on all aspects of Apiculture namely: Bee products, types of bees, types of hives, hive installation, bee keeping equipment and how to use them, hive management, bee forage, processing of honey and marketing. Each of these groups was provided with bee hives equal to the group members so that each member of the group possessed a bee hive as follows: Lochor angikalalio (24 hives), Naipa (20 hives), Namoni-Ankaala (22 hives). The potential of each location was calculated based on the speed and rate of occupancy, specifically the % of occupancy within a span of 30 days. Training on conservation of biodiversity and on the concept of sustainable livelihoods was conducted. Moreover, they were sensitized on the role's trees play in the bee keeping enterprise and that sustainability of the eco-enterprises depended solely on environmental conservation. Fruit and high value native tree seedlings were also provided to the members who were also trained on tree planting and water harvesting techniques to ensure survival of the seedlings.

### **3.2 CASE STUDY 2: PASTURE PRODUCTION ENTERPRISE**

#### **3.2.1 PROJECT DESIGN AND SKILLS DEVELOPMENT**

Four sites Naipa, Lochor angikalalio, Namoni angkaala in Loima sub-county and Naremioto in Turkana West sub-county were selected for pasture production. The communities in these sites are mainly pastoralists and graze their livestock along the cross-border region of Kenya and Uganda. The community group members were trained on pasture establishment, management, harvesting, baling and storage following a Farmer Field School (FFS) training model to enhance community's understanding of practices involved. The pasture seeds planted were *Cenchrus ciliaris*. Planting, seed harvesting and hay baling was done manually and the grass planted depended purely on rainfall for establishment. The experiment was monitored for a period of 6 months.

### **3.3 CASE STUDY 3: ALOE TURKANENSIS VALUE ADDITION**

#### **3.3.1 PROJECT DESIGN AND SKILL DEVELOPMENT**

The activity of aloe production was conducted in two sites: Lochor angikalalio (Loima sub-county) and Nalapatui (Turkana west sub-county). The community groups were trained on the importance of aloe species, different types of aloe species, nursery establishment, aloe propagation and management, aloe sap harvesting, aloe bitter gum processing and development of aloe products. The two community groups established their own aloe farm with Lochor angikalalio having 5 acres and Nalapatui 2 acre of Aloe turkanensis suckers. Further, the group members were trained on development of products such as aloe bar soap, aloe shampoo and soap liquid detergent.

## **4. RESULTS**

### **4.1 BEEKEEPING**

Figure 2 shows the percentage of hive occupancy within one month of hive installation in Lochor angikalalio, Namoni-Ankaala and Naipa. Lochor angikalalio registered 88% of hive occupancy within 30 days while Namoni-Ankaala and Naipa registered 32% and 15% respectively.

Figure 2: shows the percentage of the hives occupied by bees one month after installation

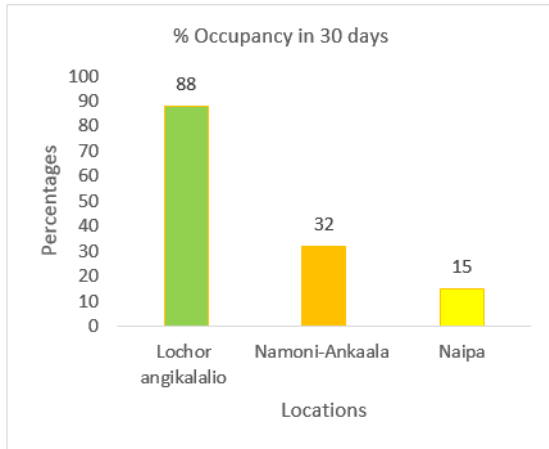


Figure 3: Number of males and females in each of the bee keeping groups

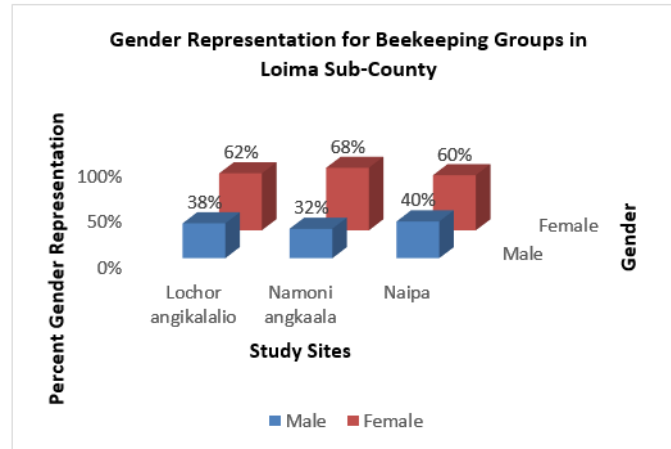


Figure 3 shows the gender representation for the groups involved in beekeeping. Being a community, which is deeply rooted in culture, women had the highest representation of 62%, 68% and 60% in Lochor angikalalio, Namoni-Ankaala and Naipa respectively.

#### 4.2 PASTURE PRODUCTION

Figure 4 shows pasture seed production per acre. The pasture farm at Lochor angikalalio produced the highest amount of grass seeds under rain-fed regime with 46kgs of *Cenchrus ciliaris* seeds per acre, Namoni angkaala 36kgs per acre while Naremioto produced 15kgs of *Cenchrus ciliaris* seeds per acre. The grass planted at Naipa did not establish to maturity, hence no results were recorded. Figure 5 shows hay production per acre at Lochor angikalalio, Namoni angkaala, Naremioto and Naipa. Lochor angikalalio produced 48 bales of *Cenchrus ciliaris* grass per acre, Namoni angkaala 41 bales, while Naremioto produced 32 bales of harvested *Cenchrus ciliaris* grass per acre.

Figure 4: Grass seed production per acre at Lochor angikalalio, Namoni angkaala, Naipa and Naremioto

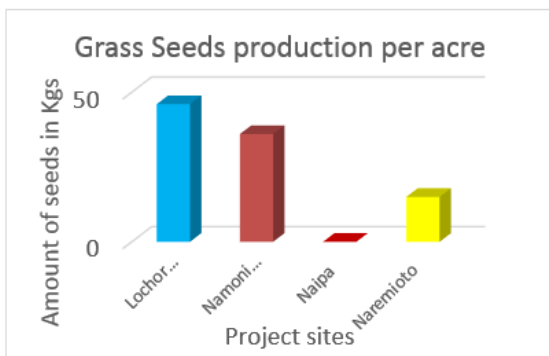
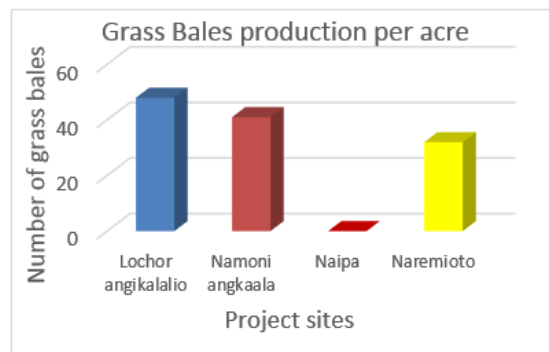


Figure 5: Hay production per acre at Lochor angikalalio, Namoni angkaala, Naipa and Naremioto



#### 4.3 PRODUCTION AND INCOME FROM ALOE ENTERPRISE

Table 1 below shows the estimated gross profit of Aloe soap, shampoo and detergent based on the cost of production and the prevailing market prices for the aloe value addition enterprises. The soap detergent had a higher gross profit margin of 79%. Aloe soap had the least gross profit margin of 37% while Aloe shampoo had a gross profit margin of 78%. The average gross profit margin of all the products was 65%.

Table 1: Gross profit of Aloe turkanensis products

S/no	Product	Quantity	Cost of production	Unit cost	Total sales	Gross profit	Remarks
1	Aloe soap	11 Pieces (1kg)	347	50	550	203	37% gross profit
2	Aloe shampoo	10 litres	439	200	2000	1561	78% gross profit
3	Aloe detergent	10 litres	211	100	1000	789	79% gross profit

## 5. DISCUSSION AND DEDUCTION

It is clear from the three-case studies that Turkana County has a significant potential for the bio-enterprises appraised. All the sites registered varying degrees of success in different enterprises. Beekeeping enterprise is a lucrative income-generating activity which can offer an alternative source of income to pastoral communities in the drylands. The potential of beekeeping in Loima sub-County is high and this was clearly indicated by the high rate of occupancy within a span of one month. Based on the study results, *Lochor angikalalio* is the best suited site for Apiculture in Loima sub-County, with 88% of beehives colonized within a month. The high rate of beehive colonization in this site was largely attributed by the high diversity of trees species thus providing a conducive environment and forage for bees. According to Haron (2019) species diversity, richness and abundance vary with landscape composition and complexity and has a great impact on bees' population. Areas with widespread flora tend to have abundant population of bees and vice versa and this explain why *Naipa* area had low hive occupancy rate due to low plant species diversity.

Native grass species on the other hand have been declining at an alarming rate. However, rangeland reseeding and seed bulking has successfully been used as a means of rehabilitating degraded drylands (Mganga, Nyariki, Musimba, & Mwang'ombe, 2019). Involving communities and training them on pasture production as an income generating activity not only provides a platform for improving livelihoods but also aid in restoration of ecosystem functionality and productivity. The performance of *Cenchrus ciliaris* in Naremioto, Namoni angkaala and Lochor Angikalalio under rainfed regime shows the importance of semi-circular bands in improving water infiltration and a possible pathway for addressing land degradation and enhancing pastoral household income through the sale of hay and grass seeds. The prevailing prices for grass seeds in Turkana is Ksh.1000~\$10 per kg and Ksh. 500~\$5 per bale. Lochor angikalalio group were able to produce 84 bales of grass hay and 80kgs of grass seeds, Namoni angkaala produced 36kgs of seeds and 41 bales of hay, while Naremioto group harvested 225kgs of grass seeds and 480 bales of hay. Naipa, however experienced very low



rainfall which could not sustain pasture established to maturity. Despite the challenges, community's participation in fodder and grass seed production and understanding the entire value chain is important in the quest for improving livestock sector and consequently contributing to community's and economic growth.

The trade in Aloe extracts raises concerns on the level of exploitation of aloe species from the wild. According to the Kenya Vision 2030, Economic Recovery Strategy and Poverty Reduction Strategy paper of 2003, sustainable utilization of aloes as a potential community-based natural resource enterprise can act as an alternative livelihood for pastoralists in the drylands (Kenya Wildlife Service, 2008). The study revealed that communities can use the resources available sustainably if they understand their importance and are able to attach a certain monetary or cultural value to it. Domestication of aloes and harvesting of aloe suckers from own a farm promote conservation and management of aloes and creates public awareness on overexploitation and importance of aloes.

The use of nature-based enterprises such as pasture production, aloe domestication and bee keeping proved to be a viable method for both community empowerment and environmental conservation and rehabilitation of rangelands. The success of beekeeping enterprise for instance depends solely on environmental conservation of the available vegetation and when the communities understand this interdependence, they are able to conserve their surroundings. The high gross profit margin achieved by these communities and the presence of ready market is a clear indication that communities are able to identify surrounding assets and enhance them even further with minimal input (M. Emery, Fey, & Flora, 2006). This notwithstanding many community-based initiatives fail because of being fragmented and lack focus and accountability resulting into low ownership (Lichtenstein, Lyons, & Kutzhanova, 2004). It is thus crucial that the design of any community business venture takes a systemic approach by creating a community-wide enterprise development system that puts into account the needs of the community. The design should also provide the requisite skills and tools for successful implementation of the venture (Lichtenstein et al., 2004).

## **6. CONCLUSION AND RECOMMENDATION**

The case studies clearly demonstrate that Bio-enterprise approach can be adopted as tool for sustainable livelihoods improvement strategy and wealth creation if well designed and organized to enable proper skills transfer to the target communities. However, certain skill gaps need to be considered, this includes: business management knowledge, marketing and distribution skills, sustainable harvesting and regulations pertaining to these enterprises. Therefore, eco-enterprises initiatives need to put into considerations relevant managerial and technical skills through development of a curriculum that inculcates the skills, awareness and project ownership. In addition, development partners must first do a proper appraisal of the prevailing climatic, economic and socio-cultural conditions of the target communities so as to choose the most appropriate bio-enterprise.

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