

**Promoting Climate change adaptation for natural resource dependent communities in Narok on Best practices in Energy and livestock Indigenous Information Network**

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### **Lucy Mulenkei**

Executive Director

Indigenous Information Network

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## List of acronyms

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|       |   |   |
|-------|---|---|
| AIDS  | - | Acquired Immune Deficiency Syndrome                     |
| ASAL  | - | Arid and Semi Arid Land                                 |
| BCP   | - | Bio-Cultural Protocol                                   |
| CBO   | - | Community Based Organization                            |
| CCCU  | - | Climate Change Coordination Unit                        |
| CDM   | - | Clean Development Mechanisms                            |
| CDTF  | - | Community Development Trust Fund                        |
| CFA   | - | Community Forest Association                            |
| CGWCC | - | conference of global warming and climate change         |
| CIDP  | - | County Integrated Development Plan                      |
| CRM   | - | Changieni Rasili Mali facility                          |
| DEO   | - | District Environment Officer                            |
| DTC   | - | Drought Tolerant Crops                                  |
| EMCA  | - | Environment Management and Coordination Act             |
| ERC   | - | Energy Regulatory Commission                            |
| EWIS  | - | Early Warning and Information Systems                   |
| FAO   | - | Food and Agriculture Organization                       |
| FGD   | - | Focused Group Discussion                                |
| GDFP  | - | Good dairy farm practices                               |
| GIZ   | - | German Federal Enterprise for International Cooperation |
| GMP   | - | Good Manufacturing Practice                             |
| HACCP | - | Hazard analysis critical control point                  |
| IIN   | - | Indigenous Information Network                          |
| IK    | - | Indigenous Knowledge                                    |
| IPCC  | - | Intergovernmental Panel on Climate Change               |

|         |   |   |
|---------|---|---|
| KARI    | - | Kenya Agricultural Research Institute                           |
| KCC     | - | Kenya Cooperative Creameries                                    |
| KCJ     | - | Kenya Ceramic Jiko  |
| KFS     | - | Kenya Forest Service  |
| KFWG    | - | Kenya Forests Working Group                                     |
| KMD     | - | Kenya Meteorological Department                                 |
| MDG     | - | Millennium Development Goals                                    |
| NAPA    | - | National Adaptation Programme of Action                         |
| NCCACC  | - | National Climate Change Activities Coordinating Committee       |
| NCCAP   | - | National Climate Change Action Plan                             |
| NCCRS   | - | National Climate Change Response Strategy                       |
| NCG     | - | Narok County Government   |
| NEMA    | - | National Environmental Management Authority                     |
| NFNSP   | - | National Food And Nutrition Security policy                     |
| NGO     | - | Non Governmental Organization                                   |
| NLP     | - | National Land Policy  |
| NLP     | - | National Livestock Policy                                       |
| NPSD    | - | National policy for sustainable Development                     |
| NRM     | - | Natural Resource Management                                     |
| OPDP    | - | Ogiek People Development Program                                |
| PRA     | - | Participatory Rural Appraisal                                   |
| SPSS    | - | Statistical Package for Social Sciences                         |
| ToR     | - | Terms of Reference  |
| UNDRIP  | - | United Nations Declaration on the rights of Indigenous Peoples. |
| UNIDWIP | - | United Nations International Decad Of                           |
| WRUA    | - | Water Users Association   |

## Executive summary

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This booklet focuses on sustainable climate change adaptation practices and technologies in energy and livestock production within the Narok Ccounty. The booklet is an output from a CRM project implemented by Indigenous Information Network and Kenya Forests Working Group on promoting climate change adaptation for natural resource dependent communities in Narok County and supported b6y ACT!. The project had three broad objectives: **To enhance the capacity of Narok County residents to respond to climate change adaptation; To advocate for the integration of climate change adaptation into sector policies, plans and strategies in Narok County** and **To improve livelihood support systems and ecosystem resilience through adaptation of best practices and technologies**. The booklet was developed through a survey to identify some of the best practices that are suitable for climate change adaptation in energy and livestock production. On farm demonstrations were then held to showcase these practices and enhance the community's knowledge on how they can be able to apply and implement them. Energy practices and technologies highlighted in this booklet include use of charcoal kilns, briquettes, solar power improved energy saving cook stoves, biogas. For livestock production some of the practices include pasture/ management through planting of Napier grass, boma Rhodes and desmodium as well as fodder management.

In addition to the best practices, the Book gives information on how Indigenous knowledge plays a vital role among the hunter-gatherers, the indigenous communities and other communities in the country as best practices and good example in conservation of natural resources and in sustainable Climate Change adaptation practices. Brief information on baseline survey undertaken during the project circle to show the need to enhanced best practices by communities in relation to their work and daily activities in order to improve their work on conservation and the protection of the Environment. In the last chapter the booklet gives information on the resources centre developed as a learning and information centre for communities to find and share information on best practices. It is expected to be a learning herb not only for communities but for the youth and students around in the country.

*We reaffirm the key role of all levels of government and legislative bodies in promoting sustainable development. We further acknowledge efforts and progress made at the local and sub-national levels, and recognize the important role that such authorities and communities can play in implementing sustainable development, including by engaging citizens and stakeholders, and providing them with relevant information, as appropriate, on the three dimensions of sustainable development. We further acknowledge the importance of involving all relevant decision makers into planning and implementation of sustainable development'* **World leader's commitments – par 42- The Future we want –Rio+ 20 outcomes 2012.**

# Chapter 1

## Background Information of Narok County

*Climate change does not respect border; it does not respect who you are - rich and poor, small and big. Therefore, this is what we call 'global challenges,' which require global solidarity. **Ban Ki-moon 2014***

Narok County is situated in Kenya along the Great Rift Valley. It is named after, Enkare Narok, which is the river flowing through Narok town. It covers an area of 17,944 sq km and has a population of 850,920. The temperature range is 12 celcius and average rainfall range of 500 to 1,800 mm per annum. Its geographical coordinates are 1° 5' 0" South, 35° 52' 0" East and its original name [with diacritics] is Narok.

The Maasai Mara National Park, an important tourist destination, is located in Narok County. It is home to the Great Wildebeest Migration which is one of the "Seven New Wonders of the World". It constitutes 6 sub-counties namely: Kilgoris, Narok North, Narok South, Narok East, Narok West and Emurua Dikirr. Narok town is the capital Head Quarters of the Narok County and stands as the major centre of commerce in the county.



*Narok County has several economic activities that are carried out by the community*

In reference to the research studies by the United Nations for the Kenya Vision 2030, Narok County is marked as one of the fundamental counties for the achieving economic pillar. Key contributions being the tourism sector through the Maasai Mara and the agricultural sector through livestock farming.

### Forest and water catchment areas

Narok County is one among many productive counties in Kenya, found south of the Rift valley. The Masaai are the greatest inhabitants of that area. Mau forests stretches into Narok County. Mau forest is the

largest water catchment area in Kenya and it also some of the highest rainfall rates in Kenya .Some of the rivers flowing through are; the southern Ewasonyiro, Njoro River, sondu and Mara river originate from the Mau forest

### **Land cover changes**

Land-cover changes in Narok County are the result of a variety of processes of land-use change. For mechanized agriculture, agro-climatic potential and accessibility to the market are the most important explanatory variables. Low altitude plains are preferred, which are easily accessible with heavy machinery. Accessibility is more important than soil quality, as the latter can be improved with fertilizers. Also, the immediate surroundings of water sources are not cultivated. Hence, pastoralists preferentially lease those lands that are further away from water sources, or that are less fertile, and thus have a lower rent value for them.

While conversion in the first period mainly took place in the outer group ranches, which were mostly under private land title, expansion of agriculture into the inner group ranches and into areas with more fertile soils happened mainly in the second period. The inner group ranches were communally owned, but outsiders could negotiate leases with powerful group ranch leaders [Thompson, in preparation]. The increasing population density associated with mechanized farming activities in the second period raises several hypotheses. More densely populated areas might become less suitable to practice extensive cattle rearing and thus people look for alternative incomes.

Alternatively, the revenues gained from mechanized agriculture might attract people from other regions, thus causing a stronger population increase in the area. The models of smallholder impact represent two distinct processes: the development of permanent settlements and expansion of smallholder agriculture. In the first period, the former process is much more important and the spatial model represents landscape attributes that are attractive for settlement. Pastoralists value the vicinity to water for their livestock. They also value the proximity to the Masai Mara National Reserve [inner group ranches], because of the availability of permanent water [i.e. the Mara and Talek Rivers], the possibility of supplementing their income by tourist-related activities and the presence of good grazing grounds in the National Reserve.

Although grazing by cattle in the National Reserve is generally not allowed, the Maasai pastoralists are granted temporary access to the park in times of drought. Hence, some permanent settlements developed at the park borders, close to the Talek River, or close to the park entrance gates [Sekenani and Olaimutiek], along the access roads to the park. In the second period, subsistence agriculture became more important and the model parameters represent, on the one hand, expansion of smallholder agriculture in the more fertile areas with higher elevation and, on the other hand, the continuing process of settlement development in the inner group

ranches. The concomitant modeling of these two simultaneous processes results in a weak explanatory power of the overall model. Further subdivision of the region into smaller homogeneous spatial entities, separating these two processes of land-use change, might raise the predictive power of the individual models. However, it is not compatible with the idea of generality behind modeling activities and it would make extrapolation of the findings to the entire region even more difficult.

The main crops grown in the county are wheat, barley, maize, beans, Irish potatoes and horticultural crops. These crops are grown under rain fed, micro irrigation, and sprinkle and drip irrigation. Maize, wheat, barley and sugarcane are grown as cash crops. Maize and wheat are the highest income earning cash crops in the county.

Mining activities include gold mining in Lolgorian, Masurura, and sand harvesting. Gold plat, one of the world's biggest gold companies which is also listed at the London Stock Exchange was awarded the lease to exploit the large gold deposits in the Lolgorian area of the County in November 2013. The firm also discovered richer gold reserves at Kilimapesa mines in Trans Mara to support commercial exploitation of the precious metal expected to be a key source of wealth for Narok County. The firm has also found gold deposits in an abandoned site, Red Ray, around Kilimapesa mines, which are expected to raise the mineral output to over 285kg per year, worth about Sh1.5 billion..

Proposed project interventions were organized along the following categories:

- Policy development within the county,
- Capacity building and strengthening of local natural resources community institutions, and
- Knowledge management [sharing of climate change related knowledge to address policy issues, best practices and technologies among others].

The project's target area was the rural areas of Transmara sub-County. Nonetheless, it was to influence climate change adaptation policy and legislation development within the Narok County Government.

### **Narok County's Vulnerability to Climate Change**

Climate change is a global issue and affects people and places in different parts of the world, including Narok County. Within the County, there has been an increase in the frequency and intensity of extreme weather events, particularly droughts. Changes in rainfall patterns, marked by delayed onsets have also been witnessed. At the same time, water levels in rivers and streams are continually receding. Some of the impacts include;

- Wildlife and livestock deaths during droughts.
- Increased human, livestock and wildlife diseases.
- Changes of wildlife habitats and loss of biodiversity.
- Human-human and human-wildlife conflicts.
- Lifestyle changes necessitated by loss of traditional livelihoods
- Increased wild winds.
- Increased poverty levels associated with loss of livelihoods.
- Low enrolment and poor attendance of schools.
- Land increasingly being sold/leased out due to its perceived loss of productivity resulting in loss of income/livelihoods.
- Receding natural resources particularly watering points and pasture.
- Increased migration from rural areas to urban areas.
- Flash floods causing soil erosion, siltation, and reduction in soil fertility, hence reduced crop productivity.
- Reduced water quality as a consequence of floods.

In March 2013, the county was one of those areas that were affected by the raging flooding menace where 15 lives were lost and about 350 people displaced. The effects occurred in three out of the five constituencies namely Narok North, Narok South, Trans Mara East and West. Loss of property including livestock deaths and damage of over 200 acres of food crops in Kikuyani were some of the effects of these floods.



## Chapter 2

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### **Supporting the inclusion of Climate change adaptation strategies within Narok Country**

*"Indigenous peoples have the right to the conservation and protection of the environment and the productive capacity of their lands or territories and resources. States shall establish and implement assistance programmes for indigenous peoples for such conservation and protection, without discrimination"* - **par. 29 UNDRIP 2007**

The impacts of climate change are already resulting in economic losses around the world. Activities to adapt to the impacts of climate change also come with a range of costs, and associated implications for the need for financial investments. Projects aimed to support indigenous communities in assessing the risks posed by climate change and their economic implications, and in estimating the costs of adaptation to climate change impacts, including through economic analysis of adaptation options are very crucial.

In the process, indigenous peoples gain an improved understanding of their adaptation requirements, this will enable them know the importance of using their culture and traditions to mitigate some effects of the climate change. A baseline survey was undertaken during the implementation of the Changieni Rasili mali in Narok County, with the main objective to assist in benchmarking key elements of climate change adaptation within sector policies in Narok County, and help identify gaps within current affected sector policies and establish opportunities for integrating climate change adaptation measures within NRM governance in the county.

The sex cohort of households heads sampled for the survey within Narok County indicated that 275 [74%] were males, while 97 [26%] of the 372 respondents interviewed were females. Three hundred and fifty six [95%] of the respondents indicated that their land tenure system is individually/ privately owned, while 12 [3%] of the respondents reported that their land is communally owned and 1% reported that the land is publicly owned. Significant number of the respondents reported that average household monthly income is less than Ksh. 20,000 per annum. Most respondents reported that they have experienced change in weather patterns in recent years. An overwhelming number of respondents 97% were of the view that climate has been changing within their locality. About 96% agreed to their livelihoods being affected by the changing climate. 91% reported doing things differently due to the effects of climate change. Majority of the respondents interviewed in Narok County were aware of the negative environmental effects of tree logging and charcoal burning.

Key informant interview with key staff in the relevant ministry revealed a slow progress towards trying to address climate change issues. The county has already formulated a county integrated development plan [CIDP]. The Narok County CIDP proposes the planting of 1 million trees in the next 3 years. In addition, the county government is also in the process of coming up with environmental control and regulation bill. The county government will soon come up with a new bill to domesticate the proposed forest and conservation bill once it is passed by the national assembly. The sectional heads suggested the following as priority policy areas in the County. Locally initiated strategic plans addressing climate change in line with National Climate Change Response Strategy [NCCRS];

- Sub-county focused action plans on climate change based on National Adaptation Programme of Action [NAPA]; and
- Capacity building [development] strategy; and Information sharing and dissemination strategies.

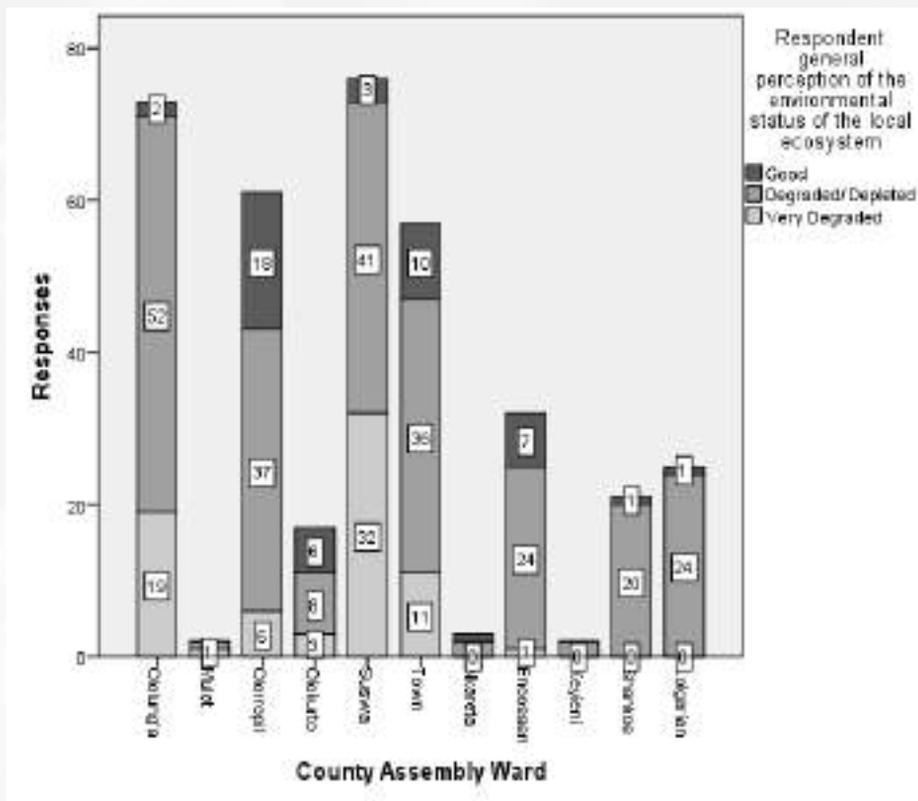
The age distribution of the average household indicated skewed cohorts. Majority of respondents were between age cohorts of 18-30 years, 31-45 years and between 41-50 years. There was significant number [16%] of respondents who indicated that they are above 50 years old. With a growing young population as well as declining elderly population indicates that the community is at the highest need for educational access that would enable them adapt to climate change and spur economic development in the entire County.

### **Respondents' main occupation**

Majority of the respondents practice crop farming [53%], 13% indicated casual employment, 12% practice pure livestock rearing, 8% indicated that they are involved in trading, while 3% reported that they are engaged in other activities such as tourism.

### **Perceptions of the status of environment**

Majority of the respondents [67%] were of the view that the environmental status of their local ecosystem was significantly degraded. A further 17% believed that the environmental status of their local ecosystem was very much degraded. Most of the respondents in all the County Assembly Wards reported that their environment has been degraded significantly



*Respondents' perception of their environment in County Assembly Wards*

## Chapter 3

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### Best Practices in livestock production

*'We recognize that farmers, including small-scale farmers and fishers, pastoralists and foresters, can make important contributions to sustainable development through production activities that are environmentally sound, enhance food security and the livelihood of the poor, and invigorate production and sustained economic growth'* **World leaders commitment Par. 52- The future we want RIO+20 outcome document 2012.**

Traditionally pastoralist utilized their dry lands or semi dry lands through mobile livestock keeping system using different herd management techniques and move where fodder is abundant. Pastoralists are increasingly becoming vulnerable to food and livelihood crises. One of the reasons is that pastoralists lands in the past few years have faced a myriad challenges. Changing land tenure from collective to titling has restricted movement and degradation increases, the traditional structures for governing sustainable land use have weakened, demand and expansion of land to other uses like crop farming, mining, sugarcane plantation has increased, perception that pastoralism isn't viable led to inadequate investment are some of the challenges.



*Having water trough for watering livestock is good practice to ensure good health and avoids human - livestock conflict.*

Promoting pastoralism as a valid mode of production and way of life to improve long-term economic security of pastoral communities and their capacity to survive in harsh climatic conditions requires best management practices that would involve improving productivity in a sustainable manner:

- Mapping and inventorying the natural resource base mainly water sources and vegetation/pasture
- Establishing legumes in pastures to allow nitrogen to be fixed in the soil and results in increased the forage quality of your pasture-forage mix.
- Planting protein rich Napier grass or a protein rich fodder on edges of farmland maize plantation is advisable
- Alternative watering is a way of providing water for livestock that are fenced out of water points
- Pasture fencing to ensure division of pastures and rotational grazing system. This will increase the number of grazing paddocks and allows for better utilization of forage by cattle and forage re-growth after grazing
- Utilize cow-dung for manure for other crops
- Farmers with limited land can limit free-range mode and undertake zero grazing. Dairy goats do well as well in zero grazing units. Keeping sheep like Red Maasai or dooper are prolific breeders can calve down twice a year
- . Sheep-rearing is economical as 10 of them can feed on what a single cow eats.
- Consulting government livestock officers who can advice on de-worming, spraying and mineral supplements for the animals regularly to ensure they remain healthy
- Planning livestock culling and selling of livestock after some stipulated period e.g. every three months selling 30 to 50 sheep
- Getting organized into cooperatives (several organized groups [chama] can form into cooperatives) to sell produce like milk.

According to Simion Lemeta Sanare (Trans-mara Sub-County range office Narok County), Livestock in the district depend on natural pastures. Cattle are freely grazed on natural pastures while goats depend mainly on natural browse. A few pastoralists have established tame pastures in their farms.

Feed conservation is taking root in the sub county. One acre produces 300 bales per harvest. Approximate 10,000 bales of Boma Rhodes was conserved last year which is being utilized in this dry spell of 1<sup>st</sup> quarter 2015. The pasture was opened up for direct grazing.



*Pasture situation and trends in Transmara Sub- County*

### **Pasture situation and trends in Transmara Sub- County**

| <b>Division</b> | <b>Improved pasture(Ha)</b> | <b>Napier grass(Ha)</b> | <b>Natural pasture(Ha)</b> | <b>Fodder shrubs(No)</b> | <b>Other legumes(Ha)</b> |
|-----------------|-----------------------------|-------------------------|----------------------------|--------------------------|--------------------------|
| Kilgoris        | 194                         | 86                      | 28,750                     | 709                      | 3.6                      |
| Keiyan          | 15                          | 119                     | 24,800                     | 6                        | 2.5                      |
| Lolgorian       | 68                          | 6.9                     | 69,500                     | 370                      | 1.6                      |
| Kirindon        | 218                         | 34                      | 50,000                     | 355                      | 83.8                     |
| Pirrar          | 460                         | 19                      | 23,400                     | 310                      | 5.9                      |
| <b>Total</b>    | <b>950</b>                  | <b>264.9</b>            | <b>196,450</b>             | <b>1,750</b>             | <b>97.4</b>              |

*Sourced from a report livestock department transmara sub county*

### **Pasture and fodder conservation**

After intensive sensitization was done one can say that there is success story and Pasture development in the sub county is taking place at an increasing rate.. Few farmers in the district have ventured into the practice but in a very low speed because of fear of the labor demand involved in the process. The sub county animal husbandry team is in the process of mechanization harvesting of pastures. They have a bailer and a mower, and are expecting a tractor soon to drive the implements.

## Prices of grass and legume seeds

| Type of legume/grass | Price /kg | Remarks                                    |
|----------------------|-----------|--|
| Lucerne              | 1,300     | Available at KFA stores, Kilgoris          |
| Desmodium            | 3,340     | Available at KFA stores Kilgoris, on order |
| Rhodes Grass         | 700       | Available at KFA stores, Kilgoris          |

## Types of fodder crops/trees/shrubs in the district

| Division  | Type of fodder crops/trees/shrubs          |
|-----------|--|
| Kilgoris  | Sesbania, Calliandra, Leauceana            |
| Keiyan    | Sesbania, Calliandra, Leauceana            |
| Lolgorian | Sesbania, Calliandra, Leauceana & Mulberry |
| Pirrar    | Sesbania, Calliandra, Leauceana            |
| Kirindon  | Sesbania, Calliandra, Leauceana            |

## Constraints of feeds

| Constraints   | Remarks   |
|---|---|
| <ul style="list-style-type: none"><li>• Poor land ownership hinders pasture development</li><li>• Communal grazing system does not allow planned grazing system</li><li>• Overstocking depleting all pasture and fodders resources and frequent conflicts hampering full utilization of resources</li><li>• Land disputes</li></ul> | <ul style="list-style-type: none"><li>• Improvement of land tenure system</li><li>• Commercialization of livestock enterprises</li><li>• Intensification of forage conservation methods through training and demonstrations</li></ul> |

Some of the best practices available are like the Good dairy practices – The main objective is to enumerate importance of on-farm practices on raw milk production and to explain good hygienic practices from production to processing.

Milk and milk products make a very significant contribution to human nutrition. Dairying provides one of the most cost-effective methods of converting crude animal feed resources into high-quality protein rich food for human consumption. However, milk due to its high water content is a perishable commodity requiring special consideration to ensure it reaches the market in an acceptable condition

Milk composition is a basic evaluation of the feed conversion efficiency into milk and determines the suitability of milk to be processed into further products.

Main factor determining milk composition is the breed of lactating animal as well as environment and pasture. Hence on-farm practices should ensure the *safety* and *quality* of milk and milk products to protect consumer's health and to facilitate

trade. And also ensure that milk is produced by healthy animals under acceptable conditions in balance with local environment.

## **Good Dairy Farming Requirements [(GDFP)]**

### **1. Animal Health-** Milk producing animals need to be healthy hence;

- Prevent entry of disease into farm
- Have in place an effective herd health management programme
- Use all chemicals and veterinary drugs as prescribed
- Train people appropriately

### **2. Milking Hygiene**

- Milk should be harvested and stored under hygienic conditions & equipment used should be suitable and well maintained
- Ensure milking routines do not injure cows or introduce contamination
- Ensure milking is carried out under hygienic conditions
- Ensure milk is handled properly after milking

### **3. Animal feeding and water-** Animals need to be fed and watered with products of suitable quality and safety

- Ensure animal feed and water are of adequate quality [physiological needs]
- Control storage conditions of feed
- Ensure the traceability of feedstuffs bought off-farm e.g. concentrates

### **4. Animal Welfare-** follow these principals to keep healthy animals

- Ensure animals are free from thirst, hunger and malnutrition [adequate Feed + clean water]
- Ensure animals are free from discomfort [Proper housing walking area, clean bedding etc]
- Ensure animals are free from pain, injury & disease [Herd health mgt program]
- Ensure animals are free from fear [avoid mistreatment & provide security]

**5. Environment** – milk production should be managed in balance with local environment surrounding the farm

- Have appropriate waste mgt system [to avoid environmental pollution]
- Ensure dairy farming practices do not have adverse impact on local environment e.g. control run-off, avoid contamination by fertilizers, chemicals, pesticides etc.

### **Why GDFP?**

- Consumers all over the world are demanding milk and products that are free from pesticides, mycotoxins, veterinary drugs residues and other chemicals not forgetting the pastoralist communities who depend on the milk and the livestock
- If GDFP is observed, the resultant milk and milk products reaching the industry will be safe for processing and consumption. Good manufacturing practice [GMP] is only possible if raw product reaching the processor is of good quality
- Use of HACCP system as well as SPS measures are important with respect to WTO

### **HACCP food safety management system.**

- HACCP – hazard analysis critical control point. It is a tool that identifies specific hazards and measures for their control to ensure food safety
- Focuses on prevention rather than end product testing

Currently, Brookside and Spin Knit are the only HACCP certified processors but KCC and Githunguri are undergoing the process.

### **A. To see how this is being practiced in Narok, we held an on farm demonstration in one of the farms with Narok County.**

The farmer is currently planting three types of pasture that are improved;

- a) Napier grass- the farmer plants this grass in a piece of his farm. He grows the Kakamega 3 variety that is an improved variety of the grass. He also has plans of introducing the improved version of Kakamega 5 which is more nutritious to the livestock's needs. The participants were told that Napier grass produces more biomass than most improved pasture making it very suitable for small scale farms. Napier grass with proper can grow over 2 meters in 2 months, and

continuously coppices. He did advice that all that is needed is mainly cow dung to fertilize the area that you have planted this grass. Moreover, the farmer also added that you could harvest the grass as soon as it is 1meter long and store it in the dry season. Napier grass should be grown at a spacing of 2 meters by 2 meters and planted at a depth of 2 feet.

- b) Boma Rhodes- This is a leafy perennial grass which grows to 30 to 150 cm in height. Their roots have stolons and therefore spread easily in the field. The shoot base is compressed with leaf sheaths popping around. The grass contains the 4 essential food groups needed for livestock, i.e. vitamins, carbohydrates proteins and water. It takes up to 90 days for maturity. The grass is best harvested when it is at 30% of growth i.e. it has just started flowering because this is when the crude protein level is highest. The crop is harvested as wheat is harvested. In terms of seeds, 5 bags of boma Rhodes grass is enough to farm an acre. The mode of planting is that you cover the grass with a small amount of soil. The grass should be grown as the rains have just begun as heavy rain will wash the grass away.
- c) Desmodium- is a trailing or climbing perennial legume with small leaves and deep roots. He intercroops the crop together with Napier grass. The best time to plant is at the start of rains. Desmodium is grown between rows of Napier grass. By planting the Napier grass at a spacing of 1 m between plants and 2 m between rows, holes are made between rows of the newly planted Napier. Desmodium cuttings are planted 30 cm apart, as you would sweet potato vines. When desmodium is grown with Napier, the nitrogen it adds to the soil benefits the Napier and reduces the amount of nitrogen fertilizer required for topdressing the famer informed us. Desmodium produces the highest amount of protein in the farm for the livestock.

#### A. Water Pond

The farmer recently embarked on the construction of a water pond which was aimed at capturing the rainfall runoff. The pond maximum depth is 6 feet and minimum depth is 3 feet. The length and width of the pond is variable depending on the available land, it is advisable that the depth isn't too much to avoid accidents. The pond needs a 1 meter walking path and has grass grown around it.

#### B. Storage

The farmer explained that he has a well ventilated silo that is raised half a meter from the ground to avoid vermin infestation that stores the hay. The silo is where he store hey for his livestock and also this feed is used in different rations to create the best feed for the livestock. This is prepared by using a grinding machine. Storage

ensures that the hay is free of disease and also the livestock will have food during the dry spells.

### C. Zero Grazing

The farmer has a zero grazing facility that is divided into two parts; one for calves and the other for the mature livestock. This facility is informed by the fact that the farm isn't big enough to allow for movement for the cows and also because the farmer is building a biogas digester, and thus he will need a central place to collect cow dung from.



*Cattle grazing in Olkirreruki village in Lolgoriam*

## Chapter 4

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### **Identified Energy Saving Technology Saving Technologies in Narok County**

Energy Production and utilization has a close link with climate change. Biomass energy such as charcoal and firewood continues to be used in the country's urban and rural households. High dependence on biomass sources of energy such as firewood and charcoal has increased pressure on forests and has subsequently led to forest destruction. To achieve the goal of becoming a middle-income by 2030, it is important for Kenya to attain energy security and accessibility to address increasing energy demand. It is critical also to ensure efficiency in production of renewable energy and use of efficient technologies in consumption.

In Narok County, communities have put in place measures to ensure household efficiency particularly at household level.

#### **Briquettes Making in Ololunga and Enosupukia**

A briquette is a block of compressed combustible material and is a potential alternative fuel for households and institutions. They can be used as fuel instead of charcoal, firewood or mineral coal and may cost less. The use of briquettes could prove to be more economical, health and environmentally friendly to provide energy and depending on which materials were used to make the briquette; they may burn cleaner than charcoal.

The common materials used;

- Charcoal, Sawdust , Wood shavings, Biogases
- Tree seed shells croton seed shells,
- Agricultural waste; coffee husks, rice husks, coconut shells, maize cobs, wheat/beans/barley straws, groundnut and macadamia shells,
- Waste paper.

All this is dependent on the availability. Also other important factors to consider when picking briquette material is;

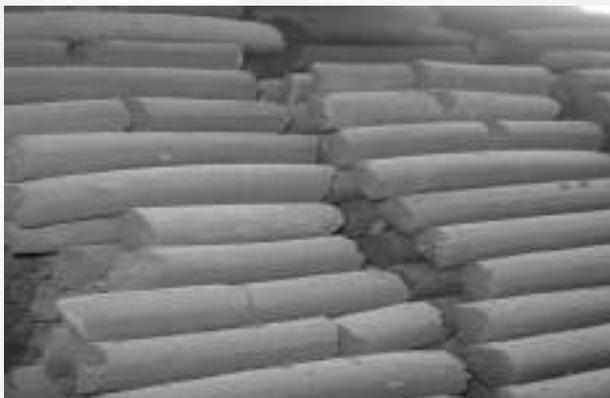
- ✓ Moisture content of the material
- ✓ Ash composition and content
- ✓ Flow characteristics

## Method

Materials are first carbonized to reduce the smoke produced when burning the briquette. Carbonization can be achieved through the following carbonizes; Portable cylindrical structures, used oil drums, open air carbonizes, constructed trough made from bricks, one could also use un-carbonized raw material; however the briquette would burn with smoke.

The process of producing these briquettes is very simple;

- Sort the raw material using a wire mesh to remove unwanted particles-stones, wood chips, etc
- The selected biomass material can be chopped/ crushed in small pieces eg. Groundnut shells, bagasse wheat straws need to be chopped into small size. However material such as coffee husks, rice husks, sawdust would not require shredding,
- Use an appropriate binder like Starch, Molasses, Cassava, Wax, Cow dung, Lime, Waste paper, Gum exudates from trees, Clay, red soil or any other fine soil with the selected biomass waste,
- The binder is added and mixed thoroughly to enhance compactness and prevent the substrate from falling apart/crumbling up,
- Mix up the binder and the biomass at particular ratios depending on the material used [Ensure the binder does not exceed 10% regardless of the type of biomass]
- Some biomass materials require to be soaked in water for a number of days to soften it enough e.g. waste paper,
- Finally the materials are ready for compaction either by hand or machine,
- The briquette will require to be left to dry a week depending on weather,
- Briquettes should not be exposed to water after drying,



*Samples of the briquettes*

## **Solar Power**

Solar power offers a very unique opportunity to mitigate and adapt to the effects of climate change and is an alternative to fuel wood as a source of energy. Solar lamps are now locally available and at affordable prices. The benefits of using solar lamps are numerous. They can be used for lighting and charging.

Solar power is generated, propagated and utilized using various methods and equipment depending on the needs of the consumer. Some basic solar equipment include; solar panels, solar lamps, solar heaters (both for domestic and commercial use), solar vehicles in Germany, solar charged phones and solar dryers.

One key advantage of solar energy is that the raw product is readily available and thus also environmentally friendly. Additionally, poverty is alleviated as the community can save on their earnings.

## **Solar Lamps**

In Narok County communities have adopted simple solar powered appliances with M-Kopa solar being the most famous. M-kopa Solar energy is provided by a company called M-Kopa Solar which, through partnering with Safaricom, provides both the solar equipment and gives users credit payment option making it affordable.



*Sample of solar lamps displayed during the energy sensitization workshop and onfarm demo*

## **Fireless cooker**

These types of cookers are made of baskets. The practice is not common in Narok County and women groups need trained on how to make this cooker. The inner part of the fireless cooker is woven with cotton waste materials, spongy lining, black Textron material and black polythene to absorb heat. This ensures food continues to cook and remains warm for a longer period.



### **Solar Driers**

Solar driers is used as a drying tool especially in areas where there are plenty of vegetables during the rainy season but during the dry spell the vegetables are not available and are very expensive. The technology helps farmers to preserve the vegetables they are able to sell them during the dry season.

### **Solar cookers**

Solar cookers kits are designed to trap radiation rays through reflection. The inner sides of the kit are made of a reflector to concentrate heat and their absorption by the black painted sufuria, which retains the heat for cooking. The kits have proved to be effective in hot areas and during the dry season.



*Simplified solar cooker for easy use by communities, using direct solar*

### **Integrated Chick Rearing Cooking Stove**

The jiko is unique and sophisticated in its own style. It has two burners, brooder and a chimney. The brooder is used to raise chicks after hatching. The jiko is also composed of two burners connected to each other by a tunnel. Only one burner is lit directly while the other receives fire through the tunnel. Subsequently, smoke escapes through a chimney constructed next to the second burner. The two burners enable faster cooking of food and saves energy

The Jiko requires cheap raw materials that are locally available only need silt instead of sand and anthill soil to act as cement. Other requirements include: wire mesh,

1/4kg 2-inch nails, gauze, old newspapers, posts, rafters, grass, and banana trunk.

The energy saving jiko has a number of benefits to its users.

- It only uses a small quantity of wood fuel.
- The jiko helps in mitigating effects of climate change by preventing wanton tree cutting for fuel.
- It also saves energy because two burners are used at ago with the same wood fuel.
- The chimney helps smoke to escape and therefore guarantees good health to the user.
- It also conserves heat.
- There is also explicit livelihood improvement when the user realizes such huge income from chicken rearing.
- Furthermore it is affordable to make since it entails the use of locally available raw materials.

To have a chick rearing component the jiko is build with a brooder extension. As wood burns in a chamber as cooking continues it generates heat that warms the chicks in a two- square-meter enclosure attached to the stove to allow circulation of air and enable the chicks feed and exercise. This is a source of livelihood that is reducing pressure on natural resources.

### **Kenya Ceramic Jiko**

The Kenya Ceramic Jiko (KCJ) is one of the oldest energy saving jiko models in Kenya. The Jiko is portable and improves charcoal burning. It consists of a metal cladding with an interior ceramic liner that is perforated to permit the ash to fall to the collection box at the base. A thin layer of vermiculite or cement is placed between the cladding and the liner.

A single pot is placed on the rests at the top of the stove.





*Sogoo Community Forest Association showcasing their energy saving technologies during an energy sensitization workshop.*

### **Biogas Production**

Establishment of biogas units helps the community members to utilize the cow dung collected from their livestock kept. The biogas technology is expected to ensure environmental sustainability as those households likely to adopt it will reduce their energy related cost and reliance of forest based products for household energy.



*Biogas plant in Ololunga during the onfarm demo*

In Trans Mara energy regulatory commission (ERC) has initiated a biogas process. The project is being implemented through local youth groups and will deliver several bio gas plants in the area.

### **Charcoal Production Technologies-Charcoal Kilns**

The alternative charcoal production technology aims at changing forest adjacent communities' attitude on wood use for charcoal production. The kilns are made up of a Chimney, adaptor and the main drum. It is used to produce maize combs charcoal that can be used in a jiko or added value by making charcoal briquettes



*Examples of charcoal production with Charcoal Kilns*

## Chapter 5

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### **Identification and documentation of local indigenous Knowledge on climate change mitigation and adaptation in Narok County**

*"We recognize that the traditional knowledge, innovations and practices of indigenous peoples and local communities make an important contribution to the conservation and sustainable use of biodiversity. We acknowledge the importance of the participation of indigenous peoples, wherever possible, in the benefits of their knowledge, innovations and practices." - par. 22 outcome document indigenous peoples conference 2014*

Important advances have been made in the United Nations International Decade of the World's Indigenous Peoples. This was approved by the General Assembly committed itself to seeking improvements in the situation of the more than 300 million Indigenous Peoples worldwide between 1995 and 2004. The UN's goal for the Decade was "to strengthen international co-operation to solve the problems faced by Indigenous Peoples in such areas as human rights, the environment, development, education and health. In order to make sure that the first decade made an impact, the General Assembly adopted a Second International Decade, which commenced on 1 January 2005 and conclude in December 2014. During the two decades, one of the most crucial was the adaption of the Declaration on the Rights of Indigenous Peoples by the general assembly in 2007. There has been a lot of advancement for Indigenous Peoples globally and their participation in different forums have helped them in fighting for their rights. It is for this quest of reaching out to them that this project decided to go a mile further to the local level to ensure that the voices from there are heard.

Taking climate change as a starting point, the assessment found that, first, farmers and pastoralists often associate their observations of climate change with other social and environmental changes, such as value change in the community, population growth, migration, urbanization, and land degradation. Second, some of the people interpret change as part of a cycle, which includes a belief in the return of some characteristics of ancient or mythological times. Third, environmental change is also perceived as the expression of extra-human intentionality, a reaction of natural or spiritual entities that people consider living beings. On the basis of these interpretations of change and their adaptive strategies, discussions with the communities focused on the importance of indigenous knowledge as a component of adaptive capacity. Even in the context of living with modern science and mass media, indigenous patterns of interpreting phenomena tend to be persistent. The results supported the view that indigenous knowledge must be acknowledged as process, emphasizing ways of observing, discussing, and interpreting new information. That

indigenous knowledge can help address complex relationships between phenomena, and help design adaptation strategies based on experimentation and knowledge coproduction.



*New face of livestock and the limited water within Narok county from the negative impact of climate change*

. Indigenous Peoples have interacted with their environment over generations through careful observations and skillful adjustments in traditional food-harvesting activities and lifestyles. Through ways of life closely linked to their surroundings, these peoples have developed uniquely insightful ways of observing, interpreting, and responding to the impacts of environmental changes. Indigenous observations and perspectives are therefore of special value in understanding the processes and impacts of climate change. There is a rich body of knowledge based on their careful observations of and interactions with their environment. Holders of this knowledge use it to make decisions and set priorities. In this case study, Indigenous Peoples are already reporting the effects of climate change, and IIN together with other organizations have attempted to incorporate knowledge and insights from Indigenous Peoples with data from scientific research, bringing together these complementary perspectives on the community livelihoods adapting to climate change.

The wisdom, knowledge and practices of Indigenous Peoples gained over time through experience and orally passed on from generation to generation has over the years played a significant part in solving problems, including climate change related

problems and its variability. Indigenous peoples that live close to natural resources often observe the activities around them and are the first to identify and adapt to any of these changes. The appearance and movement of certain birds, mating of certain animals and flowering of certain plants are all important signals of changes in time and seasons that are well understood in traditional knowledge systems. Indigenous People have used biodiversity as a buffer against variation, change and catastrophe; in the face of plague, if one crop fails, another will survive. In coping with risk due to excessive or low rainfall, drought and crop failure, some traditional people grow many different crops and varieties with different susceptibility to drought and floods and supplement these by hunting, fishing and gathering wild food plants. The diversity of crops and food resources is often matched by a similar diversity in location of fields, as a safety measure to ensure that in the face of extreme weather some fields will survive to produce harvestable crops.

Adaptation to climate change includes all adjustments in behavior or economic structure that reduce the vulnerability of society to changes in the climate system [Smith, Ragland and Pitts, 1996]. Whether people can adapt, and for how long, depends on the resources available. Africa is the region most vulnerable to the negative impacts of climate change and at the same time has low adaptive capacity. But the people, particularly at the local level, are making efforts to adjust to the changes they observe.



*A group photo of communities from Enosaeni –Narok county after documenting some of the IK*



*Scacity of water;community and livestock sharing limited water*

Climate change impacts and effects are still with us and are continuously affecting the rural, indigenous and pastoralist communities in Kenya and especially in Narok County. The pastoralist, local and indigenous communities plays key roles in adapting and mitigating by use of indigenous and traditional knowledge and has long been recognized as being particularly vulnerable to the impacts of climate change due to the close connection between their livelihoods,

culture, spirituality and social systems and their environment. At the same time, however, this deep and long-established relationship with the natural environment affords many indigenous peoples with knowledge that they have long used to adapt to environmental change, and are now using to respond to the impacts of climate change

### **Water conservation Measure**

Shallow wells were made in sandy river beds for water to collect. After drawing water the well was covered with sand to preserve the water for another drawing session. Wells were dug and ring fenced to monitor and control water use. As relates to watering of animals at water points, order was enforced to avoid conflicts. Drinking water was stored in special pots [Kesumet], also use of donkeys to fetch water during dry period and digging of wells for water security was also applied.

Ololung'a is populated mostly by Maasai community who are majorly pastoralist community; they depend a lot on livestock products that are meat and milk. The climate change factor brought the need of Indigenous Information Network to identify how prepared were the communities for incidences of climate change for the past and today.

The Maasai community named months differently according to most likely seasons, for example the month of January is known for drought while April they expect rains for cultivation. They consider the symbols of red cloud cover in the morning and blue smoky smelling clouds to show that drought is about to start. Frogs coming out of their hibernating places show the rains are about to fall and also a huge group of birds moving across the sky seasonally could predict rains.

When the nights are warm the Maasai people believe the rainy season is nearing, fluctuating water levels in the rivers accompanied by poor water quality represents for them the beginning of droughts.

Over the recent years they have recorded changes for example the inadequate water supply which they argued is as a result of clearing of forest cover. They bring out the issue of scramble for use of resources by the neighboring community the Kalenjins who have settled in Mau forest which they acknowledge as the main water catchment area.

They have also monitored the drastic change in weather pattern as they stated that the cold seasons accompanied by dry spell is very common now days compared to some years back when the warm weather of rains were common.

The community members use to depend on Ewaso Nyiro River during dry spell as they use to dig some small holes in the river and harvest water, but today the rivers can dry completely without getting a spring point.

The community used to prepare fodder for their livestock during drought seasons to sustain them and also a specific type of tree which is almost getting extinct due to over using with no replacement since it is an indigenous tree

Considering the fact that water is a fundamental aspect of the life of all living organism on earth and its scarcity is a threat for survival, the Maasai from Iolgoriani use several methods of water conservation to ensure sustainability. They separate the water points for livestock and human being by fencing the one for human being; this is to avoid the pollution of the water by livestock. Women could go very early in the morning to the river and fetch drinking water before it gets polluted by animals in a point where they share with animals.

They said that when the water is too small, they conserve it for basic functions like cooking, drinking while forgoing others like bathing and washing of clothes. They also move from where the water is scarce to places with plenty waters and pasture for their herds of cattle. In conflict management and resolution, they have selected and respected individuals to man the water point and arrange for a systematic way of water collection, reducing commotion while ensuring equal sharing among the dependants.

They could predict disaster ahead when they saw the animals growing fat and healthy. The human body feeling weak and fatigued represented danger ahead and also some wild birds like the ground hornbills could predict danger through the sounds they produced at night or very early in the morning.

### **Livestock**

Diverse livestock diseases were experienced. Occasionally, disease out-breaks were witnessed. Among the diseases were anthrax, East Coast Fever and Foot and mouth disease. Herbal medicine was used to cure some diseases, with other having no

cure. Among herbs used included *Seketeti* [Maasai], where seeds were ground and administered as cure for stomach diseases. In case an animal had died of unknown illness, they could tell whether the meat was fit for human consumption or not by the behaviour of safari ants. If the ants rejected the meat, it was unfit for human consumption.

Breed quality was achieved through borrowing of quality bulls as well as retaining quality cows. There was no deliberate action to reduce or maintain herd size. The larger the herd the better it was for the Maasai and Ogiek communities

There were livestock disease outbreaks, for instance orkipiei [disease affecting goats-lungs]. Herbs were used to cure such diseases. Some of the herbs are still used to cure livestock diseases [1/5 likelihood of use]

There are several livestock diseases that are cured using indigenous knowledge; herbals such as *Esaien*, *sisia*, are used to cure bloat and pneumonia for the animals.

The animals are also important in predicting danger ahead, for example when slaughtering an animal and find swollen bile, it predicts the danger of attack/war by the cattle raiders or enemy. The owl bird and some other wild birds also predict death in a society when they position themselves and start singing or producing scaring sounds in the evening or night hours.

Anthrax for animals is common but the community uses herbal medicine such as *emisigio*. Wounds in the hooves of the livestock are treated by use of the animals' urine and also making the animal to stand on water for sometimes



Women participants listen keenly during discussion, they talked about traditional population control measures.

## **Pasture management**

Pasture reserves were set aside, for use during dry spell. Burning of grass was also done to allow sprouting of fresh pasture and kill pests. During dry spell, fodders were cut from forest bushes for feeding livestock. Maasai being majorly pastoralist they consider fodder very important for their animals and this always calls for the need to conserve and manage well the grass for present and future use. They use different methods of fodder management such as;

- ✓ Migration to look for greener pasture as they give room for the growth of the grass for future use.
- ✓ They fence specific places set for fodder growth.
- ✓ They set a section in their farms for fodder and cultivate the rest for crops.
- ✓ They use the paddocking method of grazing to ensure there is constant supply and replenishment of grass.

The Maasai community uses their animals to predict weather changes. The animals tend to behave strangely by lifting up their noses pointed to a certain direction as if they smell something, this they interpreted as the animals smell rain. After a short while of this observation the rain falls, this is therefore important in preparing the lands for planting.

## **Energy**

Firewood, and to limited level cow dung were main energy sources. Use of open fire and three stones was prevalent. Not all tree species were harvested for firewood. Some were seen to have special purposes, while other were poisonous, hence avoided. Among special tree species that were spared include *Mugumo* and *Mtamayu*. Energy source among the maasai community does not contribute much to the climate change since the maasai women does not burn a lot of carbon into the atmosphere or use a lot of firewood to cause deforestation. The community depends most on the fallen dry branches for firewood but conserve it through the use of the cow dung as an energy source. It's dried and burned to cook meals and also provide warmth during cold seasons, it's also used in the cow shed to scare mosquitoes from feasting on livestock.



*The plate shows the Ogiek youth and elder explaining the details of a book published by Ogiek People Development Program [OPDP]*

## **Indigenous Knowledge on water resource conservation**

In response to the question on means of predicting rains and droughts the community highlighted a number of issues and techniques of predicting weather change they mentioned such as; singing of birds such as hornbills, animals behaving with funny reactions, mist in the evening and safari ants coming out of their hiding places predict that rains are about to fall. This enabled them to start preparing land for plantation for the purpose of food security.

In the issue of water conservation, they constructed ridges across the streams to contain water for future consumption by livestock and human beings. They also use traditionally made pots and buckets to store water for drinking. This drinking water is gotten very early in the morning before the animals pollute the water during dry seasons.

In order to prevent and resolve a conflict that might arise over water resource among the community members or human-wildlife, they fence around the water sources meant for human consumption different from animals in order to create barrier. Specific people were assigned the duty of manning water sources to avoid conflicts and also animals were directed to their specific place of drinking.



*A Maasai elder contributing a point on their traditional ways of weather prediction at AIC church Iolgoriani*

## ***Effective uses of water resource during droughts***

Climate Change effect currently has its impact to the environment and the dependants of the resources found in those environments. There is much to learn from indigenous, traditional and community-based approaches to natural disaster preparedness. Indigenous people have been confronted with changing environments for millennia and have developed a wide array of coping strategies, and their traditional knowledge and practices provide an important basis for facing the even greater challenges of climate change. Although their strategies may not succeed completely, they are effective to some extent and that is why the people continue to use them. While indigenous communities will undoubtedly need much support to adapt to climate change, they also have expertise to offer on coping through traditional time-tested mechanisms.

To capitalize on, develop, expand and mainstream indigenous adaptation measures into global adaptation strategies, traditional knowledge should be further studied, supported and integrated into scientific research. Incorporating indigenous knowledge is less expensive than bringing in aid for populations unprepared for catastrophes and disasters, or than importing adaptive measures which are usually introduced in a top-down manner and difficult to implement, particularly because of financial and institutional constraints.

The partial success of the use of traditional knowledge in coping with climate change leads to the conclusion that a healthy relationship between scientific knowledge and traditional or indigenous knowledge which both have their limitations is desirable, especially in developing countries where technology for prediction and modeling is least developed. Whereas most precipitation models and records mainly focus on changing amounts of precipitation, indigenous people also emphasize changes in the regularity, length, intensity and timing of precipitation. Whether or not scientific models are incorporated into local explanations depends on the status and accessibility of science within a culture and on the influence of the communications media.



*Having water trough for cattle is a good practice for livestock*

# Chapter 6 :

## Olorukoti community resource centre

*“We stress the importance of the participation of indigenous peoples in the achievement of sustainable development. We also recognize the importance of the UN Declaration on the Rights of Indigenous Peoples in the context of global, regional, national, and sub-national implementation of sustainable development strategies.” par. 49 World indigenous peoples conference outcome document 2014*

The resource centre given the name Olorukoti community resource centre is housed by the Youth Empowerment centre in Kilgoris Transmara subcounty of Narok. This has now empowered the youth centre to be vibrant and have added value and benefit sharing by both in sharing information learning from each other.

The main objective of the centre is to Support Narok county community to collect, manage and disseminate Reliable climate change and environmental information. The centre main mission is to build and enhance the adaptive capacity of Narok residents to climate change and environmental issues through knowledge management with a goal to Strengthening climate change adaptive capacity of Narok County community.

Has a very clear message- OUR Knowledge our heritage that knowledge is one of the very important for Indigenous peoples and their local communities which has helped conserve and protect our heritage for centuries. This aspect is well recognized globally and communities should continue passing that knowledge from one generation to the other. Reaffirming the commitments by Parties to the Convention on Biological diversity which Kenya is a party , its article 8j and related provision



*Signs showing the direction of the Resource Centre*



*Section of the resource centre being visited by community members in Transmara ,Narok county*

*'Information is empowering. A community who does not access any information will always remain behind in development and they will never know what goes around them. Having the resource centre within a community is one of the best practices that help empower the people. No matter whether they are literate or illiterate that quest for what is going around them will be something that will make a difference. The youth who hang around in verandas and corridors of buildings in the shopping centres will have something to give them hope. This is the reason why during the formulation for this project the two organizations thought it was wise to have a best practice on communication, education and public awareness venue where the community can come and get information, awareness on issues of Climate change , other environmental and development aspect in general.' IIN 2015*



*Student from DEB - Kilgoris visiting Olorukoti Community Resource Center*

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