

The



Chronicles

THE NEWSLETTER OF A -SUSTAINABLE APPROACH TO LIVELIHOOD IMPROVEMENT



Inside

- Place of the alluvial aquifer waters
- Mapping high value multipurpose trees
- Managing natural resource to enhance food security
- Balancing livelihood needs and environmental concerns
- Building people's resilience to mitigate effects of climate change
- Building peace and harmony in Kenya's recourse starved ASAL areas



Objectives

To use sustainable Natural Resource Management strategies to enhance water and food security for sustainable livelihoods of smallholder farmers.

To examine the influence of Value Chain Development, entrepreneurial opportunities, and innovations on poverty alleviation among the women and youth in improving livelihoods in western and southeastern Kenya.

To explore the use of sustainable renewable energy and its contribution to entrepreneurial Job Creation options for youth and women in western and southeastern Kenya.

To assess the determinants of nutritional status and its health effects among women and children in Western and South Eastern Kenya.

A. To demonstrate how the use of ICT and its applications can be instrumental in the documentation and dissemination of real time information (on sustainable livelihood and natural resource management) in Southeastern and Western Kenya for sustainable livelihoods.

Guiding Principle

“Education of People from Developing Countries Willing to Serve Society and Contribute to the Development of Their Country”.

- Ms. Grietje Wille, ASALI Project Fund Provider

Editor's Note

The SEKU-ASALI Project team extends warm welcome to our readers to this inaugural issue of the Project's newsletter. As its name suggest the newsletter's main objective is to give our partners and stakeholders a glimpse into the various activities the Projects has engaged in within specific time periods.

In this issue, our activity leads have given a rundown of what had preoccupied them in the recent past as they engage with communities to conceptualise, plan and implement livelihood improving activities, thereby fulfilling the key objective of the project, namely to serve society and contribute to the development of the country. Not left out of the loop are the research assistants, most of whom are drawn from the Project's target communities and who are, therefore, conversant with the livelihood-related challenges and opportunities in the regions.

On Food security, the project's activity lead for agriculture and natural resource components, Dr. Dorothy Amwata, gives an account on how the Project has worked to mainstream women and the youth in the economic engagement of the communities in a bid to enhance food security.

Water for pasture and domestic use has been a perennial problem to the residents of Kenya's arid and semi arid regions, which account for 80 percent of the country's land mass. Dr. Moses Mwangi, the Project's water activity lead, and research assistants have painted a an elaborate picture of the numerous challenges facing the communities in the ASAL regions, detailing some of the measures the ASALI Project has put in place to mitigate the perennial water scarcity.

Also covered in this issue is the Project's involvement in building resilience among the communities to address the negative effects of climate change; balancing human economic activities with environmental conservation concerns; as well as conservation of high values trees for medicinal and economic wellbeing.

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Message from the Vice-Chancellor



*Prof. Geoffrey Muluvi
Vice-Chancellor*

The South Eastern Kenya University is proud to be associated with *A Sustainable Approach to Livelihood Improve* (ASALI) Project. The University feels honored to host the SEKU-ASALI Project, a component the larger ASALI Project. As a partner in the tripartite collaboration of Vrije (VU) Amsterdam of the Netherlands, Moi University of Kenya and South Eastern Kenya University (SEKU), our University has realised valuable benefits of the Projects which have manifested in numerous ways.

The ASALI Project research activities target, in large part, the arid and semi lands (ASALS). The ASALS are home to 25 per cent of the Kenyan population accounting for close to 11.3 million people. With scarce and shifty rainfall patterns, and over 70 percent of Kenya's livestock population the bulk of national game reserves, the ASALS are highly susceptible to land degradation, a situation that render the residents highly vulnerable in terms of food security.

Situated right in the ASAL region, SEKU, must of necessity, device and champion best practices in tackling and alleviating the long suffering among the local communities occasioned by perennial food insecurity, itself an offshoot of poor climatic conditions, environmental degradation, unsustainable water resource management and a general lack of foresight in the exploitation of available natural resources. Understandably, our academic and research focus as a university is on agriculture, health, environment and natural resources.

The significance of this partnership between us and Vrije Universiteit Amsterdam, through the SEKU ASALI Project, in helping SEKU to achieve its mandate cannot be overstated. The project has provided invaluable capacity building support through funding for our staff pursuing their PhD

and master's degree programmes. Besides, the area-specific shorts courses offered by the Project have seen our staff develop important skill and competencies in various areas, resulting in improved work output.

On their part, staff and students of SEKU have gained a great deal through the exchange programme between SEKU and VU. At the same time, the project has facilitated easy interaction between SEKU and our sister university, Moi, with the staff and students of the two institutions being able to share knowledge and experiences to bolster our academy programme delivery and research activities. The partnership has also allowed a flow of students from VU to take up diversified field researches in Kitui County.

Most importantly, the project has facilitated our outreach programmes, thus enhancing SEKU visibility in areas such as Kajiado, Makueni and Kitui counties, where our impact is now being felt in a positive manner as the SEKU-ASAL engage the local communities in range rehabilitation, grazing management, water harvesting, renewable energy and vulnerability monitoring among other livelihood enhancing activities.

The foregoing are important gains that we must all as patterns nurture and allow to blossom into even greater collaborative arrangements for the good of our humanity as was envisioned by the founder of the Legacy Fund. As the funding comes to a close later this year, SEKU is committed to sustaining the endeavours developed in the four years of external support.

*Prof. Geoffrey M. Muluvi, PhD
Vice Chancellor
South Eastern Kenya University*

Word from the Director

It gives me great pleasure to be part of this documentation and recollection of some of the ASALI project experiences and achievements at SEKU. Looking down the project memory lane that spans half a dozen years, we can be satisfied with all that has been achieved in conformity with the overall project goal. Outstanding are the applied



Dr. Denyse Snelder
Director, ASALI Project

and participatory researches, with findings of immediate and practical application in the target pastoral and agro-pastoral settings. The research, conducted jointly by SEKU staff, students and communities, will lead to both short and long term effects on livelihood development, play a critical role in designing poverty reduction interventions, and, in so doing, help build resilience among the vulnerable (agro-) pastoral communities. These achievements meet the core orientation of the Legacy fund of the late Ms Grietje Wille (through which the project is funded) to provide support for *"the education of people from developing countries who are willing to serve society and contribute to the development of their country"*

It is appreciable that the ASALI project objective and thematic areas link well to Kenya's Vision 2030 which aims to transform the country from a low income, agrarian economy into an industrialized, middle income country by 2030, providing a high quality of life to all its citizens in a clean and secure environment. The accomplishment of this development program is hinged on the provision of sustainable food security, which, in turn, relies on the sustainable management of the country's natural resources. This explains why both *national food security*, a key objective of the agricultural sector, and *"a clean, secure and sustainable environment"* are placed high on the Kenyan Government agenda.

SEKU's efforts to *"serve society and contribute to the development of the country"* have been directed at some of the most vulnerable areas in the Kenya, i.e., the *arid and semi-arid lands* (ASAL). Research is conducted among the marginalized poor communities living in these ASAL areas, following a transect laid out over the ASALI project area.

Integrated and trans-disciplinary approaches are used to investigate aspects of livelihood improvement, including sustainable natural resource management, entrepreneurial opportunities and value chain development, renewable energy, and cross-cutting themes such as information access through ICT. The focus of the interventions is on small-scale farmers, women and youth in the vicinity of the institution, with the objectives to *1) develop sustainable natural resource management strategies to enhance water and food security for sustainable livelihoods of smallholder farmers, 2) examine the influence of value chain development and entrepreneurial job creation options for youth and women, 4) examine nutritional behavior and its effects on health among women and children, and 5) demonstrate how the use of ICT and its applications can be instrumental in the documentation and dissemination of real time information on sustainable livelihood and natural resource management in southeastern Kenya for sustainable livelihoods"*.

Examples of project activities include those related to forestry and revolving around appropriate plant species for arid and semi-arid areas. Communities have been empowered through educational and training programmes on technologies for harvesting rain-water and surface runoff, such as, sand dams, earth dams, water pans, and rock catchments, yielding water for food production. Likewise, technological innovations for the collection of water from atmospheric moisture sources, such as, humidity, dew and fog, are being explored. The experimental set up for assessing water harvesting technologies near SEKU's campus at Kitui will go a long way in providing a research base for staff, students, and communities, with the ultimate goal of building resilience among local communities in the arid and semi-arid lands. Cognizance is taken of the modern ways of pastures rehabilitation and conservation, including the introduction of new grass varieties and its impact on livestock farming, a sector currently facing a myriad of social, economic and environmental challenges. SEKU has finally benefited from the ASALI project by adding value to its staff through sponsorship of a number of post-graduate students engaged in data collection and analysis and the writing of scientific papers for

The ASALI Project VU and SEKU Team



Dr. Denyse Snelder

Dr. Denyse Snelder holds a PhD degree from the University of Toronto, Canada, based on her research focusing on vegetative control of soil erosion in the semi-arid Baringo District, Kenya. She holds a full-time position at the Vrije Universiteit Amsterdam as senior advisor and director of various research and capacity building projects, such as Spatial Planning for Agribusiness and Public Policy Development in greater Western Kenya (SPADE); Natural Resource Management and Conflict Resolution for Stability and Inclusive Growth in the Greater Virunga Landscape (3C Project), funded by NUFFIC; A Sustainable Approach to Livelihood Improvement in Kenya (ASALI), funded through a legacy by VU Amsterdam.



Prof Mary Mburu

Professor Mburu is an alumna of the University of Reading in the UK. Mary is a trained agronomist whose teaching career spans over a period over twenty years, 14 of which were at the University of Nairobi. She is the SEKU ASALI Project Principal Investigator (PI) and Project Coordinator and, the agronomy activity lead in the AWP&B.



Ms. Colette Gerards

Ms. Gerards studied Cultural Anthropology at the Universiteit van Amsterdam, specializing in Medical Anthropology and Development Studies. She joined VU from NWO/WOTRO in 2010 to coordinate the SKILL-programme up to 2014. Currently, she is the coordinator of the VU part in the EMA2SA consortium and many activities and projects with the South Africa VU Strategic Alliances Programme. She is part of the VU team in the ASALI and the Nuffic NICHE projects in Kenya. Colette is the accounts manager for the region 'Africa' for VU International Office, facilitating partnerships, among several other engagements.



Ms. Sabina Di Prima

Sabina MSc. Degree is in Environment and Resource Management from the Institute for Environmental Studies (IVM) of the VU Amsterdam and a BSc in Business and Economics from the University of Catania, Italy. She is currently pursuing her PhD studies at the Athena Institute of VU Amsterdam, her research focusing on comparative case study analyses and the development of a generic framework to scale-up Nutrition-Sensitive Agriculture (NSA) interventions in different contexts. Sabina is a sustainable land management specialist at the Centre for International Cooperation at the Vrije UUniversiteit (VU). Her work focuses on food security, natural resource management, climate-smart agriculture, indigenous knowledge, local farmer innovation and rural development.



Dr. Dorothy A. Amwata

Dr. Amwata is a graduate of the University of Nairobi, Kenya. Dorothy is Range Management Socio-Ecologist with 16 years of work experience in and outside Kenya. She holds a PhD Degree in Range Management (Resource economics-ecology option). She leads agriculture and food security; and natural resource components of the ASALI Project.



Ms. Maureen Nzilani

Ms. Nzilani holds a Bachelor of Commerce (Accounts) from the Catholic University of Eastern Africa, and is currently pursuing her master's studies in Business Administration at Jomo Kenyatta University of Agriculture and Technology. She is a trained accountant with vast experience in handling research grants and, is currently the Project Accountant for the SEKU-ASALI Project.



Dr. Patrick Kisangau

Dr. Kisangau has a PhD degree (Economic Botany) from the University of Dar es Salaam. His research focuses on enhancing livelihoods through socio-economically useful plants and conservation of threatened ecosystems. In the SEKU ASALI project, he leads the high value trees component research.



Dr. Moses Mwangi

Dr Mwangi who holds a PhD degree from Loughborough University in the UK has a background in Water Engineering and Water Resources Management. He has interest in participatory research and development of appropriate technologies with potential to reduce people’s vulnerability in the ASALs. Dr Mwangi takes the lead role in sustainable access to water resources in the SEKU ASALI project.



Dr. Charles Ndung'u

Dr Ndung’u holds a Master of Environmental Science degree from Egerton University, and a PhD (Environmental Science) from Dr. YS Parmar University of Horticulture and Forestry, India. His research interests are in land use change and its effects on natural resources, climate change and vulnerability of communities. He leads the resilience building component of the SEKU ASALI Project.



Dr. Patrick Kariuki

Dr Kariuki holds a PhD (Geology, GIS and Remote Sensing) from Technical University Delft, the Netherlands. He has a wide experience in geological resource mapping and use of remote sensing and GIS tools in various research fields having taken part in many multidisciplinary research projects. He is involved in hydrogeological research and vulnerability of borehole water resources in the ASALI Project, and incorporates the technologies in understanding the dynamics and sustainable use of ground water in the ASALs.



Mr. Osir Otteng

Mr. Otteng hold a master of art degree in Communication Studies from the Univerity of Nairobi, Kenya, and Master in Public Sector Management from Africa University, Zimbabwe. He is a PhD student in Communication Studies (Health communication) at Masinde Muliro Univerity of Science and Technology, Kenya. He is the activity lead for the Publicity and Visibility component of ASALI Project.



Building People's Resilience to Mitigate the Effects of Climate Change in Kitui



By Charles Ndung'u

The impacts of climate change in society are becoming more and more pronounced: Temperatures are alarmingly going up, rainfall is becoming more erratic, polar ice-caps and glaciers are melting. The levels of water bodies are rising and extreme weather events are becoming more frequent and intense. Droughts and floods occur more often and climatic zones are shifting. These facts are severely challenging the livelihood and food security of communities, with negative effects on sustainable development.

Kenya is one of the world's most vulnerable countries, facing climate related challenges. More than 70 per cent of Kenya's population lives in rural areas and is heavily dependent on natural resources for survival, rendering them particularly vulnerable to climate change: They depend directly on agriculture, forestry and fisheries, natural resources like water, biodiversity, mangroves, coastal zones, and grasslands, all these climate sensitive.

Assessing vulnerability to climate change is, thus, important for defining the risks it poses and providing information for identifying measures to adapt to climate change impacts.

It is against this background that ASALI Project in its 2019 - 2020 budget, put premium on resilience building among the residents of the south eastern region of Kenya, who are particularly vulnerable due to the arid and semi-arid nature of their land. It embarked on an assessment of the extent of impacts of climate change on peoples' livelihoods as determined by the magnitude of the change, the extent to which the livelihoods are affected and the ability of the people to deal with the ensuing change. The approach constituted vulnerability assessment of communities to climate change and variability and determining the most viable adaptation measures that can be adopted.

Invariably, extremes events such as drought and floods characterized the greatest threats forms of climate change that most communities faced. Along with these, pronounced reliance on rain-fed agriculture and natural resources based economies have left the communities being very susceptible to the threats of climate change. The already fragile situation is made worse by the pronounced lack of resources by communities thus compromising their ability to adapt to the impacts of climate change.

The project has teamed up with locally operating non-governmental organizations to come up with a social and economic village model wherein income generating activities such bee keeping, saloon services, agrochemical shop, ICT services and agroforestry activities were encapsulated in the model. The implementing and beneficiary community is an umbrella group known as Kyavonda, which consist of three small groups including Ndatani, Vote and Kyatune. The implementing matrix places Kyavonda at the heart of all activities while ASALI Project and other collaborating institutions (Ducubox and SASOL Foundation) will provide support services such as monitoring and evaluation, community capacity building and general oversight of the project.

Already, ASALI has purchased metal containers, beehive and computers.

It is envisaged that the social and economic village model will build the community's resilience to climate and variability through reducing their sensitivity (income diversification) and improving and broadening the resource base.



SEKU-ASALI Project team and community leaders inspect containers delivered at the site of the proposed model village

(Dr. Ndung'u is the Project's activity lead for resilience building).

Sustainable Natural Resource Management Strategies to Enhance Food security for Smallholder Farmers



Dr Dorothy A. Amwata

Activity 1: The influence of water resources on pastoral and agropastoral household food security in Kajiado District, Kenya

Background

Water scarcity remains a major development challenge in Kenya, particularly in the Arid and Semi-Arid Lands (ASALs).

Objective: This study focused on water harvesting and saving technologies that are available for domestic use, livestock watering and crop production and examined their influence on household food security in the dryland areas of Isinya and Kajiado Central.

Data were collected between June and August 2017 from a systematic sample of 72 households in total (36 per sub-county), using questionnaires, interviews and focus group discussions, and complemented with secondary data from literature. Data were collected on the types of water resources and various socio-economic factors expected to affect household water resource use, such as, age, education and gender of household head, income levels, access to credit, agro-ecological zonation, and daily food calorie consumption. The data were described through descriptive statistics and analysed using ordinal regression model.

Achievements

- The water harvesting and saving technologies that are available for domestic use, livestock watering and crop production in Isinya and Kajiado Central Sub counties profiled and their distribution mapped. The water sources in the study were categorised into two, namely surface water and ground water. The surface water included

seasonal rivers, water pans, earth dams, flood plain water diversion trench, roof catchment, rock catchment and micro pits. On the other hand, the ground water sources included boreholes, sand dams, shallow wells and hand-dug wells.

- The influence of the different water harvesting and saving techniques and on household food security status in Kajiado Central and Isinya established. For households in Isinya sub-county, over 78% of the households that were accessing water from rivers, earth dams, *ololopolis*, shallow wells, roof catchment were found to be more food secure compared to households accessing water from the hand-dug wells.
- Factors that influence the type of water resources accessed by a household include the type of land use, agro-ecological zone, nature of roofing material, access to credit, age and education levels of the household head.
- Increased knowledge and evidence that enhancing household access to water through harvesting and saving technologies requires access to credit, education and awareness with women and young household heads as targets.



Community members in Kajiado inspect hay baling during their training. The project has introduced a number of drought resistant grasses for livestock which is the Counties economic main stay.

Activity 2: Assessing and Document Food Availability, Accessibility and Utilization in South Eastern Kenya

Understanding of the food availability, accessibility and utilization is critical in understanding the household food and nutrition security status. Further, postharvest food handling methods both indigenous knowledge and conventional knowledge enhances access to good quality, healthy and nutritious food.

Lastly, evaluation of high value neglected crops also contributes to food availability, access and nutrition. The information obtained through this study will be disseminated to relevant stakeholders in the form of policy briefs (decision makers), community briefs (village barazas) and peer reviewed publications (scientific community) to improve on food postharvest handling and management practices, value addition to enhance nutrition and market value of the food produced while also promoting the adoption of high value food crops that are resilient to the dryland environment.

The objective is to profile and screen farmers and pastoralists in south eastern Kenya (SEK) in terms food and nutrition status. This include assessment of food availability, accessibility and utilization in the study area, of this theme contributes to: the assessment and documentation of food availability, accessibility and utilization in SEKU); b) the assessment, of the existing indigenous and conventional postharvest food handling methods and value adding technologies/processes that enhance food security) and c) identification and promotion of high value neglected crops in the study area and the contribution to food availability, access and nutrition.

Achievements

- Farmers and pastoralists in Kajiado of south eastern Kenya profiled and screened in terms of food security and nutrition status across different agro-ecological zones. The food insecurity hot spots were majorly agroecological zone 6 in Kajiado Central with the highest food insecurity index . On overall 68% of the households were food secure while the remaining 32% were food insecure. Of those who were food insecure, 57% were from Kajiado Central and the rest 43% were from Isinya Sub-county
- Food utilization of selected crops and high value crops assessed. Contribution of different crops (food and high value) to nutrition and security documented. It was found that the high value crops such as sorghum, millet, cassava contributes 26% of the household food production in SEK and 39 per cent of household food consumption as opposed to Maize that contributes 43% of household food production and 52% of food consumption in the study area.

- Value addition methods and knowledge (indigenous and conventional) for different food systems assessed. They include cake making, beer brewing and animal feeds using cereals such as sorghum, millet and cassava.
- About 25 Farmers and 25 pastoralist in Isinya and Kajiado Central trained on value addition and post harvest management through demonstrations and practical sessions. Of all the people trained, 58 % were women; 19% men and 23youths
- Promising post harvest methods for livestock products such as meat include drying, salting, smoking, deep frying); while the storage in airtight metal or earthen containers, gunny bags or grain. Other methods used to prolong the life of the grains under storage included mixing grains with ash or charcoal. For the milk, storage with charcoal or local herbs helped keep off microbes from the milk. The value addition technologies in cereal crops include cake making, milling of mixed cereal flour for porridge or yoghurt and *mala*, were disseminated to the target audience.

Impacts:

- Local communities members learnt practical methods of post-harvest management of agriculture products to reduce on wastage and increase food availability and income to the household
- Local communities understand the food insecurity hot spots and the need to diversify to non-agricultural related activities to cushion them during periods of scarcity as well as being proactive in assessing food through purchase of food in areas with bumper harvest and stored for the future during scarcity. Also, noting the areas of priority in terms of food insecurity management.
- Local communities, women, men and youths trained and act as trainer of trainers.

(Dr. Amwata is the activity lead for agriculture, food security and natural resources)

Thinking Within and Outside the “Boxx” To make water available for all



Dr Moses Mwangi

Living in South Sudan in the early days of the current millennium brought me to a story commonly narrated by one of the local communities to the effect that the stomach was initially not a member of the human body. It lived on its own in the forest. Man, in one of his escapades in the woods invited the stomach to come and stay with him. The stomach conditionally agreed: that he be always carried on the fore of the man and use the eyes to enjoy nature, never be put down, and be aptly given all it demanded.

Man agreed, it is said, and the first demand by the stomach was a colourless liquid called water to wet its throat, mark its territory and sanitize the new environment. The stomach dictated that the liquid be henceforth given either singly or accompanied by solid ball mixes. This ritual has since been repeated without failure lest the stomach throws stones in the direction of the kidney! For fear of the ultimate consequences, man has to keep running around in search of the liquid. In the process, he has to devise ways of accessing the commodity, a struggle replete with occasional misses, especially for people living in the arid and semi-arid lands (ASALs).

It would thus appear that the A-Sustainable Approach to Livelihoods Improvement (ASALI) was driven by the desire to assist man in lessening the burden in scouting for water to sustain himself and his livelihoods in efforts to meet the needs of the stomach. The conceivers of ASALI were alive to the fact that livelihood is sustainable when it can cope with and recover from stresses and maintain its capabilities both now and in the future without undermining the natural resource base. This has been the drive in the applied participatory approaches in investigating the prevailing water problems in the ASALI project transect that runs through the three ASAL counties of Kitui, Machakos and Kajiado where pastoralists and agropastoralists dwell.

The research efforts have yielded prescriptions that take care of the social, economic and environmental concerns, based on ideas bent on starting from where the people are. The project recognizes that more attention must be paid to the various facets, factors and processes which either constrain or enhance people's ability to make a living in an economically, ecologically, and socially sustainable manner. The project has aimed offering the prospects of a more coherent and integrated approach to poverty in the marginal geographical area with an appreciation that the water livelihood comprises the capabilities, assets and activities required for a means

of living which contributes net benefits to other livelihoods in the short and long term. Lessons learnt have led to understanding the complex and differentiated processes through which livelihoods are constructed, the institutional processes and organizational structures that link the various inter-related elements.

This has benefitted from total stakeholder involvement where their knowledge, perceptions, and interests are taken in. This has led to the realization that while economic growth may be essential for poverty reduction, it all depends on the capabilities of the poor to take advantage of expanding knowledge and opportunities. It has emerged that that poverty as conceived by the poor themselves is not just a question of low income, but includes other dimensions such as bad health, illiteracy, as well as a state of vulnerability and feelings of feebleness in general. Another important revelation of the studies is that the poor themselves often know their situation and needs, and, thus, must be involved in the design of policies and project intended to better their lot.

Field research initiatives that have taken place on sustainable water development and management among the ASAL inhabitants have involved ground, surface and the skies in different settings by different institutions. They all have had a concerted effort to increasing food supplies and improving the health status of the people in the target milieu. Out of this concern, several activities and research centres have been borne.

Farming systems research focusing on the production activities of households have provided a new perspective on the way to view the production and consumption decisions in light of the waters available. As a result, there has been a shift towards a social and economic perspective that focuses on the enhancement of peoples' capacities to secure their own livelihoods. This has allowed the project to embrace a holistic perspective which involves taking into account the context, resources, institutions and, organizations.

Participation and empowerment are the basic tenets of the ASALI project approach. Lessons learnt include the fact that measures may be location specific. As such, to sustain positive livelihood outcomes, effective local institutions that deliver goods and services must be in place. An important part of the project activities has been in community capacity-building and institutional strengthening, with a focus on service delivery as well as risk-management.



A waterbox

...Harvesting the Sky Rivers

Dew and fog harvesting has not been well explored as a means to provide water for social and economic needs. An assessment on the reasons militating proper adoption of dew and fog harvesting showed that largely the appropriate knowledge is missing on the ground.

There is however a huge potential for the technology being embraced. The ASALI Project has deliberately looked into possibilities of harvesting dew for use in food security improvement and household water use. Some measures have been actualized with encouraging results.

The major lesson learnt is that harvesting the skies by collecting dew and fog has potential in the arid areas, with quantities varying with collection and storage designs and, the amount of water in the atmosphere.

Dew reduces water stress for plants as water deposited on grass and leaves reduces transpiration. In Makueni, Kajiado and Turkana counties, the ASALI project has been involved in trials to grow food using the Groasis waterboxxes with important results.

This encouraged laying of trials in 2019 on a variety of roofing materials that are common in the ASAL areas. The project purposed to also make trials in use of hydropanels in the arid areas as means to provide all year round water. Education has been provided on use of cloud harvesters and, the rainmakers in feeding households with water.

...Water and Pasture Conservation

The rising frequency of hydrologic droughts have heralded in absorption of practices hitherto unheard of among the pastoralists. Cactus use has found its way in being utilized as a forage substitute for cattle and other grazing livestock among the Maasai in Elangatawuas area of Kajiado County. The practice has helped sedentalising livestock in times of drought, saving the livelihood from demises that come from the weather vagary. The nutrient content in the cactus is noted to vary according to various feeding forms, stages and ages of growth. Overall, they are reputed to be high in moisture content and low in dry matter, energy, fiber and ash but low in protein. Because the level of water in the diet increases the rate of passage which leads to scouring in cattle, the pastoralists ensure presence of hay or a brush pasture that the cattle can utilize to increase their level of dry matter intake, reducing the incidences of fiber balls in cattle caused by the high levels of crude fiber in cactus.

Invasion of the rangelands along the SEKU ASALI transect by undesirable plant species is one of the challenges facing the local rangeland productivity and by extension, livestock production. The spread is currently at an unprecedented rate, affecting communities in different ways.

The hazards of the invasive plant species manifest in negative environmental and socio-economic impacts in the rangelands. They have led to degradation of the environment leading to serious impacts on local communities' water and allied resource bases. The effects and impacts of the plant invader species on the grazing areas and natural pastures and, crops cause massive losses in livestock production which is an important segment to the country's GDP.

The continuing changing production systems in the ASALs have resulted in different degrees of degradation and productive capacity. Overgrazing has impacted negatively on vegetation resources and biodiversity in general. Elangatawuas area has for example been invaded by the *ipomea* (*Oltinetei* in the Maa language) while *CascutaDodder* (*thina* in the Kamba language) are increasingly becoming a threat to plants such as the mango trees.

The focus on this study by the ASALI project has been to better understand the dynamics of the invasive weeds mainly on pasturelands and croplands and the linkages to water availability. The areas affected by the invasive plants are noted to be highly eroded and of minimal water retention and, pastures and other low growing plants distinguished.

It is expected that the accrued knowledge will enable taking action to reverse the trend and, include measures of recovery of invaded and degraded land primarily through pasture improvement and other interventions as this will enhance the utilization of these areas for increased livestock productivity and reverse degradation. Ultimately, this will help in water retention for groundwater recharges.

Another areas of concern has been in paddocking of grazing areas (*olopololi*) and letting in water to grow pasture for livestock. The project has been instrumental in introducing new species of grass that are conducive to the ASAL environment and, rehabilitating the rangeland with disappearing species known to tolerate droughts and, exploring ways and means of improving surface runoff collection in support of the traditional practices. The project has been instrumental in knowledge provision on use of hydroponics for commercial and household fodder use.

...Place of the Alluvial Aquifer Waters

Water insecurity in the arid and semi-arid areas often leads to food insecurity, a major concern for the inhabitant communities. One key to unlocking agricultural potential of the area is enhancing water security through increased ability of farming systems to buffer water variability by means of improved capacity to store water. This can simultaneously increase the efficient use of limited water resources. The river beds of the local seasonal rivers provides opportunities for nature-based water storage.

The sandy river beds contain significant amounts of water throughout the dry season and have the potential for intensifying irrigated agriculture at both macro and micro levels. The experience of the ASALI research project is that water storage in the sand rivers is largely not well managed. Knowledge of the recharge, infiltration, water loss and storage mechanisms would be an important basis to optimize the use of this resource by using appropriate pumps, constructing check-dams and sub-surface dams, sand storage dams and, enhancing upstream and downstream management of the seasonal rivers.

Noteworthy, advances in developing the alluvial ground water resources for human, crops growth and livestock needs are under investigations. The ultimate objective is to share on how improved access to and efficient utilization of the water from alluvial aquifers can be realized. A major threat to the survival of the alluvial aquifers emanates from the increased sand harvesting, firewood, charcoal burning and brick, making. The problem is aggravated by ignorance of the country water law and, prevailing impunity.

A survey on the boreholes status in Elangatawuas has brought to the fore issues of borehole drying or, experiencing drawdowns that have culminated in lowering of the pumping equipment. The development is being associated to social, economic and geological concerns that have been documented by the ASALI project for lobbying and advocacy in efforts to make the water resources sustainable. Appropriate knowledge in construction of sand dams has been noted to be missing in the entire transect leading to low performance or total failures of the infrastructures provided.



Herders drive their livestock through a dried seasonal river in Kajiado. Water for livestock is a major challenge in the region

Which way water development and management?

The experiences of the ASALI project gives credence to thinking within and outside the box. Thinking within implies approaching water problems in new and, innovative ways; conceptualizing problems differently and, understanding the position in relation to particular situations in a way never thought of before. Perhaps one of the most profound effects of thinking outside the box is that it has potential to help stay adaptable.

The mind and practices will be open to new ideas or solutions or situations, and therefore better able to navigate the ever changing landscape of water scarcity. Thinking outside will mean a willingness to consider different solutions and methods in order to reach desired water development and management outcomes. By thinking outside the box and questioning the status quo, it provides the opportunity to constantly be considering how to improve an experience, product or service on water. This allows to keep growing and can lead to intelligent and forward-thinking decisions in water provision and livelihoods sustenance.

As the Maasai say *Esuj erashe ngejuk emusana* (A new idea (custom) follows an old one – meaning that if an idea is good it will be copied and followed) the inklings discovered and propagated by the ASALI project are a huge step towards solving water problems in the ASALs.

They need to be embraced. At the same time, the existing water resources such as the boreholes, shallow wells, earth dams, water pans and seasonal natural lakes can be modified to meet sustainable measures.

In Kyambusyani in Kitui County, the ASALI project has initiated moves at developing integrated water resources that will link water sales to apiculture, horticulture, agroforestry and, commercial entrepreneurship that will improve resilience of the people in light of the punishing weather and grinding poverty.

A water dam has been completed and a model commercial village is in the making. This and other sustainable approaches developed by the project will serve as a programming framework to devise a set of integrated support activities to improve the sustainability of water and related livelihoods among the vulnerable pastoral and agropastoral groups by strengthening the resilience of their coping and adaptive strategies.

(Dr. Mwangi leads the Project's sustainable access to water component).

ASALI's Contribution to Water Management in Kajiado: The View point of a Resident cum Research Associate



By *Matampash Lesiamon*
(Research assistant)

Like other arid and semi-arid land (ASAL) regions, Kajiado County is a beehive of activity for government department other and development agencies working to improve the livelihood of the resource deprived populations. Several of these activities are directed at finding a solutions to the perennial water and shortage and food insecurity for both humans and livestock.

Several research projects have been carried out by the SEKU ASALI Project in Elangatawuas which lies to the extreme south west of the project transect. The relevance of the activities undertaken has been very attractive as an avenue towards solving critical problems that afflict the area and benefit the people in both social and economic terms. This ASALI project orientation made me and the people of Elangatawuas develop a deep love to interact with the project activities on realization that the intentions are meant to make people jointly establish the problems affecting them and arrive at suitable solutions that are locally made. Satisfaction is derived from the fact the ASALI project has been providing the required professional knowledge to solve local problems. The approach of involving the inhabitants in deciding on the best way forward is highly appreciated as it is bent on building sustainability. It is hoped that at the expiry of the ASALI project, the relationship built will thrive to better the Elangatawuas people lives and, that of their livelihoods.

A most interesting research activity has been that of sustainable use of the local alluvial aquifers. The importance of the Toroka seasonal river and its main tributary, the Molokwa, cannot be overemphasized as it is a lifeline for the Elangatawuas inhabitants and their various livelihoods. The river is shared by livestock farmers, crop farmers, sand harvesters and loaders,

charcoal burners and, firewood collectors. The waters contained are an important environmental asset that also provides water for wildlife and the ecosystem in general.

It never occurred to me, born and brought up in his area, that there is need to carry out an assessment at the household level that would help in arriving at measures that can make the river used for the total wellbeing of all in the area. A lot of social and economic change taking place in the area brought about by globalization, climate change and shift in tenure among the Maasai. The researches undertaken by SEKU-ASALI have been an eye opener that have given the inhabitants a deeper understanding of the area and the various dynamics that affect the area in short and long terms. There is an overall realization that the main problem in the area is water management. The people, thus, need capacity building and management practices and provision of alternative water resources and livelihood means. Through the research, it has become clear that there are simpler water development endeavours such as dew harvesting for household and livelihoods needs that can also take place to alleviate water problems. It has also become clear that the policy makers have not been on the right path in water provision as they can promote water harvesting from roofs and other materials which would help the people meet their basic water needs.

Policy developers had hitherto emphasised on macro water supplies such as boreholes and dams which have heavy capital and operation and maintenance costs. There is now a realization that seasonal shallow wells can be developed to provide water in the area with appropriate protection and provision of appropriate watering methods. The irrigation practices along the Toroka River are mainly done around the shallow wells, growing crops such as kales, onions, cabbages, spinach and tomatoes. Other drought related challenges include conflicts between wildlife and livestock, people and wildlife and, crop farmers and livestock keepers. Since most of the wells are far from homesteads wild animals such as monkeys and elands invade the crop farms, raising food insecurity. . People are trying to find ways to curb the menace through barbed wire fencing which is very expensive hence, the majority cannot afford.

Wells (*sinyai* and *lumbwa*) are the most preferred water sources in Elangatawuas, mainly because they have for ages provided reliable water even during droughts. Compared to boreholes, wells have minimal development and operational costs. People use wellwater for livestock, domestic purposes and even for commercial purposes and crop irrigation. This has



A farmer waters his cattle

helped the people raise money for purposes such as school fees and household commodities.

Most women have formed groups which at the end of the day joint a network formulated by the Action Aid Kenya which is also an important institution in the area. The women network has taken on board activities such as bee-keeping, dairy farming and crop farming. Some women have gone into water sales from boreholes to uplift their economic status. The groups also been planting trees along the seasonal river as a way of conserving the environment. Recognition is given to the fact that plants are the basis of all major food chains and at the same time provide many essential and luxury products for the pastoralists. Among the Maasai living in Elangatawuas, the relationship between them and their environment is of great importance in their life styles. Apart from their predominantly nomadic pastoralism the Maasai have begun to exploit their surrounding in a systematic manner by involving themselves in other economic activities such as irrigation along the river banks, mining, brick making and sand harvesting. Some of the money made of the group activities is directed towards water development such as buying of water containers and storage facilities.

This has made many people in Elangatawuas initiate crop irrigation and dairy cattle keeping farming practices. 22 boreholes are run on diesel.

Boreholes (*Oltinka*) are important to the people, especially with the presence of modern technology in their operations. 16 people have solar-pumped boreholes which have proved to be economical as they benefit from the ample sunshine in Elangatawuas.

Elangatawuas is largely an arid area and receives erratic and low amounts of rainfall per year. Temperatures are very high which encourages loss of water through evaporation and evapotranspiration. The circumstances make the dams and water pans not to last for long. They however also provide good water sources. Water pans and earth dams have also played a key-role in the economy of the people of Elangatawuas. Following the government driven land sub-division many people cannot access the shallow wells along the seasonal rivers, they therefore have resorted to constructing water pans and earth dams to help them access water for their various needs. Sand dams have been constructed in the area by the government. However, they are have failed because of poor location and construction. There are 8 seasonal lakes in Elangatawuas which are located at the boundary with Oldonyo-Onyokie and Kilonito and Elangatawuas. The lakes are owned by Oldoinyo-Onyokie and accessed by the three group ranches for uses such as livestock watering, domestic and irrigation purposes. The lakes do not dry and as such they are very useful. They face conflicts such as wildlife vs human and wildlife vs livestock. Other than livestock and people, the lakes are also accessed by wildlife.

Dying Water Management Knowledge among the Kamba of Thaana-Nzau



By Nicholas Kitaka Nzuka
(Research assistant)

Background

Water as a resource on the earth surface is very important to living beings and organisms without which they cannot survive. This problem is more endemic in the arid and semi-arid areas of Kenya, and has now been worsened by population pressure and global weather changes. By and large, there is a miss in involving the local people and their knowledge in solving their water problems.

Indigenous knowledge is considered to be a body of knowledge existing within or acquired by local people over a period of time through accumulation of experiences, society-nature relationships, community practices and institutions by passing it down to other generations (Mercer et al, 2010).

Cognizance is taken that the Thaana-Nzau people have interacted with a variety of people in the country and beyond who have influenced their indigenous knowledge.

The interface between indigenous knowledge systems and water security among the Thaana-Nzau people is embodied in the traditional knowledge and skills in developing, managing and protecting water sources. The water knowledge the rural communities possess enables them to develop their capacities to achieve sustainable and equitable development. The utilization of indigenous knowledge systems in the water security processes is based on the fact that the people have managed the ecological and hydrological environments without damaging them.

This study was driven by the need to establish the distinctly indigenous, indigenized and contemporary methods that rural areas are currently using and how they impact on water management and conservation. The research found that the custodians of indigenous knowledge have failed to appropriately disseminate indigenous knowledge to the younger generation resulting to the knowledge being restricted to the elderly. This explains why the use of indigenous methods in the application of water security processes has diminished over the years. Relatively few people among the Thaana-Nzau community still have a strong interest in the indigenous knowledge systems that motivates them to undertake obligations towards achieving

water security. There is however a general agreement that indigenous management and water development techniques have potentials of improving water security in the Kitui rural households.

Research Methodology

Research Aim

The aim of this study was to determine the knowledge, attitude and cultural practices in the Thaana Nzau community of Kitui in Kenya in relation to water development and management. Open and close-ended questionnaires were administered used to collect information on boreholes, shallow wells, scoop holes and water pans.

Data Analysis Methodology

Before analysis, the data collected was first examined for completeness. Quantitative data was then cleaned, coded and fed into the Statistical Package for Social Sciences (SPSS) IBM version 25 for analysis. Creswell (2013) notes that in quantitative research, the sole approach to data analysis is statistical and takes places in the form of tabulations. He further notes that the findings are usually descriptive although conclusive only within the numerical framework. In this regard, this study, therefore, used descriptive statistics such as totals, percentages, and frequencies were used to meaningfully describe the distribution of measurements. The data from the interview schedule was also analyzed using descriptive statistics. Inferential statistics involved comparisons of the relationship between various socio-economic factors such as income levels, family size, and status of water availability using chi-square correlation analysis. Qualitative data was discussed under themes consisted with the objectives of the study. In-depth probing was used to confirm the qualitative data. The analyzed data was then presented in form of graphs, pie charts, and statistical tables.

Study Area

Figure 1 shows the study area geographically located between -2.00° and -0.716° and 37.79° and 37.96° E. It harbors winzyeei location and, borders the sub counties of Mbeere and Masinga Administratively, Thaana-Nzau location falls within the Ngutani Division of Migwani-Mwingi sub-county. It has an area of 250 square kilometers. The highest point has an altitude of about 100 meters above sea level. The lowest point is 734 meters which is the valley bottom of river Tana. The location drains towards rivers Kithyoko, Nzuli and Tana, which are the three main rivers in the area, with two being seasonal and one permanent. The topography of the area is characterized by Musonoke hills which mark the boundary of the location to the East. The basement rock is dominated by metamorphic rocks. The area has two types of soil: the clay soil and sandy loam with pockets of black cotton soils. Like the rest of the arid and semi arid lands of Kenya, the Thaana-Nzau suffers from multiple environmental problems some of which are associated to climate change, global processes, land-use change and development itself.

The lands have a harsh environment characterized by low rainfall and high temperatures. This region is characterized by dry land vegetation of *acacia- Comniphora* type. The area has an average temperature of 25°C, with the highest temperature of 33° C in January and October, and lowest temperature 18°C, being recorded between July and December. The area receives bimodal rainfall. Long rains start in April and are very short and uncertain. The short rains start at the end of October and are very short and unreliable.

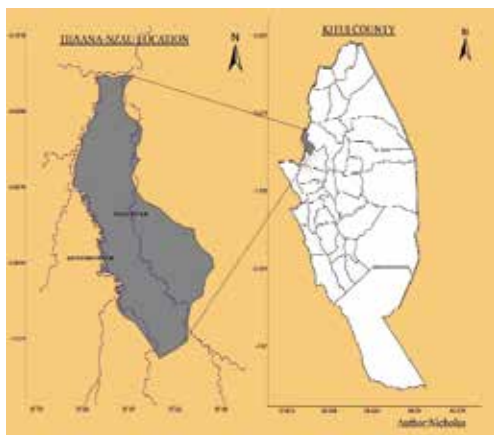


Figure 1: Map of study area

Results

Water Sources Reliability Level

The common water sources in Thaana-Nzau are boreholes, shallow wells, scoop holes, water pans, sand dams and roof water harvesting.

In general, Thaana -Nzau has a water insecurity status. The researcher sought from the respondents the level of water security in their area for domestic, livestock and agricultural use. In this regard, the respondents gave out varied responses as shown in Table 11. The table indicates that the residents of Thaana-Nzau have adopted a number of small-scale water harvesting technology systems. However, their reliability level is very low. For instance, community water pans and, household roof water harvesting were rated as the most unreliable sources of water. This trend was attributed to the small number of the adopted technologies, low and unreliable rainfall, and the common type of roofing; grass thatch; which does not support roof catchment.

Water sources reliability level in Thaana-Nzau

Water Source	Reliability Level Frequency							
	Very High	%	High	%	Low	%	Very Low	%
1. Scoop Wells	✓	50						
2. Shallow Wells							✓	2
3. Boreholes			✓	20				
4. Sand Dams			✓	20				
5. Water Pans							✓	3
6. Roof water					✓	5		

What inhibits Use of Indigenous Methods in Water Management ?

The results point towards a number of factors which limit the embracement and use of indigenous water development and management techniques in Thaana-Nzau. These include lack of the knowledge documentation, patriarchal cultural structures, obsolete and out of date practices, unproven scientific procedures, time demanding and indigenous knowledge restricted only to the knowledge holders. Concurring with this notion is Briggs and Sharp, (2004) who state how indigenous methods have not been utilized in development initiatives. Western knowledge has been prioritized as it ignores local social, cultural and economic priorities. There is still unwillingness to bring into play either indigenous knowledge or hybrid knowledge.

Conclusions

There is limited ability of indigenous knowledge to inform potential impacts on water security. Loss of ecological and traditional water security confronts many inhabitants. Relatively a few people still have a strong interest in the indigenous knowledge systems that motivate communities to undertake cultural obligations towards achieving water security. This might be attributable to the fact that historically indigenous knowledge has been marginalized from water resource and management processes. Despite the weak institutional capacities, failure of the state to provide efficient water structures combined with the challenges that the Thaana-Nzau people faces with regards to water, there is failure to recognize and accommodate traditional values as an alternative to develop, manage and, conserve water in the area. Some informants mentioned that natural resources, including waterways, are pivotal sources of their customary economy. Water ceremonies are no longer prevalent. Elderly men (*Atumia akuu*) visited the *neentree* in the forest which is referred to as *mathembo* or alternatively rivers (*Mbusi*), caves or mountain (*kiima*) peaks to appease the ancestors for water. These natural landscapes were important sites where ancestors (*Aaumau*) were situated. One informant mentioned that drought was a sign that the ancestors were displeased with the transgressions of the living. If there was no rain the ancestors were construed not to be happy about the way things were handled and the elders were therefore able to determine why it was so and perform rituals to appease the spirits. On the other hand, if things were handled well there would be rains that would provide fertility in the fields and improve agricultural production. Ancestral spirits were linked to a long tradition of practices and history and were considered as mentors and guides to supply people with rains. The results indicate that despite a number of values associated with water in the Thaana-Nzau community, the people do not really draw a comprehensive overview of the traditional practices of water in present day.

Recommendations

Based on the findings, it is recommended that knowledge networks that promote use of local and external knowledge. Creation of hybrid knowledge and rural people and government need to capacitate so as to be oriented towards improving indigenous technologies and tools and incorporating them into existing modern technologies or applications adapted to secure, manage and conserve water in rural areas. Innovative ways can be identified at all water resource levels which can be incorporated within existing frameworks on current water systems using locally available materials. This will consequently improve water service provision for social and economic gains in an environmentally stable condition. Knowledge should be applied to a new holistic approach of economic and relations which are equitable. Modern techniques need to encompass the flexibility of indigenous knowledge systems and provide options that can fit into the local biophysical and socio economic circumstances.

Harnessing Seasonal Rivers to Support Livelihood in ASALs

By Joseph M. Ndeke
(Research assistant)

The arid and semi arid localities of the south eastern Kenya suffer perennial water shortage. The rainfall in this area falls far below the optimal with an annual —. Yet the bulk of agricultural activities are rain reliant as mechanised farm practices are beyond the means of the people most of whom are sunstiteacne. Due to the foreign scenario, food security and the attendant health challenges are a major constant menace in these areas. Often, the people are left at the mercy of the government and other players for food donation and other means of livelihood support.

However, the residents of Kyome/Thaana ward of Mwingi West Sub-County in Kitui County have found relevance in the adage that necessity is the mother of invention. They are now harnessing a seasonal river to eke a living.

The river is the main water course in this area, and its stretch from the point of origin, all the way to the confluence with Tana River is 40KM. The river originates from the hills around Migwani town. For sure, this river is used to support livelihoods and hence, enhance food security. It has the capacity to store water and supply the resource at all times. Storage of water by a seasonal river is facilitated by sand or alluvial deposition on the river bed, which serve as storage medium.

For the seasonal river to have the capacity and ability to meet the water demand, land, sand and water are key. With additional stream development, 10% storage of the total volume of runoff water captured in the catchment area and stored in the river would be adequate to meet the water demand.

Relied upon for livelihood support the livelihood of over 7230 households, major economic activities along the river's banks include water for domestic use. Water and pasture for livestock; small scale irrigation schemes; afforestation; and sand harvesting.

It is estimated that activities like cow, goat, sheep, donkey, chicken, and duck farming, besides beekeeping which are supported by the river account for about 40% income; creating a reliable value chain.

In this line of livelihoods, farmers irrigate such crops as:-

Vegetables such as cabbages, kale, spinach, onions as well as fruits such as pawpaws, mangoes, banana, lemons, oranges, avocado among others. The people also grow sweet potatoes, cassava, pumpkins, guavas, and water melon. Farmers have developed nurseries for seedlings which once ready are sold to individuals and/or institutions.

This area, not only contributes towards enhancement of income, but is key towards improving the environment, the betterment of which makes an area a good place to live in.

Sand harvesting: This is a very tricky component of the livelihoods supported by Kavaini river. It is actually a "chicken and egg" problem. Sand harvesting is an activity which can easily kill this river and hence deprive the people of their aforementioned rights.

Sand's demand is like that of hot cakes. It leads to making cheap money at the level of production.

It is unfortunate that most of the actors in this business care less. To them, reducing to zero, all the gains made over the last 40 or so years, is not a big deal; so long as they earn short-term money, without knowing how much they lose in exchange.

It is sad to note, money made out of this exercise evaporates like water exposed in Sahara desert, and leaves the participants weaklings who cannot support their families.

Sand is a product of excessive erosion. So, this means, even the death of the land is eminent.

When the question of livelihood arises, it is wise to cultivate the activity in the areas of soil and water conservation and other related activities.



Lorries carrying sand. Sand harvesting has become a major economic activity with adverse effects on water resources

Prickly Cactus Provides Answer to Tricky Seasons for Kajiado Livestock Farmers

Mzee Peter Loontasati belongs to theloodokilani clan of the Maa speaking community of Kenya. Now in his 70s, Peter is a prominent and respected member of his community not only because of his polygamous status, but also because of the large and healthy herd of livestock he own. But one thing that strikes visitors to Peter's large homestead at Elangatawuas in Kajiado County is the thick neatly groomed cactus fences. Peter who is one of the SEKU-ASALI contact farmers reveals the connection between the well-kept prickly cactus and healthy animals which are the envy of many. In an interview with ASALI Chronicle, Mzee Loontasati, vouches for cactus as the panacea for the perennial animal feed shortage in the arid and semi-arid regions of Kenya

Question: *Cactus is only known for its utility as a fence, how did you get the idea that it is also an animal feed?*

A. I picked the love of cactus from my late father who domesticated the plant for feeding livestock in stressful times. The pricks on the plant scare people from walking near them. But the cactus are a lifesaving plant as forage to my livestock and, hence my household livelihood wellbeing. I have used the cactus for long with satisfaction. As a result, I have come to appreciate the nutrient content of the cactus at its variations according to feeding forms, stages and ages of growth.

Q. *Are there nutritional values of the part that you have learnt?*

A. The plant is very high in moisture content which works well for the livestock in the dry times when water and pasture are scarce. I have observed that the livestock can easily survive on cactus water if other sources of water are not available. Being rich in water, it represents a cost-effective option for water provision to livestock. I am told by scientists that besides water, the cactus are high in sugars, ash and vitamins A and C, but are low in crude protein. The level of water in the diet increases the rate of passage and leads to the scouring often seen in cattle. This increased rate of passage also reduces the absorption of nutrients contained in cactus. Unlike other fodder and forage crops which need to be stored as hay or silage, cactus is an evergreen crop and can be used round-the-year. During droughts and consequent livestock famines, I have always fed my cattle on cactus and have not had any harm to the animals. The only major factor that influence the amount of the cactus eaten by the livestock is the degree of burning of pads during singeing. However, the glochids, which frequently escaped burning, do not affect consumption. All

livestock prefer just enough singeing to remove the large spines. A minor factor that does not affect consumption is the accumulation of soot on the pads.

Q. *Is cactus on its own enough as food for livestock or do you have to give them other feeds?*

A. The nutrient content of cactus is often less than that required by any animal other than a dry, early bred, beef cow. As a result the livestock often takes large amounts of cactus to satisfy minimal nutrient requirements. Notably, cattle often bloat, caused by large amounts fed. I have learnt with time that it is always advisable to feed some hay (depending upon cost and availability) or have a brush pasture that the cattle can utilize to increase their level of dry matter intake and reduce the rate of passage of the cactus. This also reduces the incidence of pear or fiber balls in cattle caused by the high levels of crude fiber in the plant. My overall experience is that cactus good for livestock and, too much of it is in order. It's a nutritious forage, and prepared correctly, livestock can eat it and help to get pastures back into shape and a step closer to healthier livestock. My experience has been that the cactus is highly variable in nutrient content depending on species and variety, age, class, season and plant part. I am not a scientists but informed that the cactus is low in protein and phosphorus content but high in energy, water, fiber and ash. Burning the cactus is an effective way to utilize a ranch resource and to aid in maintaining cows in an emergency feed situation.



Mzee Peter Loontasati explains how he uses cactus as animal feed

Q. *Have other farmers been attracted to the plant as an animal feed or are you still the only user?*

A. The cactus is an important emergency feed resource for livestock. The use of cactus as an emergency or sustenance feed during drought is increasing in Elangatawuas. During drought, many other ranchers ask for the cactus to save their livestock. Livestock production systems faces low productivity due to low feed availability and quality, especially in drought periods when livestock suffer large losses. By feeding the livestock on cactus has saved my livestock on many occasions. I also do not have to

move my livestock during drought which ensures that they are not overly stressed and, provide the necessary milk for the family. As a family, we are able to keep them in one place and attend to the household livelihood chores.



A cactus bush in Mzee Loontasati's homestead

Q. Besides livestock are you engaged in any livelihood activities?

A. I also do crop farming, with my efforts being to match seasonal fluctuations in food and feed supply needs including treating crop residues; modifying agronomic practices; varietal selection; pasture improvement; planting multi-purpose forages; conservation; and rumen manipulation. However, there are financial limitations and inadequately qualified staff to carry out analytical work and advice on what I intend to do, and do. Thus I dwell a lot on own experiments and analysis. Availability of crop residues is limited to crop production. In this dry area, improvement of pasture is restricted to sowing improved grasses. The SEKU ASALI project has been instrumental in showing how to grow new varieties of grass and, rehabilitating new ones. My experience is that silage making from low-nutritive-value tropical forages involves the risk of bad fermentation and needs more facilities. Cactus can improve the nutritive value of poor-quality diets, for example crop residue based diets because of its high content of soluble carbohydrates. It also increases weight gain in small ruminants and heifers fed on crop residues or poor-quality pastures, provided that a small amount of a nitrogen source is included in the diet.



Mzee Loontasati herds his cattle within the confines of the cactus fence

Q. What do you see as the way forward for both the small- and large-scale farmers in the arid and semi-arid regions such as yours?

A. Experts have in the past recommended planting of trees and shrubs to provide standing feed resources so that herds and flocks can survive critical periods of shortage and prolonged drought. This I have done and, my farm has several trees that provide forage to my livestock, some with tangible medicinal values. I however still plant more cactus plants, which I value even more. The ecosystem goods and services provided by cactus include soil and water erosion control, biodiversity conservation, change in micro-environment especially increase in moisture that promotes growth of adjoining plants and microbiomes, and provision of habitat to wild life, carbon sequestration both above and below soil and enhancement of aesthetic beauty of landscape by greening of dry areas. The fences at home block intrusion of snakes and other animals that could get into human and livestock compounds, as such they are a security assurance. I would recommend enhanced use of cactus as animal feed in light of the persistent droughts and food deficiency for livestock. There is need to disseminate knowledge on multi-functionality of cactus for dryland areas and, develop it as a sustainable crop. Its potential to contribute to addressing sustainability and climate change challenges is huge. Policy-makers and donors should educate farmers and agricultural extension officers on the benefits of this multi-purpose plant, which I believe has a special place in the arid lands. The evergreen cactus offer opportunities for improving fodder availability in ASAL regions; but its potential as a feed is largely underutilized.



Mzee Loontasati's son, Tetu Olbiyoto, prepares cactus to feed the livestock

Building Peace and Harmony among Antagonists in Kenya's Recourse Starved ASAL Areas



By Ida Gathoni (Research Assistant)

The present century has seen a significant increase in resource conflict in the world's arid and semi-arid areas. The conflicts arise from differences in needs, values or ideas, and absence of sustainable means to reconcile the dispute. The main causes of conflicts are climate change, bludgeoning human population and the globalisation of the economy. The arid and semi-arid lands of Kenya which occupy over two-thirds of the country's land mass experience persistent conflicts over pasture and water resources mainly due to these resources' biting scarcity. The severity and magnitude of the conflicts, which range from simple disagreements to violent armed conflicts, vary within different regions depending on the level of scarcity.

In Ukasi region of Kitui County, the research question on the dire state of livelihoods vulnerability normally get two common responses: persistent droughts and tribal conflicts. The overall findings reveal that clashing perspectives, way of life and access to resources are the main causes of conflicts. Ukasi is arid and prone to various forms of drought that affect its pastoralists and agropastoralists interest groups. The resource limitations lead to dire competition for food for people and forage for livestock. The area experiences armed conflicts over access and control of water and pasture resources between the Kamba community agro-pastoralists who claim to own the area, and Somali and Orma pastoralists who move to the area in search of water and pasture for survival.

The conflicts over resources manifest as incompatible interaction between the three antagonists. A major consequence of the competition is conflict over resources with complex negative social, cultural, economic and political implications. The conflicts result in loss of lives and property, displacement of people, hatred and animosity between the adversaries, destruction of water resources, reduced trade and investment in the area.

Climatic change has continued to impact on water and pasture availability in Ukasi, associated with higher than normal temperatures, less frequent and, higher intensity precipitation events. However, the direction and magnitude of changes in future precipitation is largely unknown. The uncertainty prevalent in key climate conditions for water and pasture resources

significantly hampers the present day understanding of future availability of the two resources and the identification of target regions for focused adaptation. What is clear in the Ukasi situation is that when livelihoods are threatened, peace and security are threatened in equal measure.

The various studies undertaken in Ukasi by researchers from South Eastern Kenya University under the auspices of the SEKU-ASALI Project have conclude that the conflicts are a direct result of structural inequity and unequal distribution of power in as far as resources access, ownership and, use of dwindling natural resources are concerned. It is a situation with the identifiable groups being in conscious opposition to each other as they pursue incompatible goals. Conflicts in Ukasi, which is an arid land endowed with scarce natural resources are a common phenomenon. The local environmental change evidenced by increasing frequency of droughts from one in every six years to one in every three years, coupled with population increases has led to unprecedented demand for resources to sustain people and their livelihoods. Environmental pressures have changed conflict dynamics. Conflicts have intensified due to dwindling natural resources caused by severe droughts which deplete pasture and water points, triggering inter-tribal attacks and counter-attacks where lives are lost. Other causes of conflicts include historical rivalry, deep-seated cultural values, land issues, political incitements, and proliferation of illicit arms. Thus, exploitation of natural resources and other related environmental stresses are crucial in all phases of the conflicts, from outbreak and escalation of violence to undermining prospects for peace.



A water pump rendered unusable after being destroyed in inter-community conflicts

The SEKU_ASALI study show a clear pattern, where the pastoralists' movements are either in search of water and pasture resources. The agropastoralists, on their part, adapt their cultivation to varying conditions of soil fertility and rainfall. Either way, flexibility is a key element in the subsistence, often at the expense of community cohesiveness. In the same way, patchy resources imply intentionally ambiguous tenure systems that allow multiple claims on them. Wet areas represent a particularly evolved example of such multiple claims on common property resources. Most conflicts consist of simple oppositions: farmers versus herders. However, richer environments such as wet areas

attract a multiplicity of users. The wet areas are used for irrigable crops and rich pastures as the waters recede. Attempts to manage the wet areas have a particularly poor record because users are unable to prevent large-scale water extraction, and because joint management arrangements are vulnerable to free-riding. The prognosis for the survival of traditional management of wet areas must therefore be pessimistic, despite numerous analyses showing they are economically productive if left in place.

Building Cooperation between Antagonists

Attempts at peace building undertaken prevent, alleviate, or resolve conflict amongst the warring communities have not led to long lasting solutions. A most often common endorsement in efforts to avert conflicts over pasture and water resources in Ukasi is building of harmony among the three main conflicting groups. The official line remains that the adversaries must be made to appreciate the constitutional provision that each of the three groups has all the rights to be in the area as long as there is no abuse of rights of the other. Although the conventional laws provides for prevention or resolution of conflicts, such conflicts remain on the antagonists' agenda. The laws either fail or are weak in character, because the actors involved see them as a challenge to their sovereignty. As a result, most of the mutual obligations not often exceed existing common law. There is no relative weight to each rule, and the dependent population and social and economic needs are more important.

There has been poor management of the conflicts by government bodies in Ukasi through weak expression of authority and lack of holistic approach where it has approached the matter mainly from point of view. Although attempts to involve the community have been partially successful, conflicts over resources like wetlands and grazing has made them more difficult. Numerous initiatives have been put in place in order to prevent, alleviate or resolve conflicts in Ukasi consisting of both peace negotiations conducted by the government, political leaders, and sometimes by external parties such as the nongovernmental organizations and through grass-roots initiatives. As a result of numerous peace building initiatives, the area has experienced an overall reduction in the number of conflicts save for conflicts related to competition over natural resources. Conflicts arising from historical rivalry and socio-cultural practices have greatly reduced.

Conflicts over control of and access to water and pasture still persist and are associated with extreme climatic events. It safe to predict that Ukasi will see increasing resource-related disputes, what with bludgeoning population that will exacerbate the water and pastures stress levels?

The SEKU_ASALI Project's studies propose a process where emphasis is place on the strengths, weaknesses, and opportunities arising out of each community, which can lead to the betterment of the area's social and economic development, with each group benefitting from the presence of the others. Proactive cooperation can help prevent and resolve conflicts over water and help maintain communal and profitable stability and help build sustainable peace. The initiative can bring together the societies to work together on the development and management of common-resources and protect them for improved livelihoods with view to building peace and security at the local level with ample socioeconomic benefits. The Somali

and the Orma communities are pastoralists. This makes them move between the various locations of Ukasi and beyond to sustain their livelihoods. As such they bring into the common market place a number of commodities that are not available with the Kamba community. These commodities are converted into monetary values that the communities need to sustain themselves. On the other hand, the agropastoralists Kamba have farm produce that the pastoralists need to eat and, crop remnants that can be fed to livestock.

The pastoralists also live on the shops and hotels in the area for consumables. The premises are largely owned by the agropastoralists. With tangible cooperation, some of these undertakings can be exchanged through battering. Allowing the pastoralists to graze has the value of adding manure to the farms. Renting the water points is a form of income to the Kamba community.



A woman looks for water at a seasonal river

Balancing Livelihood Needs and Environmental Concerns Charcoal Making in Kitui:

By Harun Kiruki

Large scale charcoal making was introduced in in Kitui in the early 1990s from Chyulu Hills in the neighbouring Makueni County. This coincided with periods when weather conditions began to be more erratic and droughts became a common phenomenon leading to massive crop failures and famines. Most households in Kitui are agro pastoralist, dependent on rain fed agriculture. With erratic rainfall, their livelihoods were negatively impacted. Thus, charcoal making acted as a 'safety net' with cash generated used to buy grains, supplementary foods and other household commodities when food supplies run low.



A full-grown tree (*Strychnos spinosa*). Thanks to charcoal production, it is now hard to see members of this species in Kitui South.

INSET: Traditional charcoal kiln in Mudha, Kitui

health and willpower. Trees suitable for charcoal making were not a problem and could easily be accessed on one's own farm or from neighbours free or at very low cost. The scale of production fuelled by abundant tree resources coupled by lack of regulations ensured that the prices of charcoal remained low for very long periods. Instead of earning a decent livelihood charcoal producers were condemned to a life of penury, while enriching middlemen and government officers. The resultant massive tree cutting and environmental degradation, prompting the government to invoke a ban on charcoal production, particularly in Kitui. These bans, largely not respected, only increased the exploitation of charcoal producers by both the middlemen and government officers.

In order to try and find solutions to the charcoal sector, South Eastern Kenya University commissioned a study in Kitui South and Kitui South Game Reserve. The study found out land cover change was taking place due to charcoal production. In addition some local tree species such as *Kyathandare (Cassia abbreviata)*, *Kalului (Balanites aegyptica)*, *Kyae (Strychnos spinosa)* and *Kasibu (Boscia coriaceae)* have been wiped out. It is not easy to see a tree of those species which is more than 3 metres in height. The study also revealed that charcoal income comprises 20% of the household income. In addition if the current harvesting trends continue, there will be no trees to harvest by 2030. This will impact negatively on livelihoods and women headed households will be the worst hit. So what's the way forward? The study suggested a number of solutions to the charcoal problem namely,

- Decriminalising of charcoal production so that producers can invest in tree planting, with the knowledge that they will sell their products openly and to the highest bidder
- Strengthening charcoal producer associations that members can self-regulate and negotiate for better market prices
- Adopting tree harvesting practices which do not take away the entire tree, but focuses on regular harvest of branches
- Encouraging farmers to set up enclosures so as to encourage regeneration
- Encouraging planting of fast growing ASAL species such as *Musewa (Acacia polycantha)* and *Kithumula ()* for charcoal production
- Training and adoption of better charcoal production technologies.



Women sell charcoal by the roadside in Kitui

Due to low entry requirements for charcoal production, many residents of Kitui ventured into the practice to make an extra coin. To start charcoal production one only needed an axe, a panga, good

These solutions can be approached at policy level. The two levels of government should realize that both charcoal production and consumption will be with us for a long time and take steps to ensure that local communities livelihoods needs strike a balance with conservation needs instead of making knee jerk reactions to the charcoal question.

Assessing Borehole Vulnerability and Finding Artificial Recharge Mechanisms



Dr. Patrick Kariuki

BACKGROUND

Water availability in arid and semi-arid areas is one of the main challenges that impact on human survival, livelihood and social and economic development. Due to scarcity of surface water, groundwater abstraction is considered a major avenue to alleviate the existing water availability

challenges, which currently are being compounded by effects of climate change. However, Modification of the recharge area for groundwater by changing the land surface due to human activity leads to imbalances in groundwater extraction and recharge.

The modification forms depressions so that water no longer flows along original pathways. Such changes may increase or decrease rainwater recharge to groundwater. Shorter flow paths may increase susceptibility to contamination while re-directed flow paths may deplete total recharge of the aquifer (Peckenham, Thornton & Whalen, 2009).

Groundwater is a subsurface phenomenon where its potential location is based on indirect analysis of observable features such as geological structures in the form of lineaments, other surface observable geomorphic features and hydrologic characteristics. Establishment of groundwater locations and quality is an important stage in its provision in water scarce areas. Satellite remote sensing together with Geographic Information System (GIS) provides tools for better observation and more systematic analysis of various indicators i.e. lineaments, and landforms from a synoptic perspective.

In this study, an integrated approach to the groundwater potential mapping and exploitation challenges was done. Desktop studies by use of secondary data and field surveys were used in mapping groundwater zones and associated characteristics along a transect cutting across Kitui, Machakos and Kajiado. GIS and remote sensing tools were used to establish groundwater occurrence potential and related potential recharge characteristics. A field survey of existing boreholes along a northeast-southwest transect from Kitui through Machakos to Kajiado counties, cutting across different agro-ecological zones, was carried out with a total of 148 boreholes surveyed.

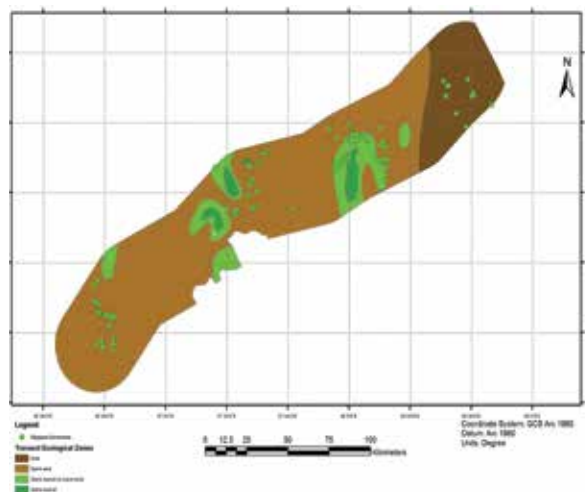


Figure 1: Survey Transect showing location of boreholes relative to ecological zones

Preliminary Findings

Preliminary results established that there are various factors influencing the groundwater potential in the area among which is geomorphology, geological structures, and anthropological factors. Lineaments provide one of the major factors controlling both presence and recharge of groundwater resource. The geology on the other hand is generally that of the basement system that comprises of mainly hard rocks with low porosity thus the importance of the fractures as groundwater source in the area.

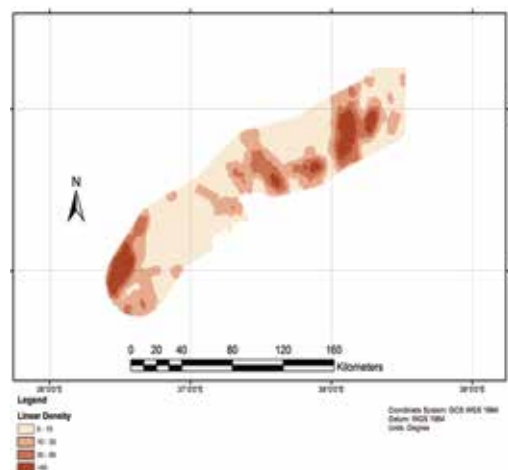


Figure 2: Lineament density as potential groundwater source and recharge zones

In terms of recharge, the most commonly applied methods among the respondents was river spread and holding surface ponds. However, there was lack of knowledge in most of the other potential recharge technologies. Many dry boreholes have thus not been used as recharge sources even where there is close proximity to existing productive boreholes.



Figure 3: Holding dam used as borehole recharge source in Machakos

The main management challenge was established to be frequent breakdown and lack of resources for repair for community owned boreholes. Low borehole yield against high demand is a critical challenge during dry seasons, particularly in arid areas in the north-east end of transect.

Power source was a frequently cited with diesel being the most common as a challenge in relation to high bills. It was observed

that there is appreciable adoption of solar power technology at 30% of the mapped boreholes.

However, the challenge with solar power was commonly sighted as limitation to cloud free conditions and daylight with most of the installations lacking backup batteries. However, the major challenge beyond the capability of the residents was high levels of heavy metals and fluoride especially in boreholes within the Mui basin in Kitui county that has resulted in serious health problems to the consumers. This calls for the need to introduce technologies that would help ease the burden by processing the water before consumption.

It has therefore been recommended that the counties need to intervene by helping communities in water quality improvement through adoption of low cost technologies and in improving management practices of community boreholes through capacity building. Lack of follow up monitoring of boreholes after installation was identified as a major gap that requires the counties attention.

Mapping High Value Multipurpose Trees



Dr. Patrick Kisangau

Multi-purpose woody trees and shrubs are vital components of arid and semi-arid ecosystems. They offer both regulatory and production services, yet there is inadequate information on their actual use and the factors affecting utilization of these plant resources, particularly in the drier areas of Kenya. A study has been going on to assess the local uses of multi-purpose woody trees and shrubs to determine how socio-economic factors influenced their use in Kitui, Machakos and Kajiado Counties in Kenya. Plant species use-value index (UVI) has revealed 10 indigenous wild woody species of high value in the study area.

Some of the most important indigenous High Value Multi-purpose Trees and shrubs (HVMTs) recorded are *Osyris lanceolata* (East African Sandal wood), *Dalbergia melanoxylon* (African blackwood), *Melia volkensii* (Mukau), *Terminalia brownii* (Muuku), *Tamarindus indica* (Kithumula/Mukwasu) and *Zanthoxylum chalybeum* (Mukenea/Mukanu).

Ongoing activities

Determining the Ecological Diversity of HVMTs within the Traditional Agroforestry Systems in South Eastern Kenya

Objectives

- i) Determine the status of use of high value woody tree and shrub species in South Eastern Kenya
- ii) Establish *ex-situ*, selected high value woody species germplasm at the university botanic garden
- iii) Determine diversity and encroachment levels of HVMTs
- iv) Adopt into farming systems priority high value woody tree species.

Dissemination

Dissemination of findings will begin by sensitizing farmers in selected pilot localities within the project area of Kitui, Machakos and Kajiado counties. This will be guided by participatory-based prioritization of high value woody plant species by the local community in the study area. Dissemination will also be strengthened by setting up demonstration plots of high value woody species at the university and community gardens. These will act as hands-on skill and technology transfer contact points on matters of good agronomic practices, including sustainable harvesting techniques for the selected priority high value woody species. Farmer exchange visits to establish tree planting nurseries like in KEFRI, Kitui station among others will be encouraged. Other dissemination channels will include scientific papers, exposure to field experiments, workshops and seminars, radio and television, print media, news releases, pamphlets and brochures.



Focus group discussion on HVMTs in Kitui County. INSET: *Osyris lanceolata* growing in the wild in Kitui

Opening New Frontiers: Maasai Pastoralist Women in Kajiado Now Own Cows



By Ida Gathoni

A chat with Magdalene Ipani, the chairlady of the Naretoi Women Group in the former Elangata Wuas Group Ranch of Kajiado County illustrates the fact the cow will for a long time to come remain a revered source of livelihood for the Maasai community. The Maasai people are known the world over for their resilience in pastoralism in one of the most unpredictable arid environments characterized by low rainfalls, high temperatures, low forage and frequent droughts that decimate the livestock livelihood. The local social, cultural and economic arrangement seem to prescribe possessing large herds of cows as it is a sign of prestige for the Maasai men. Traditionally, all livestock in the homestead (*enkang*) belongs to the man. A man with a large herd is considered rich and accorded high esteem. This makes cattle very dear to the Maasai men. This partly explains the domineering status of the men in the community and the sidelining of woman in the ownership of assets in the family.

Changes in land tenancy and the consequent land use transformation has allowed creeping in of changes in the livelihoods holding, access and, management. Women are increasingly participating in households' development, ushering them into the contributor category of the family social and economic wellbeing. The men are increasingly coming to accept this.

Naretoi Women Group has a membership of 18 women who have been able to successfully start rearing of Friesian cows that are earning them a living through milk sales and helping them to provide for their families. The group has disproved the general belief that only men can own cattle in this community. The men, on their part now appreciate that their wives can have an initiative that provides alternative to pastoralism. They also have started supporting the women group in taking care of the acquired cows. Women find this a major milestone in the societal development and, a major stepping stone to full recognition in decision making, particularly on livelihoods.

As the pastoralist land shrinks, due to changes in land tenure and other economic realities the Maasai women see themselves taking more and more livelihoods diversification activities. To supplement the household survival, the women have sought alternative ways of earning money, some of which are challenging traditional gender roles. Women report feeling empowered because they have their own income from their interventions. To buy the more expensive Friesian cows, the women initially sourced money from the group savings. The milk produced from the Friesian cows is sold in local towns and the local Karero Farmers Milk Cooperative Society. Calves produced from the hybrid animals are sold out if male

while the female are retained to raise the herd. To sustain the Friesian cow industry, knowledge and practice on pasture development, management and value additions is demanding enhancement efforts to finding new ways to feed the animals in an environment that is increasingly heading towards wanting sufficient land to graze. Providing extra feeds in the sedentised form of pastoralism will comprise a main way to live and support the emerging endeavours. In endeavours to support resilience levitation, the SEKU ASALI project has been working with the women and men in Elangatawuas on livelihood improvement on good husbandry, pasture improvement and, entrepreneurship and financial management. The project has been supporting the pastoralist community in growing fast-growing grasses to graze or harvest for hay or silage, and planting caliantra trees whose leaves are useful as fodder. The new fodders are used to feed animals in normal drought periods, when the pasture available is no longer sufficient and traditional migration is difficult, or sold to bring in cash. The commercial ventures and the money generated meet the women needs and buy supplementary feeds for livestock. Besides working with livestock, including chickens, the group has installed rooftop rainwater harvesting systems, and uses the water to domestic and producing vegetables through irrigation, a feat they are proud that their children are learning for posterity.

Magdalene Ipani reiterates that the Maasai community has been reluctant to abandon pastoralism, despite mounting challenges from pastoral land reductions, population pressure, climate change and global dynamics. To her, these are drivers of the Maasai pastoralists' changes, emphasizing that some aspects of the people's lifestyle can be maintained in smaller spaces by finding new opportunities to earn cash. These include aspects like the Friesian cows tending, vending water, bee keeping and cultivation of irrigated vegetables among others. Some of the local herders discern that in a culture and economy built on cows, having fewer is not easy. They, however, reckon that changing to the dairy cows is bringing in a more reliable income.

The group says that reducing the herd size is a reality pastoralist have to deal with. Because of the bulging population, space is shrinking, and so adaptive strategies have to be sought and reduced to manageable sizes. The Naretoi Women Group fraternity thinks that dairy farming is an idea whose time has come as social and economic conditions grow more unpredictable. The members observe that in the community where a person's entire life revolves around cows, the principles in both the old system and new are the same: care for cows, earn a reliable income from them and, use that cash to pay for what is needed.



SEKU ASALI Team members, Dr. Dorothy Amwata (Left) and Dr. Moses Mwangi (Centre), admire Magdalene calf

SEKU Staff Benefit from ASALI Project Funding for Capacity Building

One of the key objectives of the A Sustainable Approach to Livelihood Improvement (ASALI) Project is to build capacity for staff of the partner institutions. In the past three years, the project has invested substantially in the realization of this goal. SEKU's members of staff have benefitted from funding both for short and long courses in Kenya and abroad.

In it's 2019-2020 budget the Project set aside over €35,000 for staff undertaking post graduate studies in various academic fields. Staff at various stages of their studies were given financial assistance. Of those sponsored by the Project, 11 were taking their doctoral studies while six were master's degree student at SEKU and other universities in Kenya and neighboring Tanzania.

His research topic was: *Charcoal Making and Woodland Change: Human Decision Making Processes and Their Implication on Woodland Ecology and Livelihoods*. The project also funded another PhD study in health communication with a focus on HIV/AIDS by Osir Otteng a member of the SEKU ASALI Project team



SEKU-ASALI Project team member, Osir Otteng (2nd from left) with a section of his lecturers at the VU-Amsterdam Summer School.

The funded studies have yielded over 20 articles published in reputable journals in the last three years. The research cover a wide range of subject areas including, water, agriculture, health, environment and natural resources management, finance and linguistics.

During the same period the Project also sponsored training in various thematic areas. In May 2018 the it organised a-one week training workshop in Naivasha on competency-based curriculum development for the SEKU-ASALI team. In July of the same year, Project team member, Dr. Moses Mwangi, and and a member of the SEKU Management Dr. Samuel Mutukaa, attended a two-week summer course, "Feeding the Billions" at VU-Amsterdam.

In 2019 the Project organised three group training programmes in different aread including a one-week projoect planning and management course in May in Naivasha. Two other training sessions were held in July on GIS Remote Sensing, and Water Resource Management and Modeling. In july of the same year, Osir Otteng, a member of the project team, undertook a summers course on Global Health at VU-Amsterdam in the month of July.



PhD candidate, Harun Kiruki (2nd from left), poses for a photo with panelists after successfully defending his thesis at VU-Amsterdam. With him are from left Ms. Sabina Di Prima (VU), SEKU VC, Prof. Geoffrey Muluvi, and ASALI Project Director, Dr. Denyse Snelder

At the same time the Project advanced full scholarship to one faculty member to undertake doctoral degree studies at the Vrije Universiteit Amsterdam, the Netherlands. Harun Kiruki, lecturer in the School of Environment, Water and Natural Resources graduated with a PhD degree in Environmental Studies in 2019.

*“Education of People from Developing
Countries Willing to Serve Society and Contribute
to the Development of Their Country”*

- Ms. Grietje Wille, ASALI Project Fund Provider

