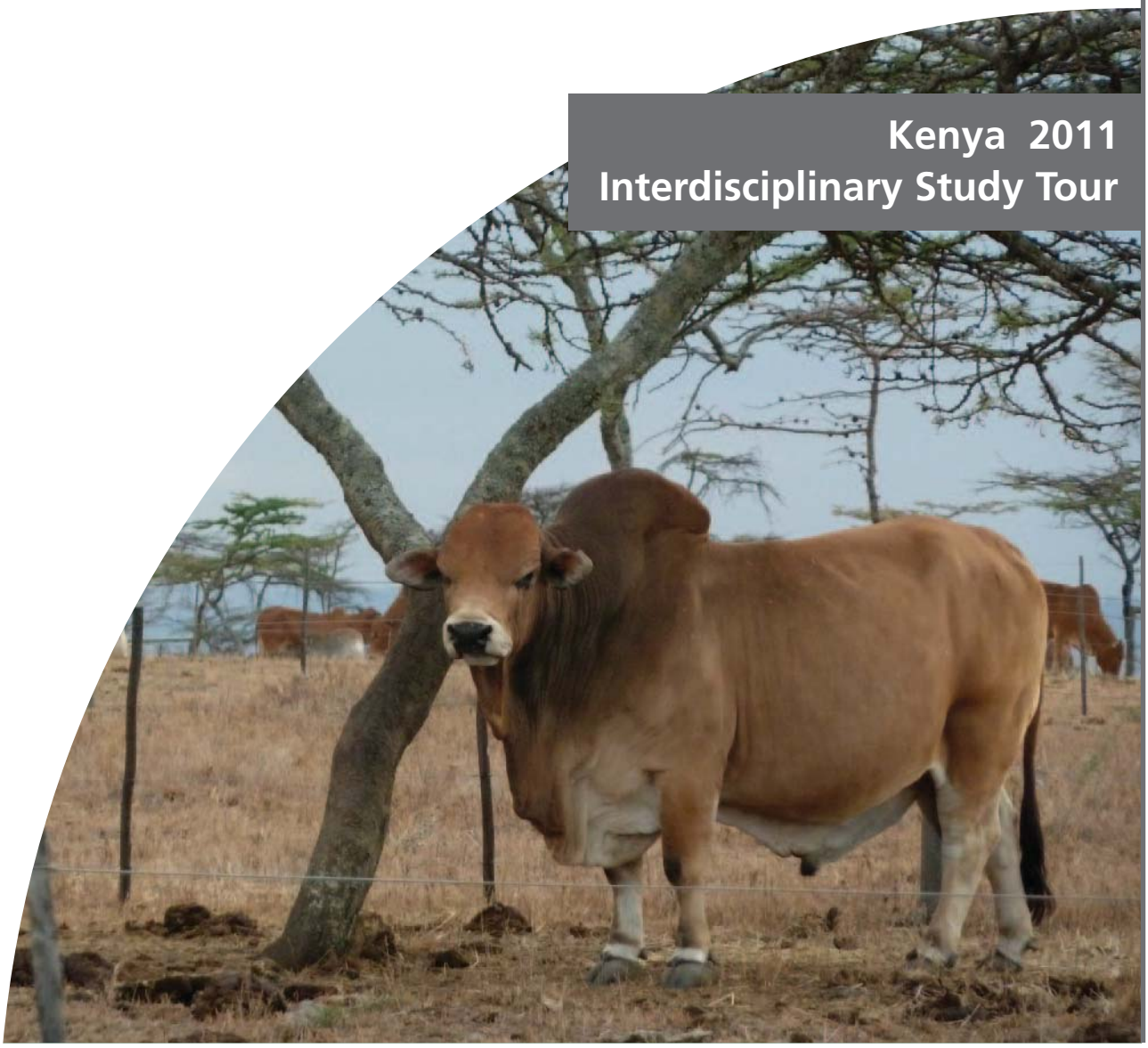
UNIKASSEL VERSITÄT

GEORG-AUGUST-UNIVERSITÄT GÖTTINGEN

Potential of rural Commodity Chains for Livelihoods, Job Creation and Development

A study tour to Kenya
from March 5th to March 20th 2011

Kenya 2011
Interdisciplinary Study Tour



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Cover picture (front): Boran stud bull at Ol Pejeta Conservancy.
Cover picture (back): Ol Pejeta scout leading the excursion team back to civilization.

All pictures taken by excursion team unless otherwise stated.

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Preface

The University of Kassel in Witzenhausen and the University of Göttingen offer studies in the field of agriculture, resource management, environment, forestry, fisheries, food, nutrition and related sciences in the context of rural development, sustainable resource use and poverty alleviation with a regional focus on developing countries particularly in tropical and subtropical areas. Both universities have built a wealth of expertise on tropical landuse systems and the sustainable management of natural resources. Many of the students interested herein will eventually conduct research in tropical countries - often in the frame of their M.Sc. or Ph.D. theses – and their academic curriculum must prepare them for the task. It is obvious that even the best lecture at a university in a so called „developed" and temperate region cannot substitute hands-on experience while visiting the tropics. Therefore, field trips to tropical countries are a most desirable part of any such curriculum.

Scientists of the German Institute for Tropical and Subtropical Agriculture (DITSL) and the agricultural and forestry faculties of the universities in Witzenhausen and Göttingen maintain continuous mutual research and academic training and networking activities and projects with Kenyan universities and research institutes as well as international research centers based in Kenya. Among these are Egerton University, the Kenya Agricultural Research Institute KARI, the International Center for Insect Physiology and Ecology icipe, the International Livestock Research Institute ILRI, the World Agroforestry Center ICRAF and the International Center for Tropical Agriculture CIAT. Egerton is partner in the University of Kassel's BMZ-funded international centre of excellence for development research ICDD (International Centre for Development and Decent Work) and Egerton and KARI are both partners in DITSL's DAAD-funded Cross-continental network for sustainable adaptation of grassland systems vulnerable to climate change "GrassNet". The 2011 field excursion of students and lecturers from Witzenhausen and Göttingen to Kenya was organised based upon this institutional foundation. Particularly through its varied geography, Kenya offers interesting examples for small to large scale tropical agriculture and landuse. It shows the different development pathways that different parts of the sector can take within the overall development of the national economy. It offers insight into the effects of globalisation on landuse and the agricultural sector.

The excursion was preceeded by a phase of intensive preparation. A seminar of 2 contact hours per week was held during winter semester 20010/11, where students presented different topics related to the forthcoming field trip. Funds were acquired, logistics were organised and in March 2011, 25 students and 4 lecturers set out for Kenya. Acquiring funds for such a trip is difficult and we are grateful for generous financial support by the German Academic Exchange Service DAAD, the University of Kassel through the Faculty of Organic Agricultural Sciences in Witzenhausen and the International Academic Exchange Office, the University of Göttingen through the Faculty of Agricultural Sciences, the Foundation fiat panis Ulm, the Universitätsbund Göttingen, the Freundeskreis Wilhelmshof e.V. in Witzenhausen, the Hochschulverband Witzenhausen e.V., the Altner-Combecher Stiftung für Ökologie und Frieden, and the German Institute for Tropical and Subtropical Agriculture.

From March 5th to 20th 2011 we followed through a very interesting and physically taxing schedule. Every aspect of the programme moved exceptionally smooth, which was facilitated through the excellent support received from our partners - to whom we express our sincere gratitude. We would also like to thank our colleagues from Witzenhausen and Göttingen for their great support in preparing this trip. Finally, all participating students deserve a big "Thank You". They worked hard to achieve the predetermined goals. But besides the work we also had a lot of fun together. It was a great opportunity to have had a chance to travel with all of you.

Eva Schlecht
Andreas Bürkert
Grete Thinggaard
Christian Hülsebusch

Introduction and Itinerary

The excursion group in front of the Nairobi National Museum - just a few hours after the arrival in Kenya.

From March 5th to March 20th 2011 a group of 9 students from the University of Kassel (Witzenhausen) and 16 students from the University of Göttingen, accompanied by 4 lecturers went on a two-weeks excursion entitled "Potential of rural commodity chains for livelihoods, job creation and development" to Kenya. A detailed list of the participants is provided on page 167.

The group arrived in Kenya´s colourful and pulsating capital, Nairobi, on March 6th and spend there the first three days of the excursion. In Nairobi the group got not only essential information about the country´s agricultural and forestry sector by visiting the headquarters of some of the most influencing institutions and international organisations in this field, but also got an impression about the culture and history of the country by visiting the Nairobi National Museum. Thus, the stay in Nairobi gave a good theoretical, but also practice-oriented start for the further experiences.

From Nairobi the excursion group made its way up in northern direction. From Embu in the South-East of Mt. Kenya to Nyeri, Nanyuki and Nyahururu in the West of Mt. Kenya the landscape, landuse and agriculture changed enormously - from green, fertile hills to a barren, dry area dominated by acacia trees, shrubs and yellowish grasslands, from rich crop production to extensive animal husbandry and pastoralism.

Outside the capital Nairobi the group learned about the diverse challenges of Kenya´s agriculture by presentations of further national and international re-

search institutions and development organisations, in discussions with experts from the research and project point of view and visits of a diversity of farms – from small scale to large farms, from subsistence to intensive production. With the presented wealth of information accompanied by great hospitality of the hosts the group got comprehensive insights from different perspectives.

Besides structural and infrastructural challenges, worrying factors are the effects of climate chance and inappropriate landuse practices. Another challenging factor is the living and farming with wild life, which the group got to know for instance in the Ol Pejeta Conservancy in the Laikipia District.

From Nyahururu in the West of Mt. Kenya the excursion group went further western along the geologically and biologically diverse Rift Valley to Nakuru. There the Egerton University with its expertise for agricultural sciences is located and made the group feel most welcome. At Egerton the participants got insights in the scientific work and research of the University and could exchange with staff and students. In particular the visits of urban and peri-urban dairy farmers and the dairy processing chain was an experience very close to practice.

On the further itinerary some students of the Egerton University joint the group for the second half of the excursion – a great opportunity for further exchange, discussions and making friends.

From the Laikipia District the now even more international group went on towards Lake Victoria via the tea and cof-

The excursion group standing and sitting on the equator near the Rift Valley.

Students and lecturers visiting an Unilever tea factory - dressed in appropriate protective clothing.

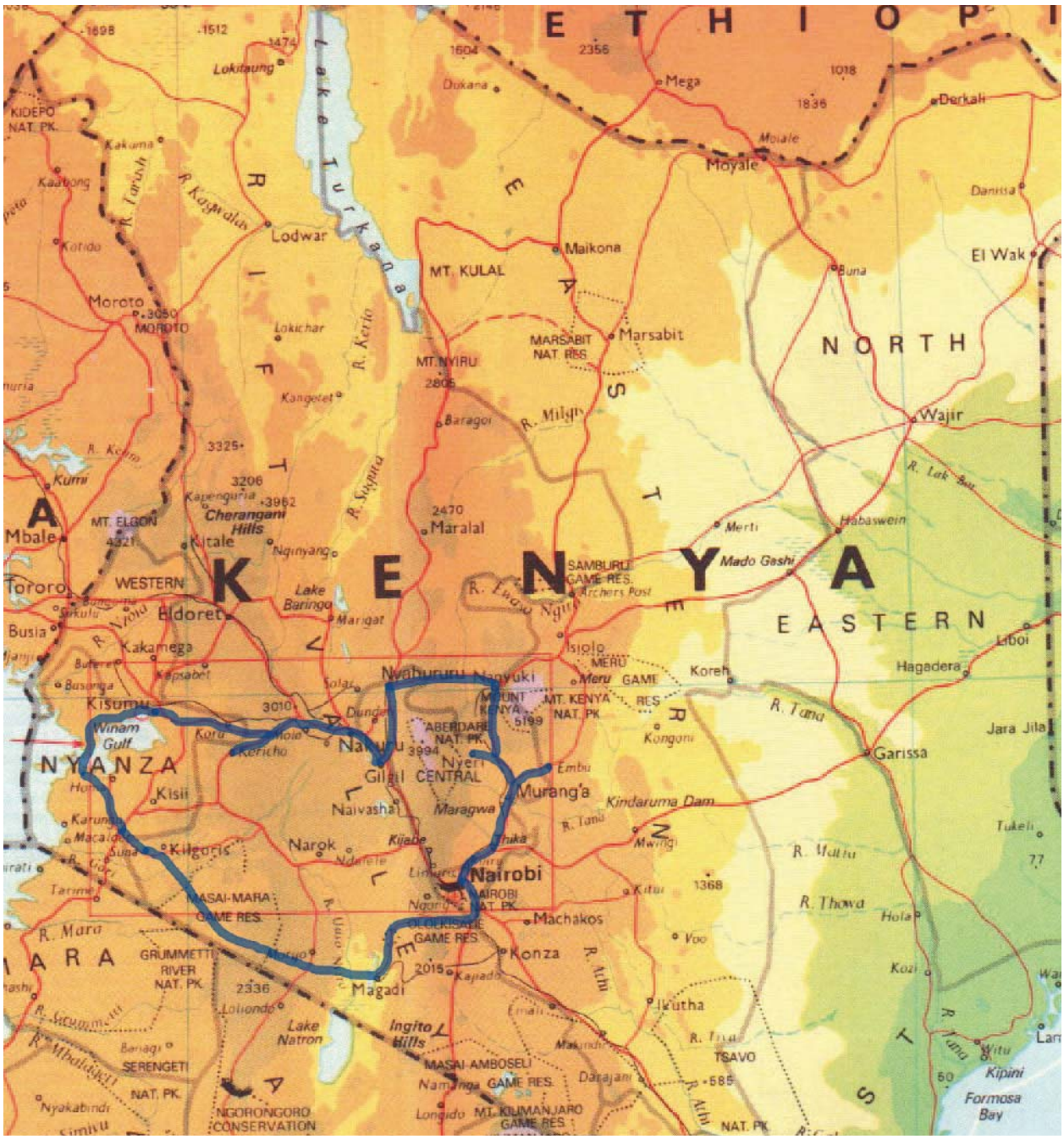
fee plantations western of the Rift Valley. Again, the group experienced the impressing change of landscape and landuse – from rather small structured, diverse agriculture around Mt. Kenya and in the Rift Valley to rather large-scale tea and coffee fields in the western highlands. In Kisumu the group visited the Lake Basin Development Authority, which analyses for instance the regional effects of climate chance and agricultural irrigation and works on the development on adaption strategies.

The excursion was very interesting, informative, inspiring, adventurous, but also tiring ...

A nice experience – beyond the study contents of the excursion - was the boat trip across Lake Victoria from the North shore to the South shore. On the southern shore of Lake Victoria a research station of the ICIPE (International Center for Insect Physiology and Ecology) is located, which works on particular intercropping and mixed culture system like the successful push-pull-programme.

From Lake Victoria the excursion itinerary lead via a region dominated by sugar cane plantations and via the Transmara to the well-known Masai Mara Game Reserve. Coming close to wildlife and experiencing again a completely different landscape and culture was a nice completion of the diverse and enriching excursion.

The itinerary of the excursion is shown in the map below (blue line) and the complete programme is listed on the following pages.



Itinerary of the excursion.

Excursion Programme

Day	Activity	
05.03. (Sat)	Afternoon:	Departure from Germany, German Railways to Frankfurt Airport, flight to Addis Ababa with ET 707 - FRA - ADD 10.40 pm - 07.40 am
06.03. (Sun)	Morning:	Flight from Addis Ababa to Nairobi with ET 801 - ADD - NBO 10.30 am - 12.30 am, arrival at Jomo Kenyatta International Airport, Nairobi, Kenya, Transfer to Chak guesthouse Westlands by Charleston Travel
	Afternoon:	Visit of **Nairobi National Museum**
07.03. (Mon)	Morning:	Visit of the **Kenya Agricultural Research Institute** KARI, (Dr. Joseph Mureithi, arranged by Dr. David Miano and Dr. Mario Younan), lunch at the KARI restaurant
	Afternoon:	Visit of the **International Center for Insect Physiology and Ecology** ICIPE, welcome and overview of ICIPE´s Research & Development - Prof. Dr. Christian Borgemeister, African Fruit Fly Programme - Dr. Samira Mohamed & Team, Leaf Miner Programme - Dr. Subramanian Sevgan & Team, Commercial Insect Programme - Dr. Evelyn Nguku & Team, Kenya Organic Agriculture Network – KOAN Team
08.03. (Tue)	Morning:	Visit of the **International Livestock Research Institute** ILRI, welcome and introduction - ILRI Management, Dr. Jan de Leeuw, Brenda Omuombo, Introduction of Biosciences eastern and central Africa (BecA) Hub –Timothy Kingori, Livestock futures – Dr. Mario Herrero & Team, Livestock and adaptation to climate change – Dr. Polly Erickson, Milk production and markets – Dr. Steve Staal, Dr. Isabel Baltenweck, IBLI – livestock insurances – Dr. Andrew Mude & Team, Conservancies – Dr. Mohamed Said, Livestock, rangelands and payment for environmental services – Philip Osano, lunch at the ILRI restaurant
	Afternoon:	Visit of the **World Agroforestry Center** ICRAF - Dr. Eike Lüdeling, Dr. Katja Kehlenbeck, Dr. Brigitte Maass

Day	Activity	
09.03. (Wed)	Morning:	Drive to Embu (180 km), Visit of **ICIPE Mango Fruit fly research site** – Dr. Sunday Ekesi
	Afternoon:	**Mwea Rice Irrigation Scheme** (National Irrigation Board arrangement through KARI) Drive to Nyeri (100 km)
10.03. (Thu)	Morning:	Drive to Nanyuki (50 km), Visit of **CETRAD** in Nanyuki - research, training and land use planning for optimal resource use and sustainable development (CETRAD Team)
	Afternoon:	Visit of a **smallholder farm and forest stands at the foothills of mount Kenya**, introduction to **index based crop insurance** for smallholder farmers (CETRAD Team)
11.03. (Fri)	Morning:	Presentation of the **Laikipia Wildlife Forum**, introduction to the Lakipia tourism concept and community based eco-tourism approaches, lunch in Nanyuki
	Afternoon:	Visit of the **Timau Farm**
12.03. (Sat)	Morning:	Visit of the **Ol Pejeta Conservancy**, introduction to the concept of conservancy – Richard Vigne, CEO, Livestock operations and commercial ranching - Giles Prettejohn, Wildlife conservation, environmental monitoring, lunch at Ol Pejeta
	Afternoon:	Drive to Nyahururu (150 km)
13.03. (Sun)	Afternoon:	Drive to Nakuru/ Njoro (150 km), **Egerton University**
	Evening:	Meeting Egerton staff and students, introduction to Nakuru Urban Dairy Value Chains project (ICDD team: Prof. Isaac Kosgey, Dr. George Owuor, Jane Sawe, Risper Berem, Thomas Ogolla)

Day	Activity	
14.03. (Mon)	Morning:	Welcome and introduction to **Egerton University** (VC Prof. James Tuitoek, Dean, Agric Prof. Alexander Kahi), Group-work (two groups): interviewing urban/peri-urban dairy producers, contract milkers, milk hawkers, large and small scale urban dairy processors (ICDD team & students)
	Afternoon:	Visit of **Egerton Castle**
	Evening:	Visit of **Tatton Farm** - Egerton University Experimental Station and Njoro Canning Factory, dinner at Egerton
15.03. (Tue)	Morning:	Drive to Kericho (150 km), Visit of **Kenya Tea Packers** Ltd KETAPA, headquarters, packing factory, growers cooperative, plantations
	Afternoon:	Drive to Kisumu (150 km), Visit of the **Lake Basin Development Authority** (Lake Victoria)
16.03. (Wed)	Morning:	Drive and boat trip Mbita Point (200 km), visit of ICIPE´s **push-pull-programme**, lunch at ICIPE
	Afternoon:	Drive to Awendo (50 km), South Nyanza Sugar Company Limited (SonySugar), **sugar cane** plantation
17.03. (Thu)	Morning:	Drive through Transmara and Masai Mara to Ol Moran Tented Camp
	Afternoon:	**Game Drive** in the Mara Masai Game Reserve
18.03. (Fri)	Morning:	Drive via Lake Magadi to Nairobi / Naivasha (200 km), Masai cattle herding and water scarcity problems
19.03. (Sat)	Morning:	Group: Day in Nairobi, Buerkert, Schlecht Huelsebusch: Departure to Madagaskar, from Jomo Kenyatta International Airport KQ 756 - NBO - ADD 8:20 am - 11:40 am
	Evening:	Group of 8 persons: Transfer to Airport by Charleston Travel, Rest of group: stays behind and organise return travel individually
20.03. (Sun)	Morning:	Departure to Germany from Jomo Kenyatta International Airport ET 802 - NBO - ADD 3:30 am - 6:00 am, ET 706 - ADD - FRA 11:00 am - 4:35 pm, German Railways from Frankfurt Airport

(Total km travelled: ca 2.500 km including local on-site mileage, total overnight stays: 14)

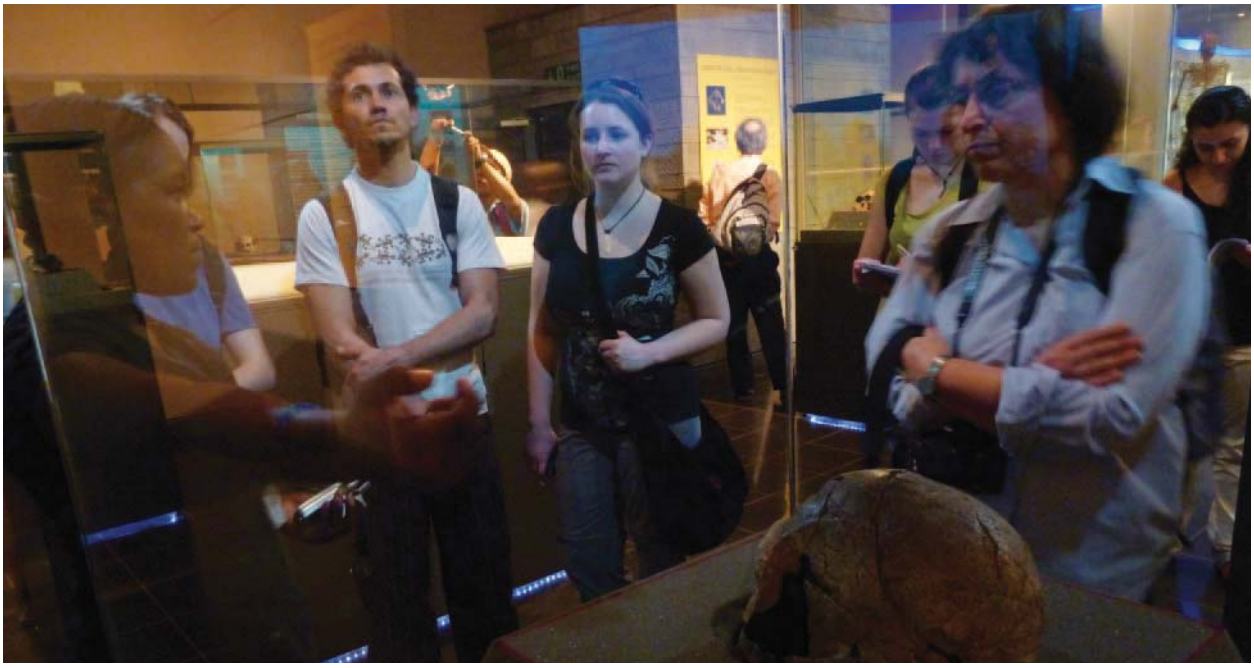
Nairobi National Museum

by Alexandra Arndt

The well worth seeing Nairobi National Museum was initiated in 1910 by the East Africa and Uganda Natural History Society, but it was only opened in 1930. Its collection has been growing continually; therefore the building was expanded two times. Apart from natural history, paleoanthropological, ethological and historical exhibits, the museum also contains a gallery for contemporary art.

The department of flora and fauna contains a collection of stuffed mammals. It comprises exhibits that show how mammals have evolved, how different they move (locomotion), what they feed on (plant, meat) and how they defend themselves. Visitors can see inter alia a giant skeleton of a whale and a replication of the popular elephant "Ahmed of Marsabit", who lived on the Mount Marsabit in northern Kenya. His tusks were very huge, they almost reached the ground. Consequently, he became endangered, because of the increasing hazard of elephant poaching in the late 1960ies. For that reason people were worried that Ahmed might become a target for poachers. Therefore they wrote letters to the government, in which they explained their sorrows. As a result, the former president Kenyatta granted that this elephant should be given exclusive protection. Although he died natural causes, he may have been affected by an earlier gunshot wound.

The collection of mammals also contains an old relative of the elephant. This is an animal, called "dugong". It lives in the sea, but emerges to breathe. Another interesting exhibit in this department is an



Students and lectures are getting information about the Kenyan history and culture by a museum employee.

artwork, which represents a mosaic map of Kenya, which has been made using a collection of butterflies from various parts of the country. The butterflies are quite diverse in terms of their size and color. Furthermore there is a huge collection of about 1,500 species of birds. Various forest-, water- and prey birds can be admired in all their glory. Every bird is contained: from the hornbill to the African crowned crane.

In the department of geology visitors get a read in the Earth´s history of East Africa. Furthermore there are explanations about the development of the Rift Valley and about volcanism.

The most fascinating part of the museum is probably the paleoanthropological department. Many replicas of several archeological finds are exhibited. Together they form the reconstruction of the origin of humankind. A large number of these finds were discovered by a famous Kenyan anthropologist family, the Leakey's. Especially Richard Leakey deserves particular mention. A part from his work as anthropologist, he led the nature conservation "Kenyan Wildlife Service" (KWS) and became also the director of the Nairobi National Museum.

In August 1984 the skilled fossil hunter Kamoya Kimeu found a small piece of a 1.6 million years old hominid skull on a dry river bank on the western side of Lake Turkana. Accordingly, the team of Alan Walker and Richard Leakey immediately began the recovery operations. Apart from the skull they excavated nearly a complete skeleton, the so called "Turkana boy". He belongs to the species of Homo erectus, namely the direct ancestor of humankind. This species was already able to use fire and to speak a higher developed language. Furthermore the Homo erectus made considerable improved tools. Both, the "Turkana boy" and "Lucy" (an Australopithecus afarensis) are the most complete skeletons ever found of early hominines. They are very special exhibitions in the museum. In addition there is a series of skulls of various hominines, a large collection of Stone Age tools, the dioramas of three pre human species and their different ways of life as well as the replica of 30.000 years old rock paintings from Tanzania, which round off the image of the early history of humankind.

Downstairs in the museum is an exhibition room for the recent history of the Kenyan Swahili-coast between the 9th and 19th century. Unfortunately this one is not so informative compared to the ancestral gallery of humankind.

On the second floor of the museum is a huge ethnographic collection, which contains a range of handicraft products, clothes, jewelry and weapons of different Kenyan population groups. In addition there are lovely painted portraits, which were painted by an Austrian artist, called Joy Adamson. She produced these artworks of individual population groups and their traditional dresses by order of the British colonial government. As a result more than 600 pictures originated between 1949 and 1955. In the same floor works by contemporary Kenyan artists are exhibited. These works of art are available to buy.

Opposite the museum is a snake park. There visitors discover different varieties of snakes, crocodiles and turtles. It is always worth to visit, although the park needs an improvement of the conditions under which the animals are kept.

Kenya Agricultural Research Institute - some Objectives and Implications

by Vince Canger

The Kenya Agricultural Research Institute (KARI), in respect to the country's demographic, has a huge role to play in Kenyan society. Therefore, it was probably fitting that the students of this excursion had their first in-depth agricultural encounter in Kenya, when they arrived at the institute. Although the students were not walking on farms or speaking with rural citizens, but were in fact sitting in an attractive conference room in the capital city of Nairobi, the encounter would serve as a good introduction to agriculture in Kenya and what would be seen and discussed later on.

KARI, with its 600 scientists and 7,000 staff members, the issues it works in, and the connections it serves throughout the country, has a far-reaching impact that was frequently seen throughout the trip. And although the presentation that was given to the students was not always agreeable, it nevertheless gave an accurate impression of Kenyan agriculture in its current state, the challenges it faces, and some outlooks for its future.

The introduction to KARI began with its 2009-2014 strategy, which largely included the most talked about and questioned subject: the "Vision 2030," as it was called. The government's goal through the vision, generally speaking, is of a transformation to a middle economy for every Kenyan citizen. The vision is composed of three pillars, political, economic and social, of which stability, security, equality and peace are the qualities being strived for. It is then within these three pillars that gives way to four main focus areas, which are agriculture, tourism, manufacturing and retail. Of course, KARI's focus is on agriculture, but it also strives to relate and involve agriculture with the other sectors, in order

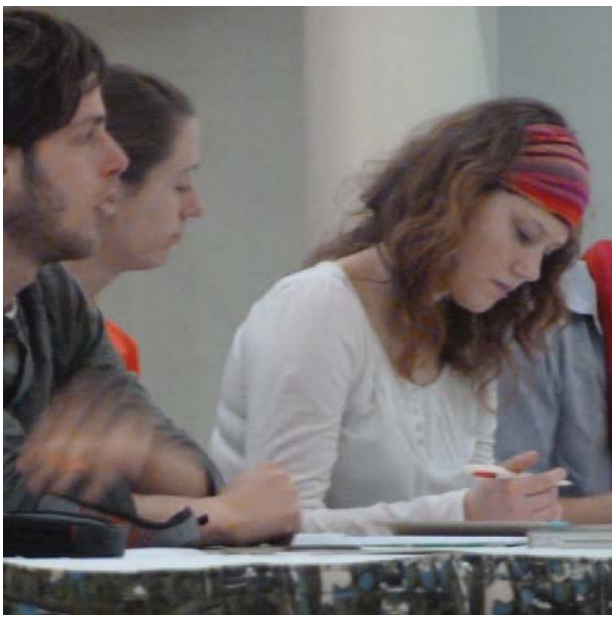
Students and lectures are listening to presentions by KARI about the Kenyan agricultural and forestry sector.

to achieve the desired goals of the complete vision. Therefore, it was explicitly mentioned that there is a broad focus on "commercializing" the agriculture sector, in the sense of contributing to the formal economy, as opposed to the predominately subsistence-based systems that dominate Kenya's agricultural landscape.

In a sense, this goal is highly justified, due to the fact that agriculture is the mainstay of the Kenyan economy. Subsequently, KARI is interested in developing the technologies that will add value and most likely be demanded as the sector commercializes in this direction. In order to do this, they have also spoken of working with "partners along the value chains" in order to analyse commodities and predict demands. What is also sure is that livestock will be a major focus of this work, as livestock already plays a central role in Kenya's agriculture. In addition, it was mentioned that interest and attention will be paid to the attractiveness of "traditional" vegetables in cropping systems, especially for commercial production. And because approximately 80% of Kenyans involved in agriculture involve themselves with livestock, the institute seeks to better integrate the cropping and livestock systems into a more unified, and more importantly, productive system. This would entail transitioning to a mixed market of local and regional distribution from a predominately local, internal consumption-based market.

Climate change also poses problems, and hence projects for KARI. When asked about KARI's involvement in climate change mitigation strategies, it was mentioned that adaptation through the production of "appropriate" crops was a focus. Currently, Kenya's drought cycle has been shortening, meaning heavier drought is becoming common after fewer years. In effect, drought tolerant crops pose as an "appropriate" solution. These are crops such as sorghum, millet, and cassava, which were said will all be pushed for adoption by the institute. But this brings many challenges with it. Widespread adoption of a non-culturally important crop, such as sorghum over maize, is not easy to achieve. One proposed solution was market-based, while the other was extension-based. On one hand, under KARI's initiative, beer producers in the country were asked to try and use sorghum for beer production over other grains, such as barely. And they tried just that. The result, they said, was an increase in national sorghum production. On the other hand, a proposed solution was that lack of adoption of suggested material was due to "weaknesses in extension," and that more sub-sector analysis, stakeholder discussions, and appropriate and direct communication had to be done on the part of the extension workers in order to increase their potential impact.

With just these few points in mind, this "restructuring" goal of the agricultural sector is an ambitious step, and in order to meet the 2030 vision an abrupt step will also be made, if the goals are to be met in time. As it stands, Kenya is largely a smallholder-based agricultural economy, and as it was stated by the spokesperson at the time, "How do we deal with thousands of smallholders?" It seems that the answer is: they can't. Therefore, in many of the KARI objectives placed in order to meet the Vision 2030, there will be an emphasis not merely on commercializing, but also expansion. There will be an increase (or a push to increase) in technology, mechanization and production for markets both national and international. This will most likely have lasting



Following the presentations, students and KARI staff discuss development challenges and opportunities for Kenya's agricultural sector.

effects on smallholder systems and lifestyles, as trends will influence agricultural models to meet emerging and future standards. It is also suggested that when agriculture plays the role of an economic growth promoter, industrializer and poverty reducer, it also becomes the "main agent of environmental degradation" (Thomas et al. 2008). Therefore, it may be important for these policies and institutions involved in them, such as KARI, to have built in "reward systems for ecosystem protection," something, which was not mentioned during the students' time at KARI.

Of course, criticism at times can come easy, and in response to Kenya's Vision 2030, there seems to be a decent amount (not only from some of the students, but from a simple web-based literature search, as well). Therefore, it seems suspect that Kenya can reach the ambitious goal of a middle economy for all its citizens through some of KARI's main objectives. Henley, speaking specifically of Kenya's Vision 2030, states, "Historically speaking, this kind of strategy in Africa has led at best to projects, which create only very limited employment and income for the poor..." and have often led to scenarios of poor farmers and consumers dealing with monopolistic and oligopolistic processors and manufacturers (2010). He also goes further to cite examples of Southeast Asian successes, which have not been based on value addition, but rather in sole "quantity," therefore without having to rely so much on processing and technology, but more on their readily available resources, including cheap and abundant labour. In this sense, the Vision 2030 can be criticized as more of a modernity plan rather than an effective development plan.

On a different point, Kibaara et al. suggest that one major hindrance to poverty alleviation in Kenya is surely land access (2008). The amount of land available to individual farmers is steadily declining and productivity and income generation is limited in return. Whether or not this will be effectively solved by KARI's initiatives is left to be seen, but what is clear is that this is recognized and even

through their goals of commercialization topics such as this will be addressed. Because smallholders due pose a constraint towards what KARI sees as effective change, it was suggested that promoting cooperatives can help to consolidate resources and serve as an "entry point" for disseminating knowledge through extension services. This may not of course directly solve the problem of declining land shares (a daunting task in itself), but it can be a part of the solution. What is concerning though, is KARI's recurring theme that makes small-scale agriculture seen as a less important player for Kenya's agricultural future.

There is no denying KARI's importance for Kenya. Its direct involvement in the improvement of agriculture means an enormous amount for a country so heavily involved in the sector. Kenya, it seems, has potential for positive change and KARI can play a huge role in that. From a student's perspective, after listening to what the directors at KARI had to say about their institution, there is a hope that an institution such as this, which invests all its time in improving an activity that the majority of the people are invested in, will continue to look towards the people for solutions rather than overlooking them for greater causes.

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ICIPE - International Center for Insect Physiology and Ecology

by Ladislao Di Domenica

On Monday, the 7th in the afternoon, the group visited the organization ICIPE in Nairobi. The introduction speech was given by Prof. Christian Borgemeister, general director of the organization, which was founded in 1970. ICIPE is an Africa based intergovernmental organization working together with 13 countries worldwide. ICIPE is funded with about 70% from project grands and with 30% of core funding from the governments of Sweden, Denmark, Switzerland, United Kingdom, France and the government of Kenya. It represents the only entomological center worldwide with the aim to help alleviate poverty, ensure food security and improve the overall health status of people living in the tropics by developing and extending management tools and strategies for harmful and useful arthropods, while preserving the natural resource base through research and capacity building. The agenda to achieve ICIPE's goals is based on the paradigm of ensuring the 4Hs: human, animal, plant and environmental health.

Human health: The main focus is on mosquitos, which are on one hand responsible for millions of deaths per year and on the other hand rated of low interest not contributing to economic benefits.

Animal health: The main focus is on the Tsetse fly, which is responsible for the Tripanosomias disease. It represents the most dangerous insect for livestock production in the Sub-Saharan region.

Plant health: With over 6 million people involved, crop production represents the most important sector in Kenya in particular horticulture. The main focus is on vegetable infesting arthropods.

Environmental health: The main focus is on biodiversity conservation and sustainable forest exploitation. Through training activities the potential of forest products like honey or silk are brought to small-scale farmers.

Throughout the different research projects of ICIPE the group got a deeper

Students and lectures visiting the laboratories of the ICIPE.

insight in the plant and environmental health department and a review about the development of the organic agriculture in Kenya and its local market.

Plant Health Section

The plant health section presented two different programmes: the Fruit Fly programme presented by Dr. Samira A. Mohamed and the Leaf Miner programme introduced by Dr. S. Sebramanion.

The Fruit Fly Programme

One of the major constraints that limits mango production is the Tephritid Fruit Fly (e.g. *Bactrocera invadens* and *Ceratitis cosyra*) that causes direct fruit damage of up to 40 – 80%. The project is aimed at development and implementation of integrated pest management (IPM) programmes that minimize the use of chemical pesticides, which then facilitates compliance with standards required for export markets. Strategic research thrusts include extensive studies on the biology, ecology and management of the target pests. The project is also implementing proven IPM technologies that are based on baiting and male annihilation techniques, fungal application, orchard sanitation, use of weaver ant (*Oecophylla longinoda*) and classical biological control using parasitoids.

The Leaf Miner Programme

The cultivation of vegetables is severely constrained by infestation of Leaf Mining Flies (LMF), especially the invasive *Liriomyza* species, of which the economically most important species are *L. sativae, L. trifolii* and *L. huidobrensis*. Restrictions on LMF-infested crops affect export to important markets like the European Union, where the insects are considered quarantine pests.

Prof. Suresh Kumar Raina is giving introduces to ICIPE's commercial insects programme, which combines sustainable natural forest use with alternative income generation through sericulture.

African wild silkmoth showcase at ICIPE.

Environmental Health Secion

The environmental health section was presented by Prof. Suresh Kumar Raina, who gave the group an overview of the different possibilities of using the forest in a sustainable way by the example of the sericulture or silk farming. The whole

Bombyx mori cocoons at ICIPE.

Silk loom at ICIPE.

lifecycle from the rearing of silkworms, cocoon production and processing to raw silk, silk yarn to a silk fabric was shown. The overall objective of the project called "commercial insects" was to support nature-based enterprises (wild silk and stingless bee honey farming) through technical training, marketing and management assistance to the rural poor communities in the dry woodland forest of Mwingi district, Kenya.

Kenyan Organic Agriculture Network

The last presentation was given by Mr. Jack Juma, who presented the Kenyan Organic Agriculture Network (KOAN) founded in 2004. It is a national coordinating body that provides leaderships and professional services to its members and other stakeholders in the Kenyan organic sector. The Kenyan organic sector on a local level is about 30 years old with focus on four products: coffee, macadamia, chili and honey. KOAN deals with market challenges, organic standards, the trade of the products bringing producers and consumers together, and tries to enhance the public awareness and education concerning sustainable production through training, media and visits of organic managed farms. The organization represents over 35,000 farmers and works with partner organizations throughout the country.

Since 2005 the organic market in Kenya has grown steadily trying to get into the East African organic market and work with international stakeholders, however the sector is facing many challenges. Among the main problems and challenges the certification is often not affordable for farmers, the production is focusing almost completely on vegetables, because of strict standards in organic livestock production and social group dynamics hinders the collaboration of small scale farmers.

Further information is provided on the ICIPE homepage (www.icipe.org) and the KOAN homepage (www.koan.co.ke).

ILRI – International Livestock Research Institute

by Asja Ebinghaus and Meike Grosse

Introduction

After arriving at the "International Livestock Research Institute" (ILRI) in Nairobi, Dr. Jan de Leeuw welcomed the group and introduced the institute. He gave us backgrounds about ILRI and its research areas.

ILRI was founded in 1994. It works at the crossroad of livestock and poverty and looks which opportunities livestock offers to people. The aim is to bear on poverty reduction and sustainable development through high-quality science and capacity building.

ILRI has offices in eastern, western and southern Africa, South Asia, Southeast Asia and East Asia. The headquarters are in Nairobi, Kenya and a second principal campus is located in Addis Ababa, Ethiopia. Nearly 700 staff from about 34 countries are employed there. More than 600 staff are nationally recruited, largely from Kenya and Ethiopia.

ILRI is a non-profit and non-governmental organization. It is funded by some 80 private, public and governmental organisations of the North and South.

ILRI's strategic intention is to use livestock as a development tool. It shall widen and sustain three major pathways out of poverty:

1. securing the assets of the poor
2. improving smallholder and pastoral productivity and
3. increasing market participation by the poor.

The research is organised through five thematic groups:

Students are listening to the presentations by ILRI.

- People, Livestock and the Environment
- Biotechnology
- Market Opportunities
- Sustainable Livestock Futures
- Poverty and Gender.

People, Livestock and the Environment

Dr. de Leeuw is the team leader of the People, Livestock and the Environment group. One topic of this group is, for example, how to improve productivity through feeds in intensifying crop livestock systems while optimizing the use of land and water.

Furthermore they do research on how to improve the adaptive capacity of pastoral and agropastoral people to cope with global forces such as climate change and desertification.

Another topic is how to conserve forage diversity and how to make many types of feed plants available to livestock keepers. Research about impacts from tourism-based incomes in Kenya's dryland belongs also to this group. To look at

Drylands of Marsabit District in northern Kenya. (Source: ILRI)

dryland is especially important as it has been neglected throughout the last 30 years. Research in biotechnology is done to secure livestock assets.

Another big research area is human and animal health as many human diseases are zoonotic, that is transmissible between animals and humans.

Climate Change and Pastoral Systems

After Dr. de Leeuw had finished, Mrs. Poly Ericksen from the same group talked more detailed about climate change and pastoralism. She told that climate variability is a defining feature of pastoral systems. The interannual and seasonal variability is high. The rainfall in the drylands is not only low, but also insecure and distributed unevenly throughout time. A drought like in 2009 leads immediately to fewer places to move to. So the mobility of the herds has to increase to find grazing and water. In other areas there can be more rainfall per day or more floods.

Pastoralists try to face climate variability through diversification of the herd composition - a mix of large and small animals and indigenous plus higher productive animals. This causes a tension between diversification and productivity, though.

The adaptation of the pastoralists shall be supported moreover through investments in better early warning and monitoring systems, through strengthening local institutions and ensuring higher level support, through the strengthening of markets and also through livelihood diversification.

Wildlife Conservancies in Kenya

The next topic was 'Wildlife Conservancies in Kenya' given by Mr. Mohammed Said. This research area deals with the challenge of combining wildlife tourism with pastoralism. Herding livestock was usually compatible with wildlife. This wildlife is now the main draw for most of the tourists visiting Kenya. But changing land use and tenure arrangements threaten the existence of both the pastoral way of life and the large wildlife herds and migrations.

One approach to help both pastoralists and wildlife thrive is to pay pastoral families to lease their land to 'The Wildlife Foundation' under the 'Wildlife Conservation Lease Programme'. Families, who participate, may continue to graze livestock, but agree not to fence, develop or sell their acreage. Up to now 8,500 acres from 117 families are leased. Another 118 community members, with more than 17,000 acres are waiting to join. The aim of the programme is to lease and conserve 60,000 acres south of Nairobi National Park, which would allow the seasonal migration of wildlife to and from Nairobi National Park.

The 'Wildlife Lease Programme' belongs to a bigger topic, the 'Payments for Ecosystem Services (PES) in Pastoral Rangelands'. Philip Osano told us about what is meant by 'Ecosystem Services' and gave

us an overview of payments for Ecosystem Services.

Ecosystem Services are for example food, freshwater, wood and fibre, but also climate or flood regulation and water purification beside many other aspects – according to the 'Millenium Ecosystem Assessment' from 2003, Ecosystem Services are generally the benefits people obtain from ecosystems. Ecosystem Services and human wellbeing therefore are closely linked, so Ecosystem Services shall be brought forward.

There are different forms of payments for Ecosystem services. A service provider (e. g. a farmer) of a defined ecosystem service can be paid through direct cash payments, in-kind payments (e. g. food) or tax incentives for example. The buyer is the 'user' of the Ecosystem service, for example the Kenyan Wildlife Service (KWS). The payment can be an alternative income for the farmer (service provider). As about 41% of the earth's land surface is dryland and more than two billion people live there - mostly as pastoralists, the critical concern is directed towards pastoral dryland systems. The aim is that payments for Ecosystem Services are a win-win situation, leading to income from wildlife tourism as well as social benefits and land and wildlife conservation outcomes.

Communicating Science for Impact

The next topic, 'communicating science for impact', was presented by Mrs. Jane Giteau, the Communication Specialist at ILRI. ILRI communicates its research ideas and findings to enhance their usability for local communities and farmers. Further more the institute´s communication is important to influence policy makers and to achieve the attention of donors giving money to the research programmes. Through communication ILRI tries to give new and important information and aims to build trust in the constituencies. Within the communications transfer process an organization like ILRI tries to change a negative situation regarding a specific subject into a positive situation: for instance hostility should be changed into sympathy or apathy should be changed into interest.

Jane Giteau said, first of all before you communicate information you need to know your audience and the needs of your audience. Important target groups for ILRI are decision makers, opinion leaders and other very important people (VIP).

When you have identified your audience, their specific information needs and the attitude you would like to communicate, you set the so called SMART objectives: they should be specific, measurable, achievable, result oriented and time bound.

The key to communicate your objectives is always the writing. It demands a good language and a topic for discussion or information. Before you start writing you need to determine your goals and objectives; identify what you really want to say and which knowledge gap of your audience has to be filled. An important rule for writing is KISS – keep it sweet and simple. It means that the text has to be interesting and easy to understand at the same time. It also should not contain (too many) repetitive words and phrases.

Finally the way a subject is communicated influences the attention and interest of the audience and the importance in the media. Jane Gitau gave the example of two major subjects in 2004 – the tsunami in the Indian Ocean and Tuberculosis. Due to the way of communication

the tsunami became much more relevant in the media than tuberculosis although much more people died of tuberculosis in 2004 than from the tsunami.

For its communication ILRI uses also the mass media as one channel of several channels. The advantage of mass media is that it reaches a range of audiences and can make it easy for people to understand how the ILRI research relates to them. Therefore ILRI also works together with journalists. The public relations is in particular important to reach politics.

On the other hand it is not easy to place a complex issue on e.g. half a page in the newspaper. Thus, in addition it is important to give more details in scientific reports.

BecA Hub

Then, Mr. Rob Skilton gave some information on the initiative BecA – Biosciences eastern and central Africa Hub. The BecA Hub is a joined project developed within the framework of Centres of Excellence for Science and Technology in Africa.

Hosted and managed by ILRI, the BecA Hub provides a common biosciences research platform, research-related services and capacity building opportunities to the region and beyond. The Hub aims to increase access to affordable high-level research facilities and to create and strengthen human resources in biosciences and related disciplines in eastern and central Africa. It realizes research work in several fields, such as indigenous chicken or plant breeding. Another aim of the Hub is also the transfer of knowledge to farmers and pastoralists.

The Hub is financially supported by donations and investments from several governments, foundations and others. An important investor is for instance the Canadian International Development Agency (CIDA).

To provide high-quality capacity building – a major objective of the BecA Hub – the initiative supports students and PhD students by e.g. technicians and supervisors (also overseas), provides access to modern facilities including equipment, technology and expertise, offers research related services and several training courses – from individual training to small group training. In 2010 the facilities in Nairobi were extended by about 40 %. For instance new crop facilities, new animal units and new laboratories were built

Urban Milk Markets – Opportunities and Threats

Mrs. Delia Grace then introduced the urban milk markets in Kenya. More than 80% of the milk in urban (as well as in rural) areas in Kenya is bought and sold in the informal sector – for instance on so-called wet markets and at street sales. In general the informal food sector is developing in particular in developing countries. This is on one hand the result of the lack of financial capacity, like less ability to pay for hygiene certificates etc. and on the other hand the result of corruption. About 85% of the milk in Kenya is marketed informal, in Tanzania even up to 95% and in Uganda up to 90%.

Food in Kenya - especially milk - is mainly produced by very small farmers and marketed via short value chains. A question is now "Will the informal sector survive in the future?"

Worldwide there is a considerable development from traditional markets to modern supermarkets. But the development is quite different from country to country. In African countries for instance the

Milk sale in Nairobi´s informal market. (Source: ILRI)

progress from traditional, informal markets to the formal market is rather slow. It is estimated that the informal sector will predominate the African markets in the next 10 to 20 years.

Currently ILRI carries out a case study on urban dairy farming in the district Dagoretti in Nairobi, where about 10% of Nairobi´s population live. About one of every 80 households in Dagoretti is involved in dairy farming, owning less than one acre of land and in average three cows (mostly cross breeds). A household produces approximately 12 kg milk a day, from which 10 kg will be sold and 2 kg will be used for the family. The household benefits mainly from the sale of milk, but also from the sale of manure to crop farmers.

About 34% of the total agricultural employment is employees in the dairy sector, from which about 2% are trading employees (e.g. mobile traders).

A big problem of the informal dairy sector is the spread of food-born diseases due to contamination of the milk for human consumption. But many households in rural as well as in urban areas cannot afford (processed) milk from the formal markets. The price for milk in supermarkets is about twice as high as on the informal market.

ILRI is working on a risk analysis and on solutions for the informal dairy sector. Hereby the understanding of risks of both the farmers and traders as well as the consumers is most important. Therefore ILRI works out a participatory risk assessment. First results show that the informal dairy sector is no worse than the formal sector at meeting hygiene and quality standards.

Index-based Livestock Insurance

The last topic of the visit at ILRI was the 'index-based livestock insurance' (IBLI), which is a service to protect pastoralists in Kenya and other east African countries against drought-related livestock mortality. In particular pastoralists in remote regions with little infrastructure and severe seasonal aridity, like in northern Kenya, are endangered due to increasing stock losses in the dry seasons. In those regions natural resources are getting scarce. The population is often unable to restock their livestock after a drought and is then dependent on food aid. There is mostly no other opportunity to generate income in addition to livestock herding.

To reduce the risks of livestock losses for the pastoralists ILRI developed an insurance scheme, which is based on the index 'predicted livestock mortality'. The index is calculated by using a measure of pasture availability that is recorded by satellites. This so-called Normalized Differenced Vegetation Index (NDVI) is fed into a response function that relates pasture availability with drought-related livestock mortality.

The index threshold, above which the insurance pays a premium to the insured

Education on livestock insurances.
(Source: ILRI)

farmer, is 15%. This means that IBLI compensates, if the predicted livestock mortality is above 15%. Insurable livestock are Camels, Cattle, Sheep and Goats. Within the insurance scheme the different livestock will be transformed into a Tropical Livestock Unit (TLU). For instance a Camel equals 1.4 TLU or a Goat equals 0.1 TLU. To calculate the value of the insured herd IBLI uses average prices for livestock. For the region Marsabit in northern Kenya IBLI set a price per TLU of 15,000 KES, for instance.

An insurance contract is concluded individually between the farmer and the IBLI. The contract is an annual contract from March to February in the next year. The insurance will only pay the premium for livestock losses within this specific time window.

Further information to ILRI and its projects is provided on the ILRI homepage (www.ilri.org).

ICRAF - The World Agroforestry Centre

by Sonja Gässler

Entrance plate of the World Agroforestry Centre in Nairobi, Kenya.

At the World Agroforestry Centre in Nairobi we were welcomed by some of its staff and were first informed about the World Agroforestry Centre (ICRAF).

Agroforestry means to grow useful trees and shrubs on farms with crops and livestock to support livelihoods and enhance conservation. Useful trees can be fertilizer trees for healthy soil, fruit trees for human nutrition, fodder trees for livestock feeding, timber trees for wood, fuelwood trees for energy or medicinal trees for health. Therefore agroforestry means combining knowledge from agriculture and forestry to create productive and sustainable landuse systems.

The Centre´s vision is a rural transformation as smallholder households increase their use of trees in agricultural landscapes to improve food security, nutrition, income, health, shelter, energy resources and environmental sustainability. The centre`s mission is to generate science-based knowledge on the diverse roles that trees can play in agricultural landscapes and to use research to advance policies and practices that benefit the poor and the environment.

Agroforestry has a world-wide significance as over a billion ha of agricultural land, almost half the world's farmland, have more than 10% of their area occupied by trees. Two trends seem almost universal in the tropics: the number of trees in forests is declining, and the number of trees on farms is increasing. Agroforestry development outcomes that led to improved livelihood (food, income, energy and water securities) and the environment are achieved by land regeneration and environmental management, by promoting agroforestry for agricultural productivity and biodiversity, climate change monitoring, mitigation and adaptation options, by knowledge sharing and by improving extensions and markets. The World Agroforestry Centre provides for example quality tree germplasm, offers options for on-farm tree management and therefore works towards relevant policies, institutions and investment.

The centre was established in 1978 to promote agroforestry research in developing countries and was recognized as the ´World Agroforestry Centre' and a CGIAR Centre in 1991. The headquarters are situated in Nairobi, Kenya with five regional offices (India for South Asia, Indonesia for South East Asia, Kenya for Eastern Africa, Malawi for Southern Africa, Cameroon for West and Central Africa, Brazil for Latin America) but also conduct research in 18 further countries in the developing world.

The World Agroforestry Centre has two education networks: ANAFE (African Network for Agriculture, Agroforestry and Natural Resources Education), which

is a network of 134 educational institutions in 36 African countries, whose objective is to strengthen the teaching of multi-disciplinary approaches to land management. And SEANAFE (South-east Asian Network for Agroforestry Education) established as international NGOs.

Strategic links exist with universities worldwide. In 2008 the World Agroforestry Centre organized its research around six global research priorities (GRPs), which address both livelihood and landscape issues. These are not stand alone and many of the research projects interlink across two or three of the priorities.

The campus in Nairobi hosts 14 institutions / centres and has its own bank and taxi service. 450 people work here. We were shown around the ICRAF house (administration, finance, human resources) and the research buildings with labs.

Seed Laboratory

We visited the seed laboratory led by Dr. Katja Kehlenbeck, which focuses on the GRP1 (domestication, utilization and conservation of superior agroforestry germplasm). Improved tree germplasm should be available with associated information on potential use, benefits and conservation as well as sustainable tree seed and seedling supply systems that promote the use of diverse and productive germplasm by smallholder farmers. The aim is to increase farmers´ access to improved germplasm of priority tree species and ensure better functioning of tree seed and seedling supply systems. This is achieved with national partners like KARI. Seed supply is conducted in community nurseries.

While the priority species are fodder trees e.g. *Calliandra calothyrsus* that improves milk yield and *Leucaena trichandra*, we could also see branches and seeds of other tree species that have many useful uses for the farmer such as *Gliricidia sepium* (for fodder and soil fertility), *Faidherbia albida* (biofuel tree, firewood, charcoal), *Croton megalocarpus* (biofuel tree), *Vitex keniensis*, *Grevillea robusta* (timber trees), *Casuarina equiserifolia* and *Jathropha curcas* (bioenergy trees).

Students and Professors visiting the seed laboratory of the World Agroforestry Centre in Nairobi.

Warburgia ugandensis and *Artemisia annua* possess a medicinal use against Malaria however its harvest is unsustainable. Therefore ICRAF promotes the domestication, dissemination and on-farm cultivation of these trees. While exotic species are often fast growing, ICRAF tries to promote native species. For instance the native Baobab tree (*Adansonia digitata*) was almost never used, but has edible fruits and in other countries drinks are made of it. One drawback was that it fruits only after 20 years. ICRAF grafted the trees so that they will fruit after five years. Another success to establish a new tree crop was *Allanblackia stuhlmani*. This tree only grows in forests and fruits after 20 years. Only females can be used to obtain the seed to make e.g. icecream. Therefore female trees were selected and grafted.

Ziziphus sp. has edible nut-like fruits and is therefore promoted for food diversification. Mango has a high potential in Kenya however out of more than 50 varieties in the motherblock, mostly five varieties are cultivated. Therefore there is a need for characterization of existing varieties with respect to their suitability of an agro-ecological zone and the disease resistance.

We also met a SIA student (Sustainable International Agriculture, University of Göttingen), who conducts her master thesis about the molecular characterization of local mango varieties and their cultivation techniques and we were invited to taste the various mango varieties and compare them to the local small mangoes.

Research questions in the lab of Katja Kehlenbeck include innovative approaches that can be developed and applied to domesticate, promote and conserve

Timber tree plantlings in ICRAF's seed laboratory.

priority high-value tree species, cost effective methodologies for characterization and selection of superior agroforestry tree genetic resources, management of multi-strata agroforestry systems for diversity, productivity, profitability and ecological / economic stability, ex situ, circa situ and in situ strategies that are most suitable for maintaining tree genetic resources and appropriate, cost-efficient, sustainable models for production and distribution of quality germplasm of priority tree species. A databank connected to a map about useful tree species of Africa based on the vegetation map of Africa with information for each tree species is available online already and more detailed maps will be developed.

Soil Laboratory

In the soil laboratory the different modern equipment to analyze samples of soil were explained to us.

These devices use for example infrared spectroscopy to measure organic carbon and the cation exchange capacity. Other equpipment can determine the resistance of a soil to erosion, particle size or the elemental composition. This will help to create a soil map for sub-Saharan Africa within the project Africa Soil Informa-

tion Service (AfSIS) that ICRAF is part of.

Global Research Priority 2

Fergus Sinclair gave a talk about the managing effects of trees on soil and water productivity and their impacts on other ecosystem services. His research aims at the Global Research Priority 2 (GRP2) to maximize on-farm productivity of trees and agroforestry systems. He presented the results of a study that shows that trees can increase the abundance of soil biota (e.g. earthworms, mites and nematodes) and some tree species also the activity of earthworms.

However the successful outcome depends on many factors like soil type and can therefore not be generalized. One of the key activities in the World Agroforestry's GRP2 is to develop decision support tools that incorporate an understanding of genetic, environmental and management control of the expression of key attributes to provide advice on what species and management combinations are likely to work in different circumstances.

Global Research Priority 3

Improving tree product marketing and extension for smallholders is GRP3 and focuses on expanding smallholders´ access to value chains for agroforestry tree products and improving their incomes and livelihoods through better marketing. Dagmar Mithöfer presented current research topics within GRP3 such as the participation of the poor in fruit marketing in Kenya, gender and agroforestry in Africa, organic certification of walnuts in China, institutions, governance, and performance of the value chain of agroforestry products in Cameroon and research and development support tool for selecting value chain approaches.

Global Research Priority 5

Dr. Eike Lüdeling presented his studies in the topic of GRP5 (Improving the ability of farmers, ecosystems and governments to cope with climate change). His data showed that the value gained by sequestering carbon through agroforestry is economically probably not attractive.

However a change in winter chill conditions that is required to break dormancy will have an enormous effect on many tree species worldwide. To predict the climate change for a certain location climate analogues are used, which means that climatic settings are statistically compared and the closest already existing climate analogue is determined for different climate change models.

CAFNET

Johannes Dietz presented a project called CAFNET to assess the current carbon stocks in Kenya and Uganda to identify implications for further carbon sequestation potential since there is only scarce information on carbon stocked in coffee agroforestry systems in Africa.

Global Research Priority 6

Delia Catacutan works in the group that focuses on GRP6, which is developing policies and incentives for multifunctional landscapes with trees that provide environmental services with the goal to develop policies that are more effective in maintaining the multi-functionality of landscapes with trees. The components of this are to understand the role of trees in watershed services and biodiversity in landscape mosaics and their tradeoffs with direct benefits (subsistence and marketed goods) and to negotiate pro-poor policies and incentives for enhancing tree-based environmental services. Incentives to enhance production of en-

Students, lecturers and ICRAF scientists exchanging ideas at a function hosted by ICRAF in welcome of the excursion team.

vironmental services and improve rural livelihoods are RUPES (Rewards for, Use of and Shared Investment in Pro-poor Environmental Services) and PRESA (Pro-poor Rewards for Environmental Services in Africa).

Brigitte Maass works in the Tropical Forages Programme for CIAT (Centro International de Agricultura Tropical) that has its headquarters in Cali, Colombia, but is hosted by ICRAF in sub-Saharan Africa. She also talked about her career in international agricultural research and higher education to give us an example of a career path.

A few more scientists shortly introduced themselves so we got an impression about the various career options and ways that have led them to work for the World Agroforestry Centre and we were encouraged to join them and conduct the master thesis at the centre.

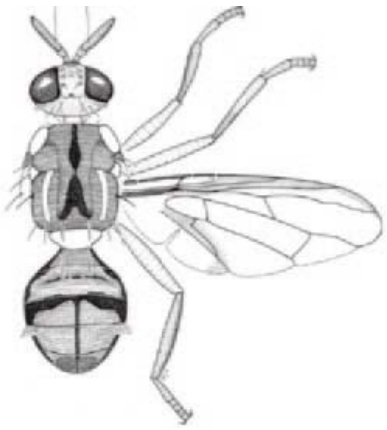
At the end of the day the scientists were open for further questions and we could talk with them while having some snacks and drinks in the lobby.

ICIPE Mango Fruit Fly Research Site

by Kathrin Grahmann

Mangos are one of the most important exported cash crops of Kenya and are mostly produced by small farmers, which cannot effort large amounts of pesticides or traps. The Mango Fruit Fly (*Diptera tephritidae*) causes direct fruit losses of up to 80% and is a quarantine insect that does not allow exporting any single fruit to Europe, if it is infested with fruit fly larvae. Therefore, an implementation of an efficient pest management strategy for small scale famers is needed to handle this type of pest. An IPM (integrated pest management) approach was developed by the African fruit fly initiative, ICIPE and GTZ and will be explained in the following.

There are two different species of fruit flies that attack mangos: an indigenous one (*Ceratitis cosyra*) and an invasive one (*Bactrocera invadens*) from Sri Lanka, which does not have natural antagonists and competes and displaces *Ceratitis* to the highlands. This invasive fruit fly was detected in Kenya in 2003 (Rwomushana et al., 2008) and has a host range of about 14 plant species there, whereby mango and banana are the most preferred ones. The IPM strategy against mango fruit flies contains four approaches: use of baits, pheromones, soil fungi and parasitoids.



Bactrocera invadens, adult male (Source: Drew et al., 2005)

To understand the different modes of action, one has to know the life cycle of mango fruit flies: female flies lay their eggs in young mango fruit plants and the larvae or maggots develop in the mango pulp by digging tunnels. The growth of the larvae hastens the maturation of the fruit and leads to dropped down fruits. Then, the larvae leave the mango and the pupae develop in the top of the soil and reach sexual maturity really fast during 7 to 14 days. The last step is to couple and lay eggs of the next generation.

The research farm that we visited cultivated its first mango trees in 1985 and harvested the first time in 1989/90. It is located 50 km away from the city of Embu. The small scale farm of 2 ha is occupied with 400 mango trees and three different varieties. Mangos flower in July and August, reach maturity in December and can be harvested in March.

1. Approach: Bait with attractant and insecticide. The bait is more attractive for fruit flies than the mango itself. Suitable baits could be Mazoferm or GF-120 (produced by DOW Agrosciences), a liquid fermentable corn extractive that is rich in soluble protein, sugar and lactic acids, but bait based on local brewery waste material can also be used. An insecticide, e.g. Spinosad that will not accumulate in the mango, is added to the bait so that flies will be killed when they eat the bait. For an orchard of 400 trees, an amount of 20 liters of pesticides is sufficient to control the fruit fly population. The weeding is done by hand without any herbicides.

2. Approach: Pheromone traps of females that attract males are combined with insecticides in a 4:1 ratio. Males can identify the pheromone 1 km away, so that 5 to 10 pheromone traps are adequate for the whole orchard. Traps are renewed every week because of scientific purposes and reasons, but could be used for at least a month.

3. Approach: Soil fungi (*Metarhizum anisopliae*) that attack larvae and can stay two seasons in the soil. The fungus occurs naturally in the soil and causes the so called green muscardine disease in various insects. *Metarhizum* acts like a parasite and penetrates the insect´s cuticle with its hyphae. After a few days, the insect will be killed and the cuticle of the dead body often becomes red. These kinds of fungi are also used in the control of malaria-transmitting mosquitoes.

4. Approach: Parasitoids (*Fopius arisanus* and *Diachasmimorpha longicaudata*) that lay eggs into the eggs of the fruit fly. Both egg parasitoids are introduced from Hawaii. At least 6,000 wasps have to be released and five releases are necessary to establish the antagonist in the mango orchard.

5. Additional measures: Orchard sanitation and management by trapping for monitoring, choice of variety, neighboring fields: e.g. the variety Sensation cannot be controlled with the described IPM approach, because the fruits are more attractive to fruit flies than the bait. Neighboring fields should be treated with IPM measures as well to decrease the surrounding pest pressure. Appropriate control options for small famers include the localized bait sprays on the tree canopy, point ball applications on the tree trunk or baiting stations and additionally, the collection and destruction of all fallen infested fruits.

Students listening to the explanations of the mango farmer.

The IPM of the mango fruit fly is a promising approach for small famers to reduce their input costs and to maximize their output goods. It is more environmental friendly and improves livelihoods of Kenya´s small mango farmers.

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Rice Irrigation Scheme in Mwea

by Merle Tränkner

In Mwea one of the 24 centres of the Kenyan Agricultural Research Institute (KARI) is located. Besides five permanent employees, there is one Ph.D student employed. The performed research is on rice and cotton, and can be divided into three programmes:

1) breeding programme

2) production programme

3) crop protection programme

The breeding programme includes the crossbreeding of new varieties. The needed new genetic material comes from the breeding programmes of IRRI (International Rice Research Institute) and CIAT. The developed hybrids consist therefore of local and imported varieties. After finishing the breeding, the new varieties are distributed to farmers. The breeding of rice can be considered quite important since rice is after maize and wheat the third most produced crop in Kenya.

Within the production programme, the development of agronomic practices, which are suitable for environment including the use of an adequate type of fertilizer, is addressed.

Environmentally friendly systems are also developed within the third programme - the crop protection programme - by entomologists, nematologists and pathologists.

Regarding constraints to rice production, two problems can be identified: One is the high sunlight intensity in the tropics, which reduce yields in short-day cultivars. For ideal flowering, those cultivars need a day length of max. 10 hours (Rehm and Espig 1991). The second constraint in rice production is the fungi *Pyricularia oryzae* (syn. *Magnaporthe oryzae*), commonly known as "rice blast". In 2008 and 2009 the fungi induced considerable losses of rice harvest. The normal yield is up to 2.4 t/acre, but with rice blast it can be reduced to 1.44 t/acre. High infection rates of rice with *Pyricularia oryzae* is a consequence of intensive rice systems, which is the case in Mwea with three production cycles per year. The application of nitrogen-fertilizer in very high amounts supports the development and spread of the fungus, because senescence is delayed. That means a longer period of fresh green material serving the fungi as nourishment. Once the field is infected, control methods are weak since there is no effective fungicide. Additionally, the fungus produces aflatoxin, a mycotoxin, which is extremely toxic and can appear in the milk of animals consuming contaminated feed such as rice stubbles and behaves mutagenic, teratogenic and carcinogenic (Agrios 2005).

National Irrigation Board

The National Irrigation Board is a system, which controls irrigation on the field. Farmers can join the programme for a fee of 200 KES and experience advantage of equal distribution of irrigation water and thus, a more or less steady harvest. Every farmer has four acres and about 5,000 farmers are participating, which means the National Irrigation Board controls a total area of 20,000 acres. During the last year more people came into the scheme, because they suffered from a lack of water and low yields. Therefore another area of 3,000 acres was included into the scheme.

The field a farmer owns is called a unit.

Students and lectures taking pictures and listening to the explanations of a KARI rice breeding expert at Mwea irrigation scheme.

70 Units are controlled by a leader, who decides how much water each farmer receives within the unit. Both farmers and leaders meet regularly with the unit leader to discuss and make proposals.

The irrigation water was taken from two rivers in sufficient amounts, but the situation had changed since other organisations gave a permission to take more water out of the river, so that the scheme does not receive enough water any more. Of the both sources water and land, water is the more and probably most limiting factor.

One rice crop is grown per year as paddy rice (variety: Basmati). Farmers use 30 kg of seeds per acre. The transplanting is done after 28 days with a space between rows of 15 to 20 cm. Weeding takes place after 14 and 28 days of transplanting or the application of an herbicide is implemented. Three groups can be divided according to their starting time of flooding. The first group starts flooding in April, the second one in May and the third one in October. After harvesting the field turns into fallow. One acre yields up to 540 kg, which is about 1.3 t per ha. This is less than the Kenyan average of rice harvest of 1.7 t per ha (FAOSTAT 2009).

As precipitation with 10,000 mm per year is not enough and water is not sufficient, farmers plant sorghum in seasons with less water. As a consequence a risk of salinization exists due to high evaporation rates. During evaporation process, water from deeper soil layers rise to upper soil layer carrying the salts with it and finally the salt accumulates.

Nevertheless, demand for rice is increasing with increasing income. Additionally, rice is considered to be a profitable crop, so many people prefer growing rice.

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CETRAD – Centre for Training & Integrated Research in ASAL Development

by Marie-Luise Hertkorn

It is astonishing how within a few hours of bus drive the landscape can change entirely: from fertile hills to a sweeping, barren area dominated by acacia trees and yellowish grass. Here in the south of Laikipia district, CETRAD is located, a center contributing to the development of arid and semi-arid landscapes (ASAL). The centre aims to assess the potential of ASAL and to promote ways of sustainable resource use. It intends to evaluate the interactions of ASAL with high potential areas and economic core regions of Kenya. CETRAD is a bilateral institution between the Kenyan Ministry of Water and Irrigation and the Swiss Centre for Development and Environment at the University of Berne. Our group was invited to the headquarter in Nanyuki, where two case studies and further projects were presented by the CETRAD scientists.

Case Study 1: Land Use Scenarios

Laikipia East is a region of 10.000 km^2. The annual rainfall (400 to 1,200 mm) is distributed in three seasons: the long rains in mid-March, the continental season in July or August and the short rains in November or December. The temperature ranges from -1° to 25°C.

After independence in 1963, the white settlers had administered the land before abandoned their large farms. That followed a period of pastoralism and communal land use. Beginning in the 1970ies, with a major peak between 1980 and 1985, a movement of Kenyans settling in the region could be observed. Today, the average land size per household is about five acres. Agricultural activities are predominately small scale crop farming and livestock keeping. Other activities are charcoal burning and small businesses.

Laikipia East faces several challenges. The overall situation is fairly insecure, steal of livestock is not a rarity. Besides that, the farmers struggle with droughts, the infrastructure is rather weak and there is a general lack of economic activities. Additionally, human-wildlife conflicts cause problems. This conglomerate of negative impacts leads to high emigration rates.

To counteract this movement, CETRAD tries to tackle the problem from different angles: drought escaping crops such as sorghum are promoted in order to replace cultures with a higher water demand. Water supply is improved by bore holes and the use of river water through pipelines – a procedure that could be cast doubt on due to its impact on the groundwater level and river ecosystems. Further approaches are the implementation of agroforestry concepts, livestock improvements and farmer trainings. Finally, silkworm keeping on mulberry trees is promoted as an additional income source extensively independent from water supply.

Case Study 2: Conservation Agriculture

Conservation Agriculture (CA) is a cultivation method that aims to unify profitable agriculture with sustainability aspects. Above all in areas with high erosion danger, CA systems are applied in order to protect the soil. CA is characterized by three principles:

Minimal soil disturbance: In the direct seeding system, seeds are planted respectively drilled through soil penetration, without mechanical seedbed preparation after the harvest of the previous

CETRAD weather station.

crop. Instead, the land is prepared via weed slashing or rolling and herbicide application. This proceeding fosters soil fauna population, improves soil texture stability and reduces machine costs as no plough, ripper or harrow is needed.

Permanent soil cover: A permanent soil cover is granted by the use of cover crops and mulch. The most positive effects are soil moisture conservation and higher rainfall infiltration, weed suppressing, reduced surface runoff and erosion as well as the enhancement of soil fauna and microorganisms. However, it should be taken into account that in regions with fodder shortage plant residues in agricultural practice prevalently are used as animal feed instead of soil cover implementation.

Crop diversity: Crop rotations contribute to soil fertility and prevent pathogen transmission. Additionally, the cultivation of diverse crops implicates balanced feed for microorganisms. CETRAD recommends 4-year crop rotations, for example artemisia – sweet potatoes – wheat – potatoes.

The CETRAD scientists were convinced by

Short message to a weather-index-insured farmer.

the CA system and emphasized its positive effects on the farmers' incomes: low costs and good yields lead to more net profit. In the conducted case study, the extension of CA practices is investigated. Secondly, small holder knowledge and skills are improved by trainings, field days and the implementation of demonstration farms. Thirdly, the impacts of CA upon environment, crop production and farmers' incomes are assessed.

Further projects

Besides the two case studies described above, CETRAD is involved in weather index insurances. There is a close collaboration between the centre and the Syngenta Foundation for Sustainable Agriculture that promotes weather index insurances in India and Malawi and is looking into solutions for Kenya, too.

Laikipia was selected as a drought-prone pilot area. in 2009, 250 farmers took advantage of the insurance. The ambitious target is to introduce the insurance in other districts and to extend the number of policy holders up to 50,000. To determine the occurrence of event insured, CETRAD maintains 30 automated weather stations across the region.

Smallholder Farm and Forest Stands at the Foothills of Mount Kenya

by Oda Reese

We visited the area called Kariunga, which is situated east of Mount Kenya. Therefore it lies in its wind shadow for the rains. It is a very windy and dry area with rainfalls up to 700 mm. Usually, there are two rainy seasons, one from March to May, one from October to December. Due to climate change one cannot rely on these seasons and the forecast rainfall, you might have one good year, three fairly good and two very bad. This year there is a forecast on not enough rain in this region. The rain is distributed badly, sometimes you have the whole rain in one week and then a draught.

The region is hilly and sometimes the land is almost bare, but there are also patches of shrubs and Acacia trees. In one part of Kariunga there are no trees or shrubs left, other parts seemed to be managed differently. Over the road one can see that there are still quite a few trees and shrubs, but this land belonged to someone else and is fenced.

Kariunga once belonged to one large-scale farmer, who owned a lot of land. After gaining independence it was sold to a group of farmers. Every farmer got land according to his share. These farmers came from high-potential regions, richer in terms of soil and rain. Because of the fact that they did not adapt the local way of farming they had many crop failures and bad living conditions, because they relied too much on rain fed crops. Also the management of the livestock was wrong and so the pastures degraded. In 1976 they started with group ranching, the population increased and so did the number of livestock. But at least the grazing management was better.

From 1990 to 1999 life was not too bad in this region. Then the draughts and crop failures started. The main problem nowadays is that 20 years ago they cut the trees down to produce charcoal for cash and domestic purposes. Without the trees and soil cover the evapotranspiration even increased and erosion started. People started to leave the region. Currently there are less than 60 households living there.

In 2009 the year was extremely dry, the Maasai were allowed to graze their huge herds on this land and even increased the problem.

There were a few projects by CETRAD, for example giving the land to people for free to get them to move in this poor region, but they more or less all failed. One big problem is for example the information transfer from institutions to the people. One way to solve the problem would be to keep few livestock and have a small irrigated patch to grow high value crops or moving to small greenhouses.

From our viewpoint on top of the hill we could see how different ways of land management affected the vegetation. The bare pasture next to the Acacia forest and over the next canyon the badly degraded land of the Maasai. Over the road the dry maize that obviously did not make it through the dry season. And even though the pasture looked very bad one cannot say whether it is overgrazed or not. Only in the rainy season you can decide that when you can see the vegetation there.

To compare the pastures we next went to a patch of land, where pastoralists

Landscape of Kariunga.

(Maasai community) live. The picture was clearly different. The only trees and shrubs left over were not suitable for charcoal production or firewood. The ground was not well covered, there were many parts where the ground lay bare and was very hard, so in case of rain the water would not go into the soil but simply flow down the hill towards the river. That means major degradation of the ground.

Because it is the end of the dry season they had left with most of the animals to better grazing grounds and left only a few animals behind. Apparently, the stock density is very high there. There are mainly goats and sheep. Only about 15 years ago the ground cover was good.

The problem is the stock management. Because the animals are allowed to roam free or are not well herded, they choose the best fodder, so these plants can't survive long but less palatable shrubs can grow. One way to avoid this selective eating and soil crusts would be to herd a big group of animals close together and force them to eat the shrubs. They would also loosen the hard soil with their hooves.

Sadly this land seems to be beyond help. The only possibility is soil reclamation, but this is very costly and will take a long time. The river that flows through the land is the only source of water for the people there. Usually the water flows all year round, but in times of a drought it might run dry. From our viewpoint we could also see very well managed land that belongs to a big farm.

Next we went to the weather station that provides the weather data for the index-based crop and livestock-insurance. Every 15 minutes the station sends the information via safaricom satellite to a data collector. Data like the precipitation and wind direction is documented manually. The transmitter has a battery that is fed by a small solar panel.

Last but not least we went to a small-scale farm that is owned by a very energetic young man. He is not only a model for

conservation agriculture but also provides services like his oxen and machinery. Conservation agriculture includes a non-tillage way of managing the fields. Through the soil cover the evaporation and weed is reduced, because of the soil rest the micro organisms are more active and contribute to the fertility. Also the overall input is smaller. For example the subsoiler only opens the ground where you want to plant the seed and leaves the rest untouched. For direct sowing it is important to put the fertilizer under the seed so the roots can access it straight away.

The stable of the oxen was covered by a roof to prevent the loss of nitrogen and to get good fertilizer.

Very interesting were the Rocco chickens that need a house on poles to keep snakes away but apart from that need little input and provide this farmer with about 2 US$ a day that covers the main needs of his family. Every age has its special feed to provide them with everything they need. The eggs are sold on the local market for 12 KES/d.

Next we came to the pond, where he stores the water to irrigate his fields. The size of this pond was quite impressive, he had three of them and with his oxen it takes him three days to dig one. In there he keeps about 900 Tilapia fish. It is important to have one shallow end to warm the water and one deep end where the fish can hide from the kingfisher. The fish do not need any attention except kitchen waste for feeding. This is a good source for cash and proteins.

The water for his fields come from a river nearby and is brought to his farm by oxen. To pump the water from the pond up into the tank he uses his „money-safer“, a manual pump. It is 150 KES to pay one man to pump with it the whole day. It is much more cost effective than a fuel pump and also less breakable.

The entusiastic small-scale farmer is presenting some of his tools and inventions.

Around his field he had planted *Grevellia robusta* trees. They provide shade and in times of a drought the animals can eat the twigs. It also provides wood and leaves for mulching.

Close to his small farm is the crop museum. This is not really a museum but a collection of old and new crops and varieties that are tested for drought tolerance. For example Coca-Cola wants to sell passion fruit juice and contracted farmers in other, more humid regions to produce the fruit for them. Now they test, whether they can grow the passion fruit as well and earn money with it. There are other crops tested like tomatoes, sweet potatoes, sorghum and peas. The varieties are not introduced to the community until they are tested and proven.

Laikipia Wildlife Forum

by Nancy Lira

Laikipia Wildlife Forum (LWF) is a broad based conservation organization dedicated to preserving and managing wildlife populations and wilderness habitats in Kenya's Laikipia region. The Forum is based in Nanyuki and is membership led. The forum's executive director is Dr. Anthony King. The LWF represents and brings together a cross section of land owners and land users. More than 300,000 people benefit from the LWF's programmes.

The forum is committed to improving the lives of the people in the region through supporting and generating sustainable livelihoods, while securing dependable, sustained access to essential natural resources. Its mission is "to conserve Laikipia's wildlife and ecosystem integrity and improve the lives of its people by bringing its societies together to conserve and sustainably use the natural resources on which they depend". The LWF's vision for the future of Laikipia and Kenya is to see a healthy and productive natural environment for people and wildlife.

The LWF was created in 1992 in response to an initiative by the Kenya Wildlife Service (KWS) to engage landowners and land users in the conservation and management of wildlife in non protected areas. During the 1970's Kenya had a tough time, internal challenges like the loss of access to export markets for beef and a fast population growth rate were having negative implications for its people's livelihoods and economy. And on the other hand, people in the area were facing a problem - the wild animals.

During the 1980ies there was a collapse in governance in wildlife, they were being slaughtered. During the 1990ies elephants migrated south and looked for safety in Laikipia big ranches. Elephants walked trough fences, they started pulling up infrastructure, fences and water pipes. Large scale ranches with extensive animal production did not tolerate other animals in the area, because of the threat of predation and competition. Because animals were in the big ranchers' lands, the issue became an issue of land ownership and race. Black small farmers were thinking that the white rancher was hosting elephants and protecting them.

Then the idea to benefit from elephants came. The government recommended that they could start attracting tourists by building lodges and making profit from wildlife sightseeing and they could also harvest wildlife. The zebra's skin could be of high international value. But a problem came here, the harvesting could be done in Kenya, but the processing could not be done there. So South Africa began processing skins, which added a lot of value to the skin and made big money for South Africa but not for Kenya.

Elephants continued to be a big problem in Laikipia, but hunting them is illegal in Kenya. The damage to farmers was continuing and their discontent was getting bigger, so the killing of elephants was still taking place. They needed to get rid of the animals or at least get some benefit either by eating its meat or selling it. But this happened always in a 'secret' way since touching wildlife is prohibited by law. In early 2000 photograph tourism was promoted in the region with the aim of creating value and at the same time preserving wildlife under the idea of ma-

king wildlife an asset not a threat.

So that's why the idea of a forum like the Laikipia Wildlife one was born. Since its inception there has been a significant expansion of localized conservation effort and expertise in relation to wild animals. More than 7,000 elephants migrate within the Laikipia area. It hosts Kenya's highest populations of endangered species in the country, including half of Kenya's rhino population and 37% of the total African population of black rhinos, 70% of the 3,000 remaining global population of the Grevy Zebra and some Reticulated Giraffes. The number of lions in Laikipia has been increasing year on year. And Laikipia supports the only remaining viable population of the Jackson's Hartebeest.

LWF has several programmes from which they work with the community. The Water Resources Management programme focuses on the way the land is used and how it has an impact on the water distribution. Pastoralists have stopped moving, and Laikipia area is a very dry one. The forum creates a framework for managing decision making through a holistic management way of thinking, trying to explore how to strengthen traditional systems with modern practices.

With the Tourism Sector Support programme they are trying to generate benefits from bringing tourists in the region.

With the Environmental Education and Literacy programme they are working through eco literacy with schools, rangelands and diverse associations in the area following the idea that if you are eco literate, its easier for you to understand what is happening in your environment and in consequence it is easier to create environmental consciousness.

With the Forest Management programme the communities develop participatory forest management plans, which give people rights and responsibilities in the community, like the charcoal production.

LWF also has the Wildlife Conservation and Management programme, which for example helps them with the construction of fences trying to solve the problem between wildlife and people in the region.

LWF works through the idea that a good and healthy relationship between humans and animals is needed in order to conserve it and live in a sustainable ecosystem. The community in Laikipia needs to get power and learn how to manage its wildlife. LWF is trying to engage people in this management, helping with the creation of land use plans, marking areas were livestock, wildlife, houses, schools, hospitals need to be, and also trying to create partnerships between the community and private entrepreneurs, who would be interested in investing and creating extra value for the community.

The forum's biggest challenge is the notion that economic growth will result in social and environmental wellbeing. This logic dilutes the importance of biodiversity. A healthy economy will only stem from a healthy society, and a healthy society will only stem from a healthy environment. Economy is within society, which is within the natural environment. It is much easier to understand the necessity of conservation and the need for a healthy environment, if our thinking is healthy. We need to understand that biodiversity means the variety of life, that humans are part of biodiversity like any other life, and that the more biodiversity there is, the more life there is. Conservation is the key for our world's future development.

Timau Wheat Farm

by Carlos Alberto Quiroz Dahik

On the Timau wheat farm the average rainfall is 750 mm per year, and the period of rain is concentrated in October, November and December. There is a high rate of evaporation, a loss of 10 mm per day approximately.

The structure of the soil is good, it is a clay soil, which does not perform well in the dry period, but is perfect for the practice of Conservation Agriculture (CA).

According to the definition of the FAO of Conservation Agriculture, it refers to "an interacting and complimentary set of agricultural practices and concepts". Despite regional differences in the mix and emphasis of the different specific components making up CA practices and which depend on agro-climatic zones, availability of farm power options, farming system types, inputs, skills, etc., the three basic principles are always present:

- minimal soil disturbance (no-tillage/ reduced tillage)
- permanent soil cover (cover crops and associated residues or mulches)
- suitable and diversified crop rotation/ associations (conservation agriculture)

The extension of land of the Timau farm is 4,500 acres, and is therewith one of the biggest wheat farms in Kenya. The biggest field has 450 ha. The main products cultivated are monocultures of canola, sunflower, legumes, soybeans (canola and bees are used as groundcovers). The crop rotation contains 50% of wheat and 50% of barley. The harvesting is done once a year. The combined harvesting went wrong, though.

On the farm one of the most important characteristics is the utilization of high technology, tractors with low consume of fuel (5 l per acre), which are fitted with GPS information system to achieve precision farming. As a result there is a considerable saving of seeds and low pollution of the environment. The tractors use a 6 m spacing planting (wheels are 3 m spacing).

Mr. Laurie Sessions of Timau Farm explaining modern high-tech-no-till equipment for large scale wheat farming.

There are problems of rust fungi and also earthworms, and organic farming has not been possible at the moment, so it is necessary to apply chemicals like Roundup two to three times per season.

The farm employs 40 workers (each worker earns 300 KES per day). The employor provides also social benefits, which

Large scale no-tillage wheat farming at Timau.

are paid to the government: 5% of the income used for social projects, construction of hospitals, schools, etc.

The price per ton of wheat on the Kenyan market is currently about 33.000 KES. The wheat variety produced is about 40 years old.

The growing season is about 110 days. After harvesting, legumes can be planted, but at that time rain is missing. The moisture of the harvested wheat accounts for 8 to 9%, so there is no need for a dryer.

Barley is sold to produce beer in the Kenyan brewery (Tusker). Kenya is one of the best malt producers of the world. Composting juice is collected to produce organic fertilizer.

Additionally the farm produces about 40 kg of lamb meat per month.

The farm organises information days for the community (small scale farmers). The farmers get the opportunity to visit the facilities and to get information about the irrigation systems, the correct use of pesticides, conservation agriculture and other agricultural issues.

Soil Information

pH	6,19
P_1	39,46 > 30
K	1,128
Ca	3,018
Fe	189
P_2	90,46 > 30
OM	2,94
EC	28,59

Further References

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Ol Pejeta Conservancy I - Rhino and Chimpanzee Sanctuary

by Melissa Valladares Schlesinger

Excursion group at Ol Pejeta Conservancy - Rhino capture crates in the back.

Introduction

The Ol Pejeta Conservancy (OPC) is located in the Laikipia District in Kenya. It is a non profit organization that works towards the protection of wildlife and the community development. In order to fulfil its objectives, it has different activities such as the wildlife-livestock integration, the Rhino Sanctuary and the Chimpanzee Sanctuary among others.

Rhino Conservation

Ol Pejeta is the largest Black Rhino Sanctuary in East Africa and provides 75,000 acres of habitat for the rhinos and is currently home to 86 of them.

The organization´s purpose is to help to protect this species and increase the national population. The number of Black Rhinos in Kenya was drastically reduced from an estimated of 20,000 rhinos in 1970 to less than 300 in the 1980ies. Due to this the Ol Pejeta Conservancy has focused on increasing and maintaining the breeding rates, and also protecting them from poaching, which has helped to reach a current population of arround 600 individuals.

The main threats rhinos face are the destruction of their natural habitats and the high demand of rhino horns. In order to protect the animals from poaching and to maintain an adecuate control of them, special measures are taken. The conservancy has electrified fences to make sure the animals stay in the protected area. There are special patrols that control the individuals, making sure each of them is seen at least once every three days, and some of the indivuduals have transmitters to be able to track them by radio.

There is a male Black Rhino called Baraka that currently lives in a special facility separated from the rest of the group, because he is blind. He lost one eye during

The male Black Rhino „Baraka“ fed by the students with hay.

Students watching the male Black Rhino and asking questions about this species.

a fight with another male and because of this, he is not able to live a normal life with the others. Now, the conservancy uses Baraka to teach visitors about rhinos and to give them the opportunity to have a closer contact with these animals.

During the visit we were able to touch and feed Baraka, and to ask the keeper some questions about the general characteristics of this species. He explained for instance that the cuts on Barakas skin are due to the presence of certain parasites, and when he scratches himself against the trees he cuts his skin. The keeper also explained that one of the main characteristics that differenciate the White Rhinos from the Black Rhinos is the shape of their mouths, since the first one feeds mostly from grazing and the second one from trees. The Black Rhino can move the tip of its mouth much better and grab the leaves, when it eats.

Besides the Black Rhino population there are also 10 Southern White Rhinos and 4 Northern White Rhinos, the last ones being really important since they represent half of the remaining world population (there are only 8 individuals left in the world).

The Northern White Rhinos were brought in 2009 from a zoo in the Czech Republic, as part of a breeding project, to increase the existing population in a more natural habitat. The Southern White Rhinos are not as highly endangered as the Northern, but the Rhino Conservancy also want to introduce more individuals in the following years to get a breeding herd.

Chimpanzee Conservation

The Sweetwaters Chimpanzee Sanctuary is also part of the Ol Pejeta Conservancy and is the only place in Kenya, where these animals can be seen, since Kenya is not a natural habitat for them.

The Sanctuary opened in 1993, with the joint work of Kenya Wildlife Service (KWS) and the Jane Goodall Institute. It was created to provide a refuge for orphan and abused chimpanzees.

There are currently 41 chimpanzees living in the sanctuary. Most of them come from countries like Burundi, Sudan, Rwanda, Uganda and Congo among others. The sanctuary is not intended to be a breeding station, so there is birth control to avoid pregnancies, although it is not a hundred percent effective and they have had some chimpanzee babies born in the sanctuary. Also the chimpanzee named

Oscar was born in Ol Pejeta - and is now becoming the alpha male of the group, after his father.

When the chimpanzees are brought to the sanctuary, they get a proper health care and are slowly integrated into the two different groups (adults and young). Since some of the animals brought to the sanctuary have been through traumatic situations, it can take some time for them to get used to being among others of their species.

Their daily food consists of a fruit juice, some green vegetables and fresh fruits. To spend the night sheltered, the chimpanzees have a special sleeping facility available, so that they do not have to sleep outdoors. In the wild chimpanzees would sleep on the trees, but due to the kind of vegetation in the sanctuary this is not possible.

Some facts about chimpanzees

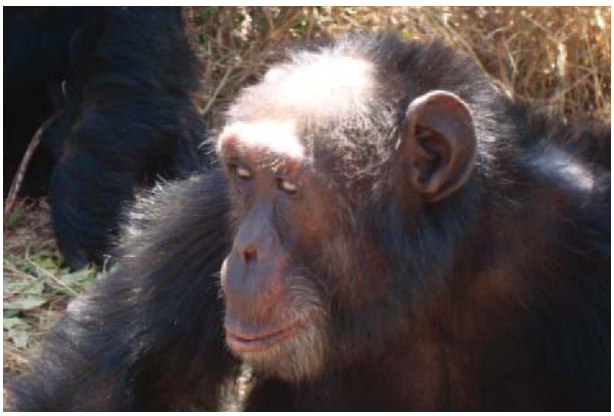
- They share 98.6% of their DNA with humans.
- They do not get Malaria.
- They use tools and use them mainly to get access to their food (stones to open nuts, sticks to get termites, etc.).
- Their hands and feet have opposable thumbs.
- They live in social groups led by an alpha male.
- Their life expectancy is normally up to 50 years in the wild, and around 60 years in captivity.
- The three biggest threats they suffer are commercial hunting for meat ("bush meat"), the destruction of their natural habitats (forests are cut to get wood) and mothers killed to get their babies for the exotic pet market.
- They are considered endangered species with about 150,000 to 175,000 individuals remaining, but aproximately 100,000 are kept in protected areas.

Two of the chimpanzees we met:

Poco

He was born in 1980 and spend the first nine years of his life in a small cage in a shop to attract clients. Due to the small size of the cage, he was forced to sit or stand on two legs. He is the only chimpanzee that can stand up and walk in a fully upright position. He was the one that came the closest to us.

Judy



Judy was born in 1983. She was confiscated from Mombasa and 10 years later brought to the Sweetwaters Sanctuary. Judy has a handicaped leg, because she had polio as a baby. She got pregnant in the Sanctuary and is the mother of Oscar, the new alpha male.

Ol Pejeta Conservancy II - Integrating Livestock into Wildlife

by Timo Wilmesmeier

Introduction

Mission Statement: Ol Pejeta works to conserve wildlife, provide a sanctuary for great apes and to generate income and complementary enterprise for reinvestment in conservation and community development.

Integrating Livestock into Wildlife

The area of the whole conservancy amouts to about 90,000 acres. The land is completely fenced. The main reason of integrating livestock into the wildlife system was the inability of funding the conservancy just by tourism. So initially the integration of livestock was for economic reasons. Further reasons were the benefit from the controlled grazing and dunging system and the improving of the habitat attractiveness.

OPC earns their income from tourism and cattle ranching. The cattle are arranged in herds of 200 animals, in addition they have a number of 6,000 cattle integrated in the OPC.

Boran Cattle

The conservancy uses the "improved" Boran Cattle. The Boran breed is the most efficient beef cattle in East Africa. It produces high quality beef. The Boran breed is a low maintenance breed with a useful degree of natural immunity against parasites. Boran Cattle is an indigenous breed. Indigenous breeds are at risk of disappearing, as hardy African farm animals are replaced with exotic breed. Moreover, the breed is mostly uniform and has a dark colour (brown to black) of skin, protecting them from getting sunburns. They are resistant against drought and heat by having a humped cooling system. According to the farmer the conservancy does not have any problems regarding the water supply.

A Boran bull grazing in the Ol Pejeta Conservancy.

The herds in OPC are breeding throughout the year. The calves are kept together with the herd until they turn eight months old. They currently keep three bulls to 100 cows. The conservancy is trying to control cow fever, transmitted by ticks, by spraying the cows once a week in a professional facility. The method of spraying against ticks is cheaper then using medicine against the cow fewer.

The cattle are slaughtered, when it has a carcass weight of 220 kg. The current price for one kg of meat is about 260 KES. All the meat is delivered to markets in Nairobi. The profits are used to benefit the conservation and communities.

Livestock traditionally forms an important part of tribal life for many Kenyan ethnical groups, who have grazed their cattle side by side with wildlife for centuries. By respecting this, OPC aims to fulfil its mission statement.

Ankole cattle kept by Ol Pejeta for stud breeding and as tourist attraction.

Enclosure System

The OPC established a management system for protecting the herds from predators at night: They build fenced enclosures to keep the animals closed together inside the fence. About 100 animals are kept in one enclosure (boma).

The cattle stay there each night for two weeks until the enclosure is moved to another place. This enclosure system has many advantages: Firstly you have a safe security system for your cattle. Predators kill just 1% of the animals. Secondly the herd is concentrated fertilizing the grassing system and thirdly OPC is influencing the wildlife moving by moving the enclosures.

Enclosure (boma) for protecting the cattle overnight from wildlife animals like lions.

There is more vegetation growing because of the increased dung from the cattle (hot spots). Using these hot spots, cattle can be used as a tool to improve and maintain grassland, creating a mosaic of habitats for all the wildlife in OPC. Hot spots are formed of the mobile bomas. The cattle, by trampling the old grass and laying down, dung and urine, transform the area into a grazing lawn of *Cynodon sp.*, favoured by all herbivore wildlife due to its high phosphate and nitrogen content. By placing the bomas one can transform and rejuvenate poor grazing land.

Drive from Nyahururu to Egerton University - and Meeting with University Staff and Students

by Tina Roner

The Sunday morning was to our own disposal and students, who did not sleep late, went either to church, to the small town of Nyahururu to do some shopping or enjoyed the Thomsons Falls situated near our Lodge.

Rift Valley

After having lunch together we continued our journey towards Rift Valley. At a viewpoint we stopped for some explanations and enjoyed its beautiful view. The Rift Valley runs along Kenya starting from the Dead Sea in the north downwards as far as Tanzania. It includes volcanic mountain ranges as well as big lakes such as Lake Nakuru.

View on the fertile part of the Rift Valley.

The Rift Valley is good for agricultural production with very fertile soils and also enough water. The annual rainfall in the Rift Valley near the equator is around 800 mm and furthermore water from the slopes of the mountains flows down to the bottom of the Rift Valley leading to good moisture conditions. However, towards the north of Rift Valley it becomes drier and pastoralists with big livestock herds dominate. As we observed from the viewpoint, the main agricultural crops in the Rift Valley around the equator are maize, beans and wheat. In the drier areas more sorghum is cultivated.

Equator Experiment

On our way down to the bottom of the Rift Valley we crossed the equator several times and at one of this big advertisement signs we finally stopped for the famous water-circle experiment. The base of this experiment is a water bowl with a hole. Our presenter Muhammad showed us more than enthusiastic how the magnet field of the earth influences the water flow on the two hemispheres. In the northern hemisphere the water in the bowl started to turn clockwise and an irregular bowl outflow from the hole could be observed. The same experiment carried out in the southern hemisphere

Equator experiment.

however lead to water turning in the opposite direction anti-clockwise. Furthermore, exactly at the equator there was no movement of the water and a straight outflow from the bowl could be observed. Believing or not, trying to copy it more or less successful nor not, we all were amazed by Muhammad's experiment and continued our journey as certificated equator experimenters.

Tea and Coffee Plantations

On the way to Njoro we had one more stop on the road with a tea plantation on its right side and a coffee plantation on its left side. Usually coffee and tea are not grown in the same region, even though both are cultivated on higher altitudes such as 1,500 - 2,000 m a.s.l. in the tropics and subtropics. Tea is tolerant to acid soils with low pH in comparison to coffee. However, on this particular site tea is grown on very good soils.

Tea (*Camellia sinensis*) is a top world famous beverage that originated from the region of China and India and is nowadays mainly grown in the subtropics and the mountain regions of the tropics like in Kenya. It actually grows as a green tree, but for easier harvesting, which is done by manual leaf picking, it is pruned to a small shrub. The leafs are picked in intervals of one to two weeks and the terminal leafs present highest quality. A tea plant can be harvested for up to 80 years before being replaced. In tea production mainly nitrogen is used as a fertilizer, which is in bigger plantations often released as granula from an airplane. Normally no pesticides such as insecticides or fungicides are used, because tea contains enough natural pesticides such as caffeine (better known as theine) and tannins. For humans tannins are especially good against diarrhoea, because of their astringent effect and for this purpose it is important to infuse a small amount of tea for a long time.

Tea picker in Kericho picking the top leaves and collecting them in a harvest bag.

Tea and Coffee offered for sale at a roadside stall near Subukia.

Coffee is also one of the world´s most important crops, which originates from Ethiopia. Only two species are economically noteworthy: arabica coffee (*Coffea arabica*), the most important one with around 90% share of production and robusta coffee (*Coffea canephora*) with more or less the rest of the share. Robusta coffee grows larger than arabica coffee,

but its beans are usually smaller. However, most important is its better tolerance against coffee rust and hence its grown more for quantity than for quality.

Coffee as everybody knows is made after roasting and grounding of the coffee seeds, known as berries, and then brewed with hot water. It is a stimulating drink due to its caffeine content. Caffeine is a stimulating alkaloid bound with potassium.

Egerton University

In the late afternoon we arrived at Egerton University, where we had a short meeting with the university staff and students.

Egerton University started in 1939 as an agricultural school founded by a white settler named Lord Maurice Egerton of Tatton. The castle, where he lived, presents today the university mark and forms a museum. In 1987 the school finally became a public university specialized in agriculture and training with first courses in livestock sciences, agriculture and economy. Nowadays Egerton University has broadened its areas of research to applied sciences, education, computer sciences, medical sciences, engineering and business studies. Currently the university offers 63 undergraduate, 46 masters, and 36 doctorate degree programmes in its various faculties and around 12,000 students from Kenya, but also from surrounding countries are enrolled.

Furthermore, Egerton University is part of the global think tank network of International Center for Development and Decent Work (ICDD) of the University of Kassel that contributes towards global hunger and poverty alleviation through research and education. Egerton University and ICDD have presently projects regarding agricultural value chains in Kenya, namely urban and peri-urban dairy chains, because dairy is the major sector in Kenya that feeds most people.

After the short introduction to Egerton University and some of the staff, PhD and Masters students we had the opportunity to enjoy a lovely evening in the university's bar garden - and through interesting discussions we made new friends.

Excursion group with Egerton DVC AA Prof. Rose Mwonya, Prof. Isaac Kosgey and Dr. George Owuor at the ARC on Egerton's main campus in Njoro.

Egerton University and Castle

by Vera Sternitzke and Ana Stoddart

Egerton University is located in the Great Rift Valley of Kenya, very close to the equator line and 180 km from Nairobi. It started out as an agriculture collage founded by Lord Egerton, a British settler, in 1930ies. In 1986 it was recognized with the status of a university.

Today Egerton University offers training in different areas: agriculture, forestry, medicine, arts, education, history and others. Currently more than 800 students are trained and educated in a wide range of programmes from bachelors to Ph.D. In addition, the university has an extensive international networking and is part of the International Centre for Development and Decent Work (ICDD), a joint programme of the University of Kassel - Witzenhausen (Germany) and other universities abroad.

On 14th of March 2011, Prof. Dr. Isaac S. Kosgey, former Dean of the Faculty of Agriculture, officially welcomed the students from the Universities of Kassel and Göttingen to Egerton University. He gave an extensive presentation on the background of Kenya's agricultural structure as well as the universities activities and courses.

During his presentation he highlighted the importance and mayor contribution of agriculture to the countries economy[1].

Egerton Castle near Nakuru.

Products and goods in the Kenyan diet and national income depend strongly on the primary sector. The Kenyan government aims to become a middle income country by the year 2030 and therefore mayor policies and changes will take part in the productive structure of the region and in particular in the agriculture sector.

With a population of 32 million habitants and a national growing rate of 2.9% food security is a main issue and challenge for the country.

The university has a strong focus and interest in agriculture and natural sciences. Mayor economic activities overtaken in Kenya are related to animal husbandry (camels, cows, goats and others), the dairy and meat sector (beef), greenhouse horticulture (flowers) and crops (tea, coffee, wheat and maize among others).

Furthermore, agriculture also has a strong linkage to the agro-ecological services that bring hundreds of tourists to Kenya every year and is a main source of income for the country. All in all, Egerton University and its alumni's have a paramount role in national policy analysis and the development of the country.

In the following, Prof. Dr. Joseph Wolukau, Director for International Linkages of Egerton University presented the main activities in his department: coordination of quality public relationships, international relationships and external academic links (covering from regional to international agreements).

Later, Egerton Deputy Vice Chancellor for Academic Affairs, Prof. Dr. Rose A. Mwonya from the Academic Affairs office gave more insights into the local vision of a sustainable agriculture. She pointed out the importance of achieving diversity in agriculture, the importance of conservation of soils, increasing the number of trees and job creation in rural areas.

In the afternoon the students from both universities and a group of professors and academic representatives visited Lord Egerton's castle. This beautiful castle is situated in the nearby area of the university. The Kenyan government and Egerton University are working on the renovation and restatement of the monument. It is also aimed to propose it as a UNESCO world heritage site.

Further References

Egerton University Website: www.egerton.ac.ke

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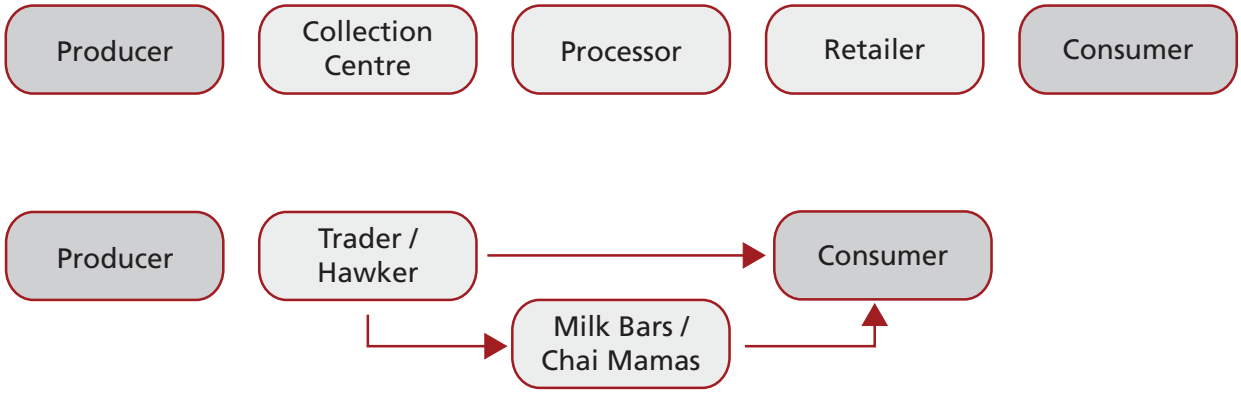
1 Kenya's GDP is of US$ 45.6 with 2.4% annual grows and the GPD per capita is of US$ 500. (Slides presented at Egerton University 2011)

Dairy Sector in Kenya

by Vera Sternitzke and Ana Stoddart



The value chain for formal and informal regional small-scale dairy sector in Kenya (own illustration).

For a better understanding of the complexity of the dairy sector in the urban and peri-urban, it is interesting to portray a value chain with the different stages and actors involved.

The peri-urban and urban dairy sector in Kenya is characterised for having a dual system, this is to say a formal and an informal sector. The formal sector has five stages, starting from the milk producers followed by the collection centre and then the processors[1]. Later the product can be sold to the retailers (national supermarkets, Nairobi's International Airport or others) and finally reaching the consumer.

However, the main structure in Kenya's rural regions is an informal dairy sector. Concentrating on the process involved in the local dairy sector, it is most important to point out that the value chain is characterized by three stages: producers to collectors (mainly traders and hawkers, but also to collection centres) and the final consumer.

Another important issue to mention is that local consumers, which tend to have low income and reduced purchasing power, have a strong demand for fresh milk[2].

It is important to highlight the national and regional efforts put in since some years ago to regulate and provide a better framework in the structure. More examples of the actions and policies will be depicted.

Producers

Women are typically the managers of the small dairy enterprises. The average number of animals per household varies and it is often less than two cows. Milk is both, consumed in the producing households and also sold to the marketing cooperatives. The dairy production is one of the few agricultural sectors that generate consistent cash flow over most of the year.

To get an insight into the first part of the value chain in Kenya's dairy sector, three small-scale producers were visited and interviewed by a group of students.

The first producer we visited is Mrs. Rose Karinki. She has two cows in the stab-

le and other two outside. The cows are grazing along the road. Supplementary she buys 4 kg of fodder containing rice and corn jam and minerals (high phosphates). The amount of milk she gets is about 15 l a day. And they need about 60 l water a day, the price for the water is 20 KES plus 20 KES for carrying the water to her house and she gains 35 KES per litre of milk. Many farmers sell their bull carves and therefore obtaining an extra income. Another area farmers have to invest in is sanitation: there are diseases like tick-bounded and the insemination is required.

The other two farmers interviewed are dealing with the same challenges like water supplementation and difficulties in the rainy season such as finding dry spaces for the cows. Interesting to mention is, that the three farmers have an intensive relation to their cows. One of the women is able to command her cow only by talking to her, with phrases such as: ‚stop eating and go to your space'. Also the cows are very fond on their owner, so that nobody else could feed or milk them.

The dairy farmers are able to send their children to school and pay for the fees. However, the income of the dairy production is very scattered and is just enough to subsist. They are all very open for new ideas and possibilities to expand their income and diversify production.

Traders and Hawkers

The milk "traders" distinguish themselves from the hawkers for having an organised working association. This local association, which is supported by the government, provides capacity building, training in sensorial tasting and finally handles a licence system (with ID-cards for more than 300 workers[3]). The licence system delimits local areas for trading as well as bans for those trades that do not comply with the rules[4]. This association charges a rate of 15 KES per month to each member.

Hawkers transporting milk on foot and by bicycle.

A typical working scheme of a trader would be to collect the milk early in the morning, from 5 am to 6:30 am, directly from the 10 to 20 farmers (located outside the market or city) to whom 25 KES are paid. Then, the trader would bring the milk to the households, chai mamas, milk bars or other buyers at a price ranging from 35 to 47 KES per litre. Generally the number of customers per trader is about 30. And during the rainy season it is possible to do two shifts and gain some extra income. Over all, a main advantage the traders have is the strong bond with the primary producers. It is often found that traders provide loans to the farmers and gain loyalty. On the other hand, hawkers provide more competitive prices for households, but this goes along with higher risk in quality of the product.

Students at the Dairy Farmers Co-operative in Njoro.

Students in a Milk Bar.

Collection Centre

The Brookside Collection Centre in Njoro (Kenya) collects over 10,000 litres of milk daily. The supply is brought directly from the nearby farmers (who receive 25 to 30 KES depending on the milk quality) and the company collects from the outer circle some more milk (this service costs a fee of approximately 3 KES for the farmer). After the milk is gathered and cooled down to 4° C, it is summited to quality controls in the local laboratory. Some tests are performed like the organoleptic controls and fat content parameter[5].

Furthermore, if the milk is aimed for the export or retail sector, then higher standards must be fulfilled, for example the NAS (Nairobi Airport Standards). Once the milk has passed the control and laboratory stage, it goes to tanks, which are distributed mainly to the processing factories (where they produce and package fresh milk, cheese, yoghurt and fermented products like "mursik").

Milk Bars and Chai Mamas

Finally, it is interesting to mention that milk bars in Kenya are very important. The quality of the products is very important to maintain a satisfied clientele therefore milk is heated at 40° to 45° C before being sold to consumers. This does not hold for the local chai mamas that run their business with low hygienic conditions as their stools are located outdoors, near the streets and in contact with animal and adverse weather condition for keeping milk or chai.

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1 In particular these two stages, collection and processing, are highly relevant in the add value of the dairy.

2 The main use of fresh milk is to blend with tea (chai tea) and fulfil basic nutritional requirements.

3 Only 7% of the traders are female.

4 An example of an action that can lead to a ban of the licence is adulterating the milk (a classic case is by adding watering).

5 If the milk does not fulfil the minimum requirements then it is removed from the dairy process.

The Push-Pull Programme - Africa´s green Revolution

by Thomas von Gehlen

On March 16th we visited the International Centre of Insect Physiology and Ecology (ICIPE). Before we went to see the fields, the professor presented us the idea of the push-pull programme theoretically. The aim is using a natural method for enhancing food security of smallholder farmers. The adaption and dissimination of the push-pull technology to climate change aims for improving food availability for half a million people in areas that are vulnerable to climate change in Kenya, Tanzania and Ethiopia.

The push-pull system involves inter-cropping cereals with Desmodium, a pest-repellent plant, and planting a pest-attractive plant, such as Napier grass, as a border crop around the field. So far, the project has achieved increases in maize yield from 1.0 to 3.5 tonnes per hectare, which has led to improved food security for close to 250,000 people in the region.

Desmodium produces a smell that the stemborer moths (important pest insects) do not like and "pushes" them away from the (maize) crop. Desmodium also covers the surface of the ground between the rows of maize. And it transfers a chemical agent into the ground that stops Striga weed from growing on maize.

Napier grass is planted around the maize crop as a trap plant. It is attractive to stemborer moths and "pulls" the moths to lay their eggs on it. Napier grass does not allow the stemborer larvae to develop on it, though: When the eggs hatch and the larvae bore into the Napier grass, the plant produces sticky glue, which traps them in, and they die.

So, the push-pull strategy shows considerable advantages: very few stemborer larvae survive, Striga weed does not grow – and the maize crop is saved.

Without the push-pull system the stemborers get into the maize crop, when moths lay eggs on maize plants. Eggs hatch into larvae that eat maize leaves and burrow into the stem as it grows. The Striga weed put its roots into the roots of the maize plant. This way Striga weed takes the nutrition the maize crop is trying to get from the soil before the maize uses it.

After this we talked about the necessity of the push-pull strategy: Without the system the stemborer and Striga cause a loss of about 80% of the crops – an alarming number. But about 40,000 farmers in Kenya have already adopted the push-pull technology.

After the presentation, we visited the **research fields**. First of all a technician from ICIPE explained us how to plant a push-pull field: You start planting Napier grass in the border around the maize plot. You should at least plant three rows of Napier all around the maize field. In the first year Napier grass should be planted before the rainy season, so that it has a start on the maize. The stem borer likes the larger Napier grass even more than the maize.

For 1 acre of land 1 kg of Desmodium seeds is needed. The soil has to be prepared as fine and clean as possible. Then you form a furrow in the middle of the rows, where maize will be planted. Now you mix the Desmodium seed with super phosphate fertilizer and sow it with the rains for maximum germination. The next step is planting the maize in the field surrounded by the Napier grass. After 3 to 6

Students and lecturer at a push-pull field (maize and desmodium).

weeks you have to trim the Desmodium, so that it does not overgrow the maize plants.

Last but not least the field has to be weed free, so that the Napier grass has a start on the maize - and the stem borer moths will be pulled from the maize to the Napier grass.

The technician also told us some advantages of the push-pull technology: Apart from the increased maize yield, you also have a continuous supply of valuable cattle feed from the Napier grass and Desmodium. With increasing milk amounts you also benefit from increasing income. Desmodium is a legume and fixes nitrogen, so that you save on fertilizer costs. Further more, the soil is protected from erosion, as Desmodium acts as a cover crop. The soil retains water, as Desmodium acts as mulch. In addition, you can get income from selling Desmodium seeds for a good price. You save farm labour as you do not have to pull Striga well and maize is protected from strong winds, when surrounded by Napier grass.

Finally we visited inter-cropping experiments in a greenhouse. Desmodium uncinatum is used as an intercrop due to its allelopathic inhibition of parasitism by Striga hermonthica, an obligate parasitic weed that can devastate the maize crop. Concluding, maize grows much better, if inter-cropped with Desmodium. Adding fertilizers and enough water the yield is even higher.

Students watching the processing of Napier grass for animal feed.

Sugar Cane

by Christine Weissenberg

Students having a look at a sugar cane field.

Unfortunately, we were not able to visit the scheduled sugar factory „Sony Sugar Cane". Just in front of the office building we were told that there are urgent orders and it is apparently not possible to show us round. So we left and stopped at a roadside sugar cane field to have a look at the crop and to get brief information by the lecturers:

Our location at that time was the district of Awendo near South Nyanza Sugar Company Limited (SonySugar). The surrounding area is a Kenyan sugar region with around 1,000 mm of rain per year. This amount of rainfall is the limiting factor – at the particular field we stopped to look at, drought problems were obvious as the plants were small in size and the leaves were curled and a bit brownish. According to Lieberei and Reisdorff (2007, page 107) sugar cane needs at least 1,000 to 1,250 mm of rain with a minimum average temperature of 18° C.

Origin of Sugar Cane

Sugar cane (*Saccharum officinarum L.*) belongs to the family of the *Poaceae* and has its origin of domestication in Neuguinea. In India the domestication proceeded and the sugar cane cropping spread worldwide.

Nowadays sugar cane is grown in all tropical countries and contributes 80% to the world sugar production. (Lieberei and Reisdorff 2007, page 107)

Prof. Bürkert challenging the students on sugar cane cultivation.

Cultivation

This crop is a perennial plant, which is cultivated for two to four and up to eight seasons (Lieberei and Reisdorff 2007, page 108) as ratoon crop growing in patches, where one single plant tillered and restocked. The regrowth, however, decreases and so the amount and the thickness of the sugar cane stems. Fertilisation, especially with nitrogen, is crucial. Sugar cane is an exhaustive plant grown either on soil with large quantities of organic matter or in „slash and burn" systems – also known as shifting cultivation. The problem with the latter is the enormous soil erosion in the time introducing the crop – although after planting of sugar cane the plants then protect against further erosion.

The nitrogen application is done by mineral fertilizer, as there are not enough animals in the region to supply sufficient quantity of manure. In some out grower concepts the fertilizer may be part of a package together with a contract with the sugar factory. 200 kg nitrogen per year is needed for a productive crop. Actually, in recent studies associated soil bacteria were found, which live from root exudates and are able to provide up to 100 kg nitrogen per year for the plants, which again reduces fertilisation to half.

Organic sugar cane is nonetheless very rare, because of the large amounts of nitrogen necessary for relatively low product efficiency. Most times organic canes do very poorly and also are unsustainably grown in small patches reducing soil fertility.

The introduction of sugar cane as a crop is done vegetative: stem pieces with two to three nodes are cut and placed into the soil. As there are root rings enclosed above each node, roots are grown as soon as they are near the soil and when there is enough moisture. It takes about nine months – in other areas up to a maximum of 24 months (Lieberei and Reisdorff 2007, page 108) for the plant to mature after planting or to regrow after harvesting. When there are different growth stages among plants of a field and in the stems of a single plant this is very problematic for harvesting and also for the sugar content. Only after finishing the internodial length growth sugar is stored in the stem mark – therefore the oldest that means lowest internodes are the most valuable (Lieberei and Reisdorff 2007, page 107). So as part of the management it is necessary to establish an even regrowth without extra tillers at different times.

Transport of harvested sugar cane to the sugar factory.

As for pest and disease control sugar cane does not need much attention as it is a very resistant crop and there are hardly any problems in this aspect.

Harvesting and Processing

Sugar cane stores the sugar in the stems, which consist to 80% of water. 50 to 60% of the dry matter then provides the sugar content.

Traditionally the canes are hand cut with machetes, which is hard work and additionally quite dangerous, because of poisonous animals like snakes and scorpions hiding in the well covered fields. Therefore it is common harvest procedure to burn the fields with a controlled fire for chasing the animals out. This way it is also possible to get rid of the leaves, which can cut the skin and would unnecessarily add to the transport weight.

Due to the custom of setting fire to the field the carbon balance of sugar cane is quite bad.

There are mechanical harvesters available, but as these are very expensive they are not used except for large-scale sugar production, for example in Brazil.

After harvesting the stems need to be transported directly to the sugar factory as the oxidation is reducing the sugar content very quickly in the tropical regions. As the transport vehicles we have seen at the SonySugar factory were all quite alike, we supposed the factory probably has contracted farmers and provides trucks and carriers belonging to the factory for the transportation during harvest times.

The actual processing of the sugar starts with chopping and squeezing the canes to gain the juice, which is then filtered to clear and remove non-sugar contents. Afterwards the juice is heated until crystallisation. For white sugar it needs a refining step – otherwise the raw sugar is just grated to the size demanded. In Kenya the final product is sugar - alcohol out of sugar cane is mostly produced in Brazil and neighbouring countries of southern America because of the Latin American history of the 70ies: during this time several countries were ruled by military regimes. To gain more control about energy resources they started to produce alcohol to use it as fuel.

Leftover Utilisation

When the sugar cane leaves are not burned, they can be left in the field to recycle nitrogen.

There is no use as animal feed as experiments have proved the leaves are so coarse and highly lignified that animals do not like to eat it – although the protein content would be sufficient. The filtrates from squeezing sugar juice out of the stems in the factory mainly contain cellulose and are of no fodder use, either. But farmers sometimes use it to enrich their soil with carbon. Otherwise it is burned for heating in the factory or used for the production of paper or cardboard.

Biofuel Production Problem

For developing countries the biofuel production for making money is discussed as a problem, because it shifts land away from food production and is therefore weakening the food security. Regarding productive and ecological aspects biofuel production in Kenya, a country depending on agricultural goods, is not advisable. Especially, when there is water scarcity or high carbon releases occur because of slash and burn systems, biofuel production does not make sense on the long run. But this issue also is a property rights problem: factories with public private partnership, where farmers are also stakeholders and own shares in the company, will look for the highest price to sell their sugar.

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Game Drive in the Masai Mara

by Cory Whitney

Introduction

This summary should start with the caveat that it is written as a critique of the Masai Mara. The establishment of a reserve or a park for the preservation of native species through tourism is a questionable undertaking, which may not yield the intended results for people and native species.

No alternative suggestions are given in the summary. It is simply a critique of the Masai Mara based on the experience of the author with no basis more reliable than my own impressions, some grey literature and a few papers.

Overview of the Masai Mara

The Masai Mara National Reserve covers an area of 1,510 km^2. The reserve belongs to the Masai people. It is named for the Maasai, original inhabitants of the area and the Maasai word ‚Maa' which means spotted (as it is spotted with patches of shrubs and shadows of passing clouds).

The Masai Mara acts as a kind of continuation of the Serengeti National Park game reserve in Tanzania and as a throughway for animals in the Great Migration from July to October.

The altitude of the Masai Mara ranges from 1,500 to 2,170 m and temperatures range from 30° to 15°C. December and January are the warmest times of the year; June and July are the coldest. The rainy season ‚long rains' generally happen in April and May and ‚short rains' are in November. The dry season is usually from July to October. The dry season is the time when the majority of the tourism happens in the area.

Questions Remaining

The first question: Is the Masai Mara Reserve effective? Does it act as a mechanism for preservation of wildlife and for the betterment of the people of the area? i.e. does creation of wildlife reserves act as a mechanism for the meeting of the millennium development goals?

A study funded by WWF and conducted by ILRI from 1989 to 2003 looked at several ungulate species populations in the Masai Mara finding losses of 95% for giraffes, 80% for warthogs, 76% for hartebeest, and 67% for impala. Increased human settlement in and around the reserve was cited as the mechanism for the loss (Ogutu et. al. 2010). This means that people were eating them and sending the meat off for black markets as ‚bush meat', which comprises a part of the diet for many Kenyans (Kiringe et. al. 2007)

These negative anthropogenic effects are not just felt for the ungulate species. The Spotted Hyenas of the Masai Mara are also experiencing stress and increased death rates. The proportion of deaths caused by humans has been dramatically increasing for this species since 1985 (Pangle and Holekamp 2010). Cheetahs have also experienced a negative effect of the anthropogenic factors in the area. The population has been declining from 30 to 50% since 1966 (Isaboke 2004-2005).

Second question: Is the establishment of a reserve job creation for the Maasai? The Masaai we saw were living in slum like conditions on the outskirts of the Masai Mara and selling lion tooth necklaces, knives etc. Creating a reserve in this case seems to have caused them to be sedentary.

Lions in the Masai Mara Game Reserve.

Job creation is a complicated economic outcome of a number of events. If the markets are allowed to openly choose the mechanisms and standards of work then little chance exists for the Maasai to get jobs in the Masai Mara. Free market creation of jobs often means that industry will choose experienced workers from the existing pool; people who already work in the industry. One example of this that we witnessed is that the drivers of the busses in the park were mostly Kikuyu. One Maasai I met told me that he really wanted to become a driver. He wrote me later that to learn to be a driver „i must travel to the city and go and learn there." He said it will take two years to complete the school and „in kenya everything u do need money..."

Finally our experience begs the question: How wild are the animals that live in the Masai Mara?

They live like celebrities surrounded by paparazzi at every move. The Cheetah we saw eating an impala was surrounded by backcountry tourism vans full of tourists. The lions resting in a patch of Acacia were seen by hundreds of tourists in whose drivers drove right up to them. Literally we were a few meters away from the resting pride. The Gnu and Zebra walking near the roads were running away from the speeding tourism vans, who were on the way to go and look at the cheetah.

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Masai Cattle Herding and Water Scarcity Problems

by Gertrud Wohlfart

The Masai Mara (Massai Mara or Maasai Mara) is one of the most prominent and famous National Parks in Africa. The name has its roots in the original inhabitants – the Masai nomads – and the river that is crossing the land – the Mara River.

With a total area of around 1,700 km^2 and its open grassland, the Masai Mara National Park is the habitat of many wild animals including the "Big Five" (lion, leopard, elephant, buffalo and rhino). Within the park, these animals are protected and attract many tourists. Every year there is a big migration taking place in the time, when the animals (especially wildebeests, zebras and antelopes) are searching for better grassland and moving across the country in big herds.

The land itself is mainly composed of four types of topography: Ngama Hills to the east with sandy soil and leafy bushes, Oloolo Escarpment in the west that is rising to a big plateau, the Mara Triangle bordering the Mara River with lush grassland and Acacia woodlands, and the Central Plains with some bushes that are forming the major part of the reserve.

The specialty about the Masai Mara National Park is that it is a reserve at the same time. This means that the original inhabitants – the Masai - are allowed to herd their cattle within the park, but are not allowed to hunt.

The Masai are semi-nomadic people that traditionally live in "kraals" arranged in a circle. The fence around a kraal is made of Acacia thorns to protect the cattle from wild animals. It is the responsibility of the men to fence the kraal, while women construct the houses, collect water and firewood, milk the cattle and cook for the family. Warriors are in charge security while boys are responsible for herding livestock. During the drought season, both warriors and boys assume the responsibility for herding livestock. The Masai people live with a communal land management system that induces a movement of livestock that is based on a seasonal rotation to utilize the land in a sustainable way.

The primary income for the Masai is livestock (especially cattle, goats and sheep). The keeping of livestock plays an important role in the life of the Masai people as the animals provide meat, milk and other products and on the other hand can be traded for other animals, money or other foods. Another important source of income for the Masai is the growing tourism. More and more tourists visit the habitat of the Masai to see the wild animals.

Of course there are some threats that the Masai have to face living together with the wild animals in such an arid area. On the one hand, the dry weather and the high potential of droughts make it difficult for the Masai to provide the cattle enough food and water. Many animals die during these times what means great losses. The Masai are still using their traditional methods to cope with the drought: splitting herds, keeping fewer animals and moving stock to find water or grass. New inventions such as the index-based livestock insurance that insures cattle herds against droughts are increasingly used.

On the other hand, problems arise with the natural competition between the cattle and the wild life (zebra, wild-

ebeest, etc.) for grass and water, especially in very dry times. Also the losses of animals that are the result from wild animals, e.g. lions that are killing them are a wide spread problem. The warriors that are guarding the herds mostly only have a knife and a stick to chase wild animals away or to protect themselves and the animals.

Further information is also provided on the websites of the Maasai-Association (www.maasai-association.org/maasai.html), the International Livestock Research Institute (www.ilri.org/ilrinews/index.php/archives/1975), the Masai Mara (www.masai-mara.com/mmvm.htm) or on www.game-reserve.com/kenya_masai-mara.html.

Schedule of the Preparatory Seminar / Presentations

Twenty presentations as per schedule below were held during the preparatory seminar with 10 - 15 minutes presentation plus 5 minutes discussion and 20 - 30 minutes presentation plus 10 minutes discussion for topics presented by 1 and 2 students respectively each presenter submitted a PowerPoint file and a 5 pages text, which are compiled here below.

No.	Title	Presenter
1	Paleoanthropology: The Rift Valley - Cradle of Mankind	Oda Reese
2	The Colonial Rule - from the East Africa Protectorate to Independence	Meike Grosse
3	The Iron Snake and the Masai Treaty: Land Tenure and Development - from pre-colonial Times to the 21st Century	Thomas von Gehlen
4	Kenya's political system from Kenyatta to Kibaki and where the new Constitution leads	Vera von der Wense
5	Cultural Diversity, local Knowledge, social Power and Poverty - Kenya's many Peoples	Vera Sternitzke & Alexandra Arndt
6	Grains of Wheat, white Masai's, Kibera Kids & Out of Africa - Kenya(i)n Literature and Film	Anna-Maria Engel
7	Kenya in the global Context	Melissa Valladares & Ana Stoddart
8	The Harambee System - formal and informal Economy in Kenya	Marie-Luise Hertkorn
9	Landuse options for the next Century: Climate Zoning, Vegetation Zones and Agro-Ecosystems under Climate Change	Sonja Gässler
10	Kenya's natural Forest Resources - between Conservation and securing rural Livelihoods	Cory Whitney
11	Coffee & Tea - Cooperative Approaches to link small Farmers to international Value Chains	Manuela Kühnert & Christine Weissenberg
12	Fruits and Vegetables - perishable agricultural Commodities for urban Markets and Export	Vince Canger & Tina Roner

No.	Title	Presenter
13	Small is beautiful versus Economies of Scale - the Kenyan Dairy Sector	Mario Cuchillo
14	The Kenya veterinary sector - livestock diseases and export opportunities	Merle Tränkner
15	The Kenya wildlife sector - backbone of the tourism industry and source of potential human wildlife conflicts	Laszlo Di Domenica & Asja Ebinghaus
16	Masai Herders and Valentines Roses - the Flower Water Conflict	Nancy Lira
17	Organic Farming & Fair Trade - Options to create Value Added for small and large Producers	Carlos Quiroz
18	Risk and uncertainty - climate index based insurance systems for small crop and livestock producers	Kathrin Grahmann
19	Gender differences - the roles of women and men in Kenyan agriculture, food processing and small rural business development	Timo Wilmesmeier
20	Preserving and adding Value: decentralized Solutions for post-harvest Handling and Food Processing in Kenya	Gertrud Wohlfart

Paleoanthropology: The Great Rift Valley - Cradle of Mankind

by Oda Reese

Introduction

Today, Homo sapiens is the most successful mammal on earth. Generations of archaeologists and anthropologists worked on the questions everyone wonders about every now and then: Where do we come from? Who are our ancestors? Why are we so special? What proof do we have for all this? The Great Rift Valley, an unusual geological formation situated in East Africa, kept many secrets over millions of years to be discovered and examined. The rare human fossils found there allow us a deeper insight into our unique evolution.

Human History

Our early ancestors

Even nowadays one cannot really tell what happened during those millions of years of human development. All the conclusions are based on logic and experience of scientist and of course opinions in the scientist world differ from person to person. So all the following facts are estimations and guesses based on fossils, geology and climate research. But there is one citation of Richard Leakey that gives us a good impression of what happened:

„The „story" of human origins goes something like this. Once upon a time, a very long time ago, a species of unusual ape in Africa were forced out of its traditional forest home because a cooling climate had steadily reduced the forest cover. Our resourceful ape grasped the ecological opportunity and, in its new, open-country niche, at once began to undergo a series of evolutionary changes. Gradually it came to stand and move on two legs, not four; to make and use stone tools and weapons; to reduce the size of its dagger-like canine teeth; to enlarge the size of its brain.

A positive feedback system was set up, each development leading to the next: The more it stood upright, the more it could use its hands; the more it used its hands, the more it needed to be upright; the more intelligent it became, the more it could rely on stone-tool technology. Eventually it became a primitive version of us, erect and intelligent, a skilled tool maker, an accomplished hunter. It stood triumphant on the plains of Africa, leaving less resourceful apes to skulk in the receding forests (in: Origins Reconsidered by Leakey R. and Lewin 1992, page 68)."

In 1974 Donald Johnson discovered the 3.2 million year old skeleton called Lucy in the Hadar region in Ethiopia (Johanson et al. 1994). She belonged to the family of Australopithecus. They lived about 4 million to 1 million years ago and were finally pushed back by the first hominids (1). Lucy's pelvis bears a striking resemblance to a human one (Johanson et al. 1994). At that time the lush native forest in Africa became less and less, and so these apes had to be able to move in trees but also in the savannah. Walking on two legs brings many advantages: The hands are free to carry food etc., the body is far away from the hot ground and the way of walking is more efficient compared to the way monkeys move. Their brain was as big as the one of current chimpanzees. During their existence the shape of the jaw-bone and the teeth changed. Also the body became more human-like and more athletic. They did not use tools yet. This creature is the most important link between apes and hominids. The genus Homo surely evolved from the late Australopithecus species although it is not

sure how. There were no fossils found from that time (Leakey R. 1994).

The first hominid was the Homo rudolfensis. His most outstanding feature was his big brain. He lived in Eastern Africa about 2.5 - 1.8 million years ago. His jaw and teeth were still quite big and strong but his body shape was already modern. He was probably the first omnivore and also the first one to use primitive stone knives (1).

Homo habilis (habilis: able, handy, mentally skilful, vigorous) lived about 2.1-1.6 million years ago in the East African Savannah. Fossil findings in Olduvai Gorge in Tanzania reveal that there was a dramatic increase in size of hominid brains as well as the sudden appearance of stone tools. With stone tools at hand our ancestors were able to change their eating habits from herbivore to omnivore. The picture of the „early us" as noble hunters lingers in our mind. But we might have been wily scavengers just as well. All we have to reconstruct the lifestyles of our ancestors are a few bits of bone and some stone tools (Johanson et al. 1994).

In 1984 Richard Leakey, one of the most important fossil hunters at this time, found the remains of a remarkably complete skeleton of an approximately 10-year-old Homo erectus. This boy had lived about 1.6 million years ago close to Lake Turkana in Kenya (Lewin, 1993). Homo erectus represents a pivotal point in human evolution. Everything that preceded Homo erectus was distinctively apelike in important aspects. Everything that followed erectus was distinctively humanlike. His body- and brain-size dramatically increased. He was adapted to long-distance ranging on African savannahs and around the 1 million-year mark he made use of fire. The range of the tools widened within time until they had various tools for almost every purpose. With all this new abilities Homo erectus was able to adapt and occupy new environments and expand its geographic range far beyond Africa. He left his home-continent and spread out to Europe, India, China and Southeast Asia. This successful species is our direct ancestor (Johanson et al. 1994).

In Europe Homo neanderthalensis derived from Homo erectus about 135.000 years ago. They occupied the whole of Eurasia and disappeared 35.000 years ago. The fate of the Neanderthals is one of the most longstanding problems in paleoanthropology. They were stockily built with thick, powerfully muscled limbs. Their big brain was even slightly bigger than ours today. But the head anatomy was unusual. The cranium had a „bun" at the back and protruding brow ridges at the front (Leakey R. and Lewin, 1992). But what happened to this highly developed species? In our modern humans there is no trace of them, no DNA, no traditions, nothing. Modern scientist assume, that when modern Homo sapiens left Africa about 80.000 years ago, he pushed the Neanderthals back. Not a war was going on but a subtle fight for resources. The climate had changed and conditions in Europe weren't too good. Apparently Homo sapiens had very strong social links between the tribes an settlements in different regions, what means that they could hunt together and support each other in case of food scarcity. In Neanderthals' behaviour scientists could not find such mechanisms, what lead to the conclusion that the Neanderthals slowly died out (GEOkompakt 2009).

Now let's come to the most successful mammal on earth, Homo sapiens. About 250,000 years ago Homo sapiens (sapiens: wise) evolved from Homo erectus in Africa. About 70,000 years ago the Ice Age covered North- and Middle Europe with huge masses of ice and snow. This lead to a lower sea level and thus made it possible for our ancestors to cross over from Africa to the Arabian Peninsula where the Red Sea meets the Arabian Sea. Where you nowadays on the coasts in Yemen and Oman you find only bad living conditions without freshwater, at that time you could find freshwater sources spread along the coast, which today are covered

by the sea. A group of only a few hundred people made their way along the coast and crossed again the sea to Iran. This is where they started to spread over the whole world (GEOKOMPAKT 2009).

What is so special about Homo sapiens?

There are numerous qualities shared among all members of Homo sapiens. The probably most outstanding quality is the spoken language, a unique gift in the kingdom of animals. Language gives us the options to discuss, plan and communicate about problems. Important is our self-consciousness, the way we see ourselves as an individual that can be referred to by a name. Also the way we developed a sense for ethical judgements and religion is outstanding. Of further important is that we have artistic imagination and therefore can improve things and achieve technical innovations (LEAKEY R. 1994).

Our closest Relatives today

David Pilbeam once described us as „ rather odd African apes". This describes quite well where we originally come from. About 8 million years ago the chimpanzees separated from the branch of gorillas. One million years later a very different branch separated from the chimpanzees - the early hominids. DNA tests show that only 1.2 % of our DNA-bases differ from the ones chimpanzees or bonobos have. Next comes the gorilla with 1.6% (LEAKEY AND LEWIN 1992).

Great Rift Valley

Location and Formation

The Great Rift Valley is situated in East Africa and belongs to the East African Rift System EARS. The EARS is one of the geologic wonders on earth, where old tectonic plates create new ones by splitting them apart. A rift is basically a crack in a plate that widens over time. The exact mechanism of forming of a rift is still an ongoing debate (2).

The EARS is responsible for many impressive changes in the landscape of East Africa. Due to this phenomenon some of the highest mountains and deepest freshwater lakes in the Ethiopian-Kenyan-Ugandan-Tanzanian region started to be created about twenty million years ago. The Kenyan dome and the Ethiopian dome brought large-scale topography to East Africa. With these two domes growing, the pattern of rainfall changed as the result of a growing rain shadow. The forest in this region began to open up, changed first to woodland, then to shrub and grassland. When the centers of the domes plunged several thousand feet, the Great Rift Valley was formed. It was a deep, meandering valley with even more ecological barriers and a mosaic environment than before. There was constant change, an instable environment, from the lush valley over open savannahs to the harsh mountains. This is the place where a tremendous diversity of animals evolved. This place seems to have acted as an engine of evolution.

But the Great Rift Valley is not only special because it was the place where everything started, but also because it preserved the proof of everything. Due to the fast eroding highlands a lot of sediments were washed to the valley and covered many bones of animals and our ancestors. The bones were covered by more and more sediments and lay well preserved over millions of years until nowadays the sediments themselves erode and give free the precious fossils. In Africa there are only two places where fossils were found: the whole of the Great Rift Valley and some caves in South Africa. This does not lead to the conclusion that these were the only places where our ancestors lived, but it were the only places where the bones were preserved (LEAKEY AND LEWIN 1992). [Not so true any more: Discovery of Sahelanthropus tchadensis in Chad the early 21st century by BRUNET ET AL. 2002]

„Even if one were not passionate about nature, one could not fail to be impressed by the vitality and the diversity of it all"(RICHARD LEAKEY about the Great Rift Valley)

For us, the hominid family, this mosaic habitat created by the rift system were crucial, for daily lives as well as in our evolutionary origin (Leakey R. and Lewin 1992).

Important fossil sites

Hadar and Awash in Ethiopia, where they found the skulls of several Australopithecus afarensis, as well as the famous „Lucy". They also found Homo sapiens and Homo erectus fossils.

Peninj, Olduvai, Omo, Koobi Fora in Kenya. This is where they found the famous „Turakana Boy", member of Homo erectus. Also parts of skeletons of Homo habilis and Paranthropus boisei were found.

Laetoli in Tanzania. There they found the 3.6 million year old footprints of a bipedal hominid. They also found Australopithecus afarensis and Homo habilis.

Makapansgat, Sterkfontain, Taung in South Africa. Here they found Australophitecus africanus (Taung Child), and Paranthropus robustus.

Conclusions

The main question is always wether the Rift Valley is or is not the cradle of mankind. There definitely is proof that Africa itself is the cradle of mankind, just as Charles Darwin already suspected. There is genetic and anthropologist proof for that. At a time when Europe was covered in ice, the landscape in Africa was created in a way that invited evolution to go there and do her best. And that is probably what happened.

It is a fact that you can find all steps of our evolution in the soil of the Rift Valley, but that does not mean that this is the only place where our ancestors lived, it only means that this is the only place, apart from South Africa, where they were preserved. So there is not a definite yes or no and it probably never will be. But it sure is a fascinating place.

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The Colonial Rule - from the East Africa Protectorate to Independence

by Meike Grosse

Pre-colonial History

In year 1000 AD Islamic city states existed at the coast of what is today Kenya, for example Mombasa and Malindi. The region was strongly influenced by Arabic culture. In the 16th century the Portuguese and in the 18th century the Omani Arabs conquered this region (Brockhaus 1990).

British East Africa and the East Africa Protectorate (1895 – 1920)

After the Portuguese and Omani Arabs the British arrived in Kenya in the 1880s. British East Africa was established, the forerunner of the East Africa Protectorate. British East Africa was administrated by the Imperial British East Africa Company (IBEAC), which was founded 1887 as commercial British company. The aim was to control trade especially with Uganda. The main article of trade was ivory, but also cloves and guns were important (Hauck 2001).

1895 the British government proclaimed the East Africa Protectorate.

At first the influence of the Europeans was restricted to the coastal region. The Europeans were not interested in the interior but more or less only in the trade route to Uganda.

To enhance the connection a railway from Mombasa to Lake Victoria was built in the years 1896 – 1901. The building of the railway met strong local opposition (Hauck 2001).

Many workers were imported from British India to do the manual labor of building the railway. Many Indians stayed there and were an important root of the later salesman and businessman class (Hofmeier 2005).

To improve the control of the trading route an effective colonial administration in the interior was needed. The administration should not cost too much, the Protectorate should pay for itself. Therefore the colonists had the idea to settle in the fertile regions of the highland along Rift Valley and to organize commercial agriculture. It was an advantage for the British that the region was sparsely populated. Many Africans had probably left the highlands because of catastrophes like pocks epidemic (Hauck 2005). But they had left without having given up their rights to the land.

The colonists thought that the Africans would not know ownership of land. So in 1902 the British government declared all land which was currently not occupied by Africans to Crownland, which they could sell, lease or give for free to Europeans. Of course that didn't fit to the ideas of the Africans. The Kikuyu were more affected than other ethnic groups, because in that region mainly Kikuyu had settled. The proceeding of the British evoked heavy protests of the Kikuyu (Hauck 2005).

However, European farmers, missionaries, and administrators settled in the highlands along Rift Valley. The settlers needed workers for their farms and so the British mobilized local chiefs who should allocate employees. Additional taxes were created which increased cost of living for the Africans so that they needed to look for work. Further on the cultivation of cash crops was forbidden for Africans so that they would not earn too much money themselves. The consequence was that many Kenyans, especially Kikuyu, worked on the farms. They were called 'squatters', because they settled with their family on pieces of the land. They got several rights, for example to keep their own cattle and to cultivate their own fields (Hauck 2005).

Kenya as Crown Colony (1920 – 1963)

In the year 1920 Kenya became officially Crown Colony.

In the 1920s and 1930s problems arose because the land started to run short. One reason was that the Kikuyu population had grown strongly; another reason was that more and more settlers had been attracted because of the possibility to get land easily. The consequence was severe scarceness of land (Hauck 2005).

Since about 1925 the settlers had more workers than they needed for the first time. Therefore they behaved more offensive against the squatters and shortened their rights. There were restrictions concerning the size of the land a squatter was allowed to have and the amount of animals he was allowed to keep. The status of the squatters got worse. Many squatters had to leave the highlands and had to settle in overcrowded reservations or in Nairobi, which was also overcrowded (Hauck 2005).

Thus the conditions became more and more adverse for the squatters. That was one of the main reasons for the Mau Mau uprising.

The Mau Mau Uprising

The Mau Mau uprising is the militant culmination of the years of oppressive colonial rule and resistance to it. It last from the years 1952 – 1960 when the British claimed the state of emergency. It culminated in a generalized civil war.

There were several predecessors of the Mau Mau uprising earlier in the history. 1920 there was a first attempt to form a protest movement, the "Kikuyu Central Association" (KCA). After the World War II this movement changed into the "Kenya African Union" (KAU) under Yomo Kenyatta, the later president of Kenya (Brockhaus 1990).

From 1950 on, many radical Kikuyu affiliated in oath bounds and terrorized nonpolitical Africans. The British government named them "Mau Mau". The origin of the term "Mau Mau" is uncertain.

Later a Swahili acronym was adopted: "Mzungu Aende Ulaya, Mwafrika Apate Uhuru" (= Let the European go back to Europe, let the African regain independence). It could also be an anagram of Uma Uma (= get out get out).

Some Mau Mau members preferred "KLFA" (Kenya Land and Freedom Army) instead of "Mau Mau". They said the British would prefer to use the term "Mau Mau" to deny the rebellion legitimacy (Kariuki 1975).

The main aim of the offensive was: "making the position of the Europeans so uncomfortable and their economic position so precarious that the majority of white people would voluntarily pack up and go" (Dedan Kimathi in Hauk 2001). Dedan Kimathi was a Mau Mau general and one of the war's most significant historical figures (Branch 2009). He was captured by the British in October 1956 and executed four months later. In today's Kenya he is seen as a national hero.

Usually the Mau Mau Warriors attacked stations, mission schools and white farms. Mostly they aimed at the cattle and crops and not at the Europeans themselves. Several dozen European and Asians were killed, sometimes very cruelly, but more than thousand Africans (Brockhaus 1990).

The police and the army killed more than 115 000 Mau Mau Warriors. Many African leaders were arrested (also Jomo Kenyatta).

1956 the Mau Mau were beaten. In spite of the defeat for the Mau Mau it was the start of Kenya's way to independence.

The conditions for colonial rule had fundamentally changed and it had become clear that it would no longer be possible to exclude all Africans from political decisions. Since 1954 the Africans were represented in the parliament. At first two elected Africans were accepted, and then a few more, then as many as Europeans, at last there was an African majority (Hauck 2001).

1960 the state of emergency was annulled and 1961 Kenyatta was released. On December 12th 1963 Kenya obtained independence (Hofmeier and Mehler 2005).

Era Jomo Kenyatta

1963 Jomo Kenyatta became Prime Minister. After the proclamation of the republic, Kenyatta became its first president from 1964 – 1978. He became famous for his slogan "Harambee" ("Let us all together pull into one direction"). He aimed to build up help to self help and co-operation.

At the beginning two parties existed, the "Kenya African National Union" (KANU) and the "Kenya African Democratic Union" (KADU). Later there was a one party system with the KANU. Kenyatta aimed to strengthen his power and to fill important positions with Kikuyu. The administration was centralized (Brockhaus 1990).

The question of land possession was the key question in the negotiations for independence. The question was not solved satisfactorily. Kenyans had to buy the land with credits from Great Britain and the Worldbank. Mainly loyal Kikuyu and collaborators gained profit from this policy.

On the 1st of June, the Madaraka Day, Kenya celebrates its independence.

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The Iron Snake and the Masai Treaty

by Thomas von Gehlen

The Lunatic Line

In 1894 the British government had decided, primarily for strategic reasons, to build a railway linking Mombasa with the British protectorate Uganda. However the Liberals in London called it spitefully just the „Lunatic Line". The railroad was also challenged by them. They said: "The Government had no right to drive a railway through country owned by the Masai and other tribes." Africans were informed after the fact and they called it "The Iron Snake"; they knew it as a bad omen. More intense resistance was encountered in western Kenya but the railroad's progress was inexorable because the might of the industrial age was no match for the African native.

An enormous Undertaking

London had several reasons for this enormous undertaking. A very important reason was to ensure protection of the source of the Nile from Britain's enemies. Second a great potential market for British goods and third it had a revolutionary effect in settling the region. Furthermore the railway opened up the interior, not only to the European farmers, missionaries, and administrators, but also to systematic government programs to attack slavery, witchcraft, disease and famine. Some 32,000 workers were imported from British India. Most of the material used came from white colonialists.

From Mombasa to Port Florence

The inaugural plate-laying ceremony was performed on 30th May 1896. By 1899 nearly 500 km of track had been laid and the line had crossed the Athi plains and arrived at the foot of the Kenya Highlands. The railhead reached an area of swampy ground known by the Masai name of Nyrobi. Here a major depot was established to facilitate the construction of the line up into the highlands. The administrative offices were also moved here from Mombasa and homes were built for the staff. In 1900 the spelling was changed to Nairobi and the future capital city was born. The railhead finally reached Lake Victoria, 930 km from Mombasa, on 19th December 1901 at a point called Port Florence.

The Development of the Railway during the 20th Century

Between 1904 and 1914, a slow rise in passengers and freight traffic helped restore confidence at home. Coffee, maize, wheat, soda ash and sisal brought the tonnage moved from the interior to the coast from 6,000 to 77,000 tons. For the Africans, however, the railroad still had little meaning. After the World War I a new main line was constructed from Nakuru. A branch to the soda deposits at Lake Magadi was completed in 1915. The Nanyuki branch arrived on the foothills of Mount Kenya in 1931.

World War II

Famine continued to be a problem in dry years. In 1943, the railway was used to distribute 120,000 tons of maize and cassava and 2,745,229 passengers but it was a rough form of third class travel. Again in 1944 100,000 tons of food had to be distributed to ensure alimentation. By the time of independence in 1963, more and more Africans had turned to buses, and „matatus" that traversed the region. This resulted in a decline in demand for rail. The infrastructure of the railway was worn out and not renewed. A lot of accidents happened during the second half of the 20th century.

Iron Snake´s Future

Mainly to the Rift Valley Railways Consortium (RVRC) under a 25-year concession in 2006 Kenya and Ugandan governments signed a joint agreement to allow privatization

of the line. RVRC is made up of Sheltam Rail Company of South Africa with 61% share. They invested 29 million dollars. In September 2006 the World Bank approved the first grant (US$ 70 mill.) to help. Not unless there is a parallel development of low-cost transport for the small farmer and economy passenger. The consortium expects to reap benefits from the recently expanded East African Community – Kenya, Uganda, Tanzania, Rwanda and Burundi – and the creation of a customs union which opened up markets for 90 million people.

"The Iron Snake must be client-friendly, or it will never survive." (John Gaudet 2006).

The Masai Treaty - Land Tenure and Development - from pre-colonial Times to the 21st Century

Pre-colonial Times

According to the tribes own oral history, the Masai originated north of Lake Turkana. They began migrating south in the 15th century and arrived in the long trunk of land stretching across central Tanzania and Northern Kenya during the 17th and 18th century. The Masai territory reached its most dominant size in the 19th century. The Masai population is now estimated 900,000.

By the end of the 19th century the Masai kingdom was weakened. A severe rinderpest epidemic around the turn of the century devastated Masai livestock. Masai people's lifestyle concentrates on their cattle which make up the primary source of food. It followed a ferocious battle with British explorers along the Kedong Valley around that period.

1st Masai Treaty: 10th of August 1904

The British commissioner in Kenya, Sir Donald Stewart, met Masai leaders and made them to sign the infamous Masai Agreement of 1904. The Masai "agreed to remove their people, flocks and herds into definite reservations away from the railway line". Masai were herded into two protected areas; in Laikipia (north) and to the south of the Uganda railway line. The treaty was to be enduring for 99 years. The 1904 treaty was theoretically meant to protect the Masai. The fertile Rift Valley and what would become Nairobi was open for the settlers. However in the process of relocation many young men and women died from flu, malaria and pneumonia. Thousands of cattle are said to have died from east Coast fever, pleuro-pneumonia and rinderpest up to 98,000 cattle and 300,000 sheep were lost in the process of relocation, leading to a substantial depreciation for the Masai stock.

2nd Masai Treaty: 4th of April 1911

The Masai were locked out of lands north of the Uganda railway line. These areas today form the main backbone of Kenya's dairy and beef industry that exports to Europe and Asia. All in all Masai lands in Kenya were cut down by 60%. The treaty was to be „enduring as long as the Masai as a race shall exist.

From Lancaster Conference to…

The goal of the 1962 Lancaster House conference was to establish the terms of self-governance for Kenya. It was thought that the British, in relinquishing the colony of Kenya, might be ready to correct some of their past wrongs. Not wishing to miss this once in a lifetime opportunity, the Masai sent a delegation to London to make their case.

The Masai were continually left out of the processes of development, and their land claims continued to be ignored. The independence government itself has appropriated portions of Masai land to declare protected areas or to use for other public purposes without any consultation with the community or payment of any compensation. In 1963 the Masai went to court to fight for their rights. They argued that the local courts had no jurisdiction. The dispute was not a contract within the meaning of municipal law. It was a treaty between two sovereigns over which no municipal court had jurisdiction.

Violence in 2007

Matters came to a head when police shot and killed a 70-year-old man and wounded four other Masai. For "grazing cattle on private land they say is theirs". A few days later, in the capital Nairobi, police fired teargas to disperse about 100 Masai tribesmen marching to the British High Commission to demand the return of their land elections in 2007.

Elections in 2007

At that same time, the Masai anxiously awaited the results. Kibaki won this elections, he didn´t supported Masai´s right. Additional key actors, including former U.N. Secretary General Kofi Annan and the U.S. government, are taking a leading role in pushing the Kenyan government to resolve the host of critical land issues that lie at the heart of the country's recent political and social instability.

The Kenyan Ministry of Lands prepared a Draft National Land Policy which says: „The Government shall establish mechanisms to resolve historical land claims arising on or after 1895, the year when Kenya became a colony under the British with the power to enact laws which formed the genesis of the mass disinheritance of various Kenyan communities of their land. The Government shall establish a suitable legal framework to investigate the historical injustice and establish mechanisms for restitution, reparation and compensation.

Current Issues

The question of whether they need to learn to be industrious urbanites rather than brave pastoralists and hunters? - Whatever the answers to these questions, what is incontrovertible is that land remains an emotional issue, central to the very existence of the Masai and of pivotal importance to the Kenyan state.

Kenya´s political System – from Kenyatta to Kibaki and where the new Constitution leads

by Vera von der Wense

Introduction

With the independence in 1963 Kenya got its first constitution which is the basis for the political system. It was elaborated by native Africans in collaboration with English settlers which is the reason why it is based on and hence similar to England´s constitution. Being once developed it has not been changed completely until August 2010, but more than 30 times amended by the three different presidents who governed since 1963.

These three periods of government and the manner of reigning Kenya by the presidents are described below. Moreover this paper gives an insight view in Kenya´s political history, its initial situation and hence the starting point for the new constitution.

Kenya´s political system

Jomo Kenyatta (1963 – 1978)

After more than 70 years colonial period Kenya declared its independence on 12th December in the year 1963. Having already been a main fighter on the way to independence Jomo Kenyatta became Kenya´s first president. Beforehand the political authority was transferred step by step from the English settlers onto the Africans. The first elections in which they were allowed to participate were held in 1961, when the Africans got majority of seats in parliament. Therefore two parties of Africans were developed in 1960: the central oriented KANU (Kenya African National Union) and the Kenyan African Democratic Union (KADU). KANU was the party of mainly major ethnic groups like Kikuyu and Luo. Being Kikuyu Kenyatta was oriented to the KANU, which came out to be more "left-wing" (Trouph and Hornsby 1998).

KADU consisted of smaller ethic groups from coast, Rift-Valley and the North. They supported a liberal political system similar to the federal one of America in which the remaining English settlers were also more interested.

The country was divided into eight provinces: Central, Nairobi, Eastern, North-Eastern, Coast, Rift Valley, Western and Nyanza which had there own leaders to build a federal political authority but more and more Nairobi took over the authority (Trouph and Hornsby 1998).

Not following the example of several other African countries which had already achieved their independence, Kenyatta´s government did not dispossessed land from Whites but forced to unite all Kenyan ethnic groups. Nevertheless government bought two-thirds of English landholding to distribute it to smallholders. After this production and export of agricultural products increased. During the first year of independence KADU was more and more suppressed by the power of Kenyatta and his party KANU.

Since KADU´s break down in 1964 Kenya was a single-party state until two years later the socialist party KPU (Kenya´s People Union) was found by Oginga Odinga. At least since then not only suppression of competitors and regime critics but also the preference of Kikuyu (Kenyatta´s ethnic group) and the enrichment of high-level officials and their families became more and more visible. Later KPU was exterminated which was one of the first actuator for ethnic conflicts and the outbreak of violence (Fiebig 2010).

Daniel Toroitich arap Moi (1978 - 2003)

Following Kenya´s constitution the new president became Daniel Toroitich arap Moi after death of Kenyatta in 1978. First his political strategy was an adoption of Kenyatta´s political system: The foreign politics were basically pro-west oriented and he supported a capitalist economy. Furthermore he

strengthened his authority by a constitutional change of Kenya from a multi to a single party state.

Since the first coup attempt on 1st of August in 1982 the country was characterized by uprisings, violence and regime critic, which was repressed by imprisonment, torture and Mois self-imposed right to nominate and release judges. But this did not stop opposition members who went on fighting against the political dominance of KANU and the centralization of the state.

During elections of 1988 Moi rigged the votes in order to keep his and the KANU´s exclusive power. He stopped every pro-democracy movement until the foundation of the Forum for Restauration of Democracy (FORD) in 1991. Being subsidised by foreign financial help FORD had many advantages for Kenya´s weak economy which was realized by Moi who allowed it to remain.

In December 1991 one year before elections for president and parliament Kenya became a multi-party state. Instead of uniting one oppositional party to gain more votes than KANU the politicians did not agree on a common proposed president and three oppositional parties were formed: The Democracy Party with his chairman Mwai Kibaki, a colleague of Kenyatta who was KANU-member before, and the independence movement FORD, which was separated into two parties. The first, Ford-Kenya, nominated Oginga Odinga as a chairman and the second, Ford-Asili, which was leaded by Kenneth Matiba (Widner 1993). To ensure his re-election Moi used several strategies to rig the vote. For example only passport holders were allowed to vote but many potential oppositional party voter did not get their passport in time. Furthermore he changed the law that the future president had to achieve more than 25% of the votes in five of seven provinces. Not formed as a unit the oppositional parties were not able to gain that level. At least vote-buying and election fraud enabled KANU and the president to remain in government. The parliamentary opposition was not able to influence the ruling party which caused a pass over of many opposition members to the KANU or a collaboration of oppositional members with the governmental party. In the following years Kenya was characterized by corruption, fraud and misappropriation of public funds, from which especially politicians and their families benefited. Moreover Moi strengthened the economic importance of his native region not only by an expansion of the infrastructure but the building of an international airport in Eldoret out of foreign funds. Although KANU was weakened by the ongoing scandals and economical crises, the opposition was not able to benefit.

In the next elections in 1997 six parties competed against each other, whereupon KANU won again. Enrichment of politicians and several high-level officials led to a bankrupt of Kenya in 1998. The solution was the foundation of Kenya Anti Corruption Authority. But being mainly involved in corruption and enrichment, Moi supervised the commission which was not able to work independently and succeeded.

Being always afraid to curtail his power, he was not able to reform Kenya´s constitution to more federal and democratic structures as it was claimed by publicity and opposition. Before the next elections in 2002 Moi announced not to be voted again. In this elections opposition formed a unit of 15 parties, the National Rainbow Coalition (NARC) and defeated the KANU (Fiebig 2010).

Mwai Kibaki (2002 - ?)

New president became Mwai Kibaki, who had already been chairman of the Democratic Party. Faced with strong political and economical problems he had to reform the country most intensively. Ultimate ambition was the inhibition of corruption wherefore a new organization, the Kenya Anti Corruption Commission (KACC), was found. Indeed not only corruption of politicians but also in everyday life, e. g. at police controls, decreased. Another ambition was the empower-

ment of education being achieved by a rise in pay for teachers and a free primary education.

Making sure to keep his position of power Kibaki did not nominated Raila Odinga (son of Oginga Odinga) as a Premier minister as it was agreed before. Moreover he tried to renew the constitution, in which more authority is transferred to president. Having defeated the referendum with 58 % the "contra ministers" were thrown out of parliament. In response to that a new party was founded, the Orange Democratic Movement (ODM), which became strongest oppositional party with powerful members like Raila Odinga and Uhuru Kenyatta. Their claim for new elections was not followed by Kibaki who obtained several new ministers, including close confidents and mainly people of his ethnic group Kikuyu.

New corruption scandals were revealed in which ministers and family members of Kibaki were in involved. More and more his reputation decreased, wherefore the competition of election between him and his challenger Raila Odinga in 2007 developed to be a close contest. Unproven if the votes were rigged Kibaki continued as a president with a slight edge to his rival Odinga, but gaining 99 seats ODM dominated in parliament. In response to the rigged votes and injustice, uprisings and violence started mainly against Kikuyu, in which the two big parties ODM and PNU were involved to put pressure on the opposing party. Only by support of UN General Secretary Kofi Annan peace was declared between the two parties who founded a Grand Coalition with Kibaki as president and Odinga as Prime Minister. The persons being responsible for the post election violence in 2007 were uncovered by a commission which forwarded their names, including those of high-level politicians, to the international tribunal in Den Haag. Although violence is over the relation between ethnic groups is disturbed and still distant (Fiebig 2010).

The new Constitution

Since independence Kenya´s first and single constitution was elaborated in 1963 is on the one hand based on the constitution of England and became obsolete. Several changes have been done by recent presidents but long time the stipulated demand for a referendum was not heared. After refusal of the first attempt for a new constitution, the government started a new try for a referendum. Instead of the first, when Kibaki wanted to change the constitution in order to expand his power, the new one consists of democratic and fair issues which were elaborated by a professional commission. The referendum had a massive turnout and was accepted with 67% of the votes. It will become applicable within next elections in 2012. The main changes and their presumable consequences are described in the following.

Probably the most noticable renewal is the restriction of the power of president by diverting power to local politicians. Moreover the president is only allowed to reign two periods of five years, the position of Prime Minister is abolished and ministers but also other high-level state officials must be confirmed by parliament. Becoming applicable, these issues do not touch the initial president and his ministers. As it is determine Kibaki will resign in 2012 which could be the reason why he supported the new constitution.

A further renewal is the land reform according to which the land should be divided equitably. Being also defined that already unfair distributed land has to be given back, many politicians, including Moi as one of the main landholders, were against the referendum. The constitutional permission to induce abortion in medical issues is a change in tradition and culture and may be hard to adopt for many Kenyans (Akech 2010). According to the economist John Githongo (2010) the new constitution "is not perfect but […] an opportunity to look forward instead of backward". The main challenges of the new constitution will be the implementation in

2012 and moreover the observance in the following years which cannot be predicted yet.

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Cultural Diversity, local Knowledge, social Power and Poverty – Kenya´s many peoples

by Vera Sternitzke and Alexandra Arndt

Ethnic Groups

The population of Kenya amounts 35.112.181 people (2008). They are subdivided in about 40 ethnic groups: more than 60% Bantu, 13% Lou, 12% Kalinjin and 1.6% Masai.

The main groups of the ethnics are the Bantu, who migrated from western Africa (e.g. Kikuyu), the Nilotic people (e.g. Lou and Samburu), who originated from Sudan and the Cuchitic groups, who were mainly pastoral tribes from Ethiopia and Somalia (e.g. Boran).

Religions

In the book "African Religions and Philosophy" (J. Mbiti) the Kenyans where described as "notorious religious", living in a „religious melting pot".

They have no word for "religion", the word "dini" was assumed from Arabic. In traditional society it required no descriptions, as the phenomenon was so pervasive.

So, atheism is foreign to Africans and they also have large tolerance for people with a different religious background.

All of the ethnic groups got their unique practice of a traditional religious system. Many people converted into the "new" religions, but there are also those who stayed living the traditions.

Example for ethnic groups, whose members are followers of traditional religion: Samburu (97% of Traditionalists) live in a northern area of the Mount Kenya, Masai who live in the East African, decrease in number (78% of Traditionalists).

Although the ethnic groups got different religious systems there are three mutual characteristics, the faith in:

- Mystical powers: also known as dynamism or magic, is based on the idea that there is an impersonal force, the good and bad purposes, may be useful. The belief in the power of medicine men (good strength) and wizards (evil forces).
- Spirits: nothing is more characteristic of the Kenyan traditional life, than the fact that death is not the end. Life is viewed as a „Go to the spirit realm".
- The highest of the essence: Subject God. Some tribes have a very close relationship (daily prayers, etc.), others have a distant relationship (God has no direct impact on daily life).

Also characteristic for African believes is more common dualism (there is a „good" and a „bad" God).

Christianity

All Christian denominations are present in Kenya, this is unique to Africa, even unique to Kenya itself.

Proselytizing started in 1846 with the opening of the mission station "Rabai", initiated by the missionaries Ludwig Krapf and Johannes Rebmann (protestant "Church Missionary Society of England").

In general, the conversion into Christianity in Kenya was particularly successful (in 1972 there were 205 different Christian groups).

Islam

The Islam is present in Kenya since about the year 1000. The religion was mainly distributed by Arab traders around the Persian Gulf. Before the 14th century the distribution had little success. Then marriages between settlers from Persia, Arabia, and Bantu-speaking women, clearly emerged characteristics of the Swahili-Shirazi culture.

Success on the coast and the north-east of present-day Kenya, northeastern (Cushitic) peoples predominantly Muslim (Somali 100%, Boran 90%) (Leifer 1977, page 226)

Muslims with Arabic and African origin are generally Sunni Muslims. Allah is identified (at the coast) with the Bantu Creator God Mungu, the expression "Mungu" is in general more common than Allah (especially in informal prayers). The Muslim views about reward and punishment after death producing major changes in traditional thinking.

Languages

The official languages in Kenya are Swahili and English.

The languages in Kenya are as diverse as the ethnic groups, for example: Kikuyu, Luhya, Lou, Kalenjin, Maa and 30 other languages. The three main groups are the Bantu languages, the Nilotic languages and the Cuchitic languages.

Art & Crafts

Art is an important part of African culture, such as music, body art (traditional decoration for social causes e.g.), dance, carving, and painting.

One typical African art, very popular in western civilization is the Makonde carving. These are the sculptures which most people know as a typical souvenir from Africa. But today it often is replaced by so called „Airport Art", that means it is a mass production for the tourist market. This production happens outside of Kenya. The products are really cheap and not individual created. This is certainly bad for the original Kenyan artists, because they lose the base of their market.

Music

There are two different kinds of music, vocal music and instrumental music. Vocal music is often practiced to pray or to pass old stories into the next generation. The instrumental music is very rhythmic and is an accompaniment for dancers.

Some examples for Kenyan musical instruments are the Atung/Oporo (Antelop beak), the Tablas and the Marimba.

Taraab music (popular music genre on the coast), is accordingly to the Suaheli culture a mixture from Arabs, Indian and African influences.

Local knowledge

Definition of local knowledge: "For Africans, indigenous knowledge is about what local people know and do, and what they have known and done for generations – practices that developed through trial and error and proved flexible enough to cope with change. The ability to use community knowledge so produced … forms important literacy skills that are critical to the survival of indigenous peoples." (Semali 1999, page 95)

A community generates its own local knowledge base = indigenous knowledge.

Indigenous knowledge is more than traditional knowledge. Indigenous knowledge is also contemporary knowledge. In terms of changing conditions it has to be reassessed, rediscovered and remade in terms of changing.

Local knowledge is inseparable linked to daily life and living:

- deeply implicated in people´s lives, e.g. Masai wonder plants
- use of healing plants, e.g. OLOISUKI bush
- braches are used for brushing the teeth - soft fibres massage gums, plant sap has antibacterial effects
- roots are used to prepare a tea, which can heal stomach or intestinal diseases (in human and animal)
- flowers are used to prepare a tea, which is drunk before exertions (for example long travel by foot)

Local knowledge encompasses healthcare, farming, warfare, education, culture, the environment, social relations, domestic activities, and religion.

Indigenous knowledge is important in promoting culturally appropriate and sustainable development. Indigenous people are more aware of and better able to identify their own needs - to find alternative sustainable solutions to current pressing issues, e.g. alleviating HIV/AIDS pandemic and poverty.

Local knowledge can be used in combination with western knowledge, e.g. Malaria treatment with *Artemisia annua L.* Malaria has been treated for over 350 years with quinine and quinine-derived drugs.

Some strains of the malarial parasite Plasmodium falciparum have developed resistance against these drugs and became useless in terms of Malaria treatment.

The WHO recommended the use of artemisinin-combination treatments (in 2001) (artemisinin = antimalarial). Researchers found out that a mild deficiency of potassium (in soil) leads to an increased production of artemisinin in *Artemisia annua L*. If artemisinin is approved by the Food and Drug Administration, it will lead to an increased demand for artemisinin worldwide. Production companies have expanded the Artemisia cultivated area from 200 to approximately 1,600 hectares in Kenya, Tanzania, and Uganda.

=> less malaria sick people

=> less economical and agricultural losses (labor losses)

=> less poverty

The problem is that local knowledge is fast eroding. It is important to preserve this knowledge, e.g. the utilization of traditional species promotes dietary diversity and ensures conservation of biodiversity.

Local knowledge should neither be romanticized nor looked down upon.

Social Power and Poverty

Poverty in Kenya is widespread and deep (as in much of sub-Saharan-Africa). Over half of Kenya´s population lives below the total poverty line (1997). The incidence of poverty is high among:

- female-headed households
- larger households
- households headed by people with no education and those engaged in private informal sector jobs.

Poverty in Kenya is predominantly rural (particularly high in the arid and semi-arid districts of Northern Kenya and Coastal Province). The reason is the lack of job opportunities in rural Kenya and the increase in the number of landless and marginal farmers. The majority of farmers own less than 4 acres of land (1 acre = 4,046.85642 m^2). The land is scarce due to division of the estates.

All sons of a family inherit even portions of farmland by their parents. As a result, the farmland becomes degraded.

Furthermore, rural people have poor access to credit, agricultural inputs and extension services.

People decide to move to cities, in hope of getting a well-paid job. Unfortunately most of them end up in poverty. The reasons are on one hand the lack of education and on the other hand the lack of job offers. And people have no money to establish their own business.

HIV/AIDS

The increase of infections is in particular high at the coast and in cities (prostitution). The urban, educated middle class is also greatly affected.

The high infection rate has also impacts on labor productivity (sick people cannot work).

If parents are too weak to care for their children, children are brought to orphan homes (the same in case of death). The reason is the decay of family bonding (previously family members took care of AIDS orphans). Nowadays orphan homes are overcrowded, lack of space, food and medicaments.

But due to the establishment of many pre-

vention programs in Kenya the AIDS rate decrease from 15% to 7% of the population during the last years.

Mismanagement and corruption

Politics and big companies are coupled with corruption. They want their cut (money) of everything. Bribes must be regularly paid to obtain the right to invest (to establish own business), to get licenses, permits, in contract procurement etc. Bribes are more harmful to growth than ordinary taxes on profits from investment.

One example of the richest and most corrupt group of companies is "TSS" (in Mombasa). They own a bus company, towers in the city-center, grain millers and many other enterprises.

Corruption contributes to economic problems in Kenya. Historically stagnation rather than growth has been the rule.

What can people do, when hardly jobs are offered and corruption is omnipresent in their country? They struggle hard to get job opportunities. Most of them get labor in the informal branch (Jua Kali = informal branch)

The informal sector is the biggest job-creation machine in Kenya (about 50% of the working population carry out informal labor).

There are no benefits and subsidies from the government.

People who work in the informal economy are either small craftsmen or merchants. They offer services and goods, they work on public places, they are not registered as tradespersons. The money they earn hardly secures the survival of their families. It is hard for these people to get out of the poverty.

Conclusions

Kenya has a very broad-based colourful culture and wisdom, more related to their roots.

In particular the older generation of Kenyans have an unquestioning believe in spiritual reality. The latest generation loses the interest in traditions partially, though.

Indigenous knowledge is still present and relevant for daily life in Kenya. It is important to preserve this knowledge.

Kenya's people are engaged to create their own job opportunities, but the diminution of poverty is hardly possible. The government offers too little support.

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Grains of Wheat, White Masai's, Kibera Kid & Out of Africa – Kenyan Literature and Film

by Anna-Maria Engel

Introduction

In Kenya a lot of international films and literature have been created. Some of the most famous and important works in film and literature history will be mentioned below. Kenya stands for the romanticism and wild exotic of Africa. If people think in Africa, they have normally the idea of Kenya with its wildlife and the native people like the Masai.

Kenya has a long own literature history and tradition. The stories had been told from generation to generation; with the European colonization the people started to write down the stories. The two main languages of the written books are English and Swahili. Some of the authors also have international success like Ngugi wa Thiong'o and Grace Ogot. Also the political circumstances influenced a lot the work of many authors. And many of them had to fight with repression and other limiting restrictions of the government, because of the lack of freedom of speech and press.

Kenyan Authors and their Works

One of the most famous authors is Ngugi wa Thiong'o. Other important writers are Grace Ogot, Meja Mwangi, Margaret Ogola and Binyavanga Wainaina. In this chapter the most important authors will be presented as well as some of their works.

Ngugi wa Thiong'o

Ngugi wa Thiong'o was born in Limuru in 1938. He was the son of a traditional farmer's family and he had a normal scholar education with some interruptions because of the political conditions. But he finished school, made two certifications, the B.A., and became professor in different universities:

- 1967-69: Nairobi University college
- 1970: Northwestern University in Evanston (USA) and
- since 1971 in Nairobi University.

He also got different prizes for his works, among others the National Prize for Literature form the president Jomo Kenyatta and the Lotus Prize for Literature from the Afro-Asiatic author conference in Alma-Ata. 1977 he was arrested because of the content of his writings, which seemed to be subversive against the political system. 1978 he was released without any legal proceedings after being tortured. In 1982 he travelled abroad and didn't return to Kenya. He went to exile in London. Since 1993 he had been professor for comparative linguistics at the New York University. He wrote a lot of books, also children's books and got a lot of prizes, for example the Gwendolyn Brooks Center Contributor's Award for Significant Contribution to the Black Literary Arts or the Distinguished Africanist Award of the New York African Studies Association. In 2004 after 22 years he visited the first time Kenya with his wife, where they were attacked in their flat in Nairobi. His wife was also raped, though the returned earlier to the United States. 2006 the three culprits were convicted to death. 2008 Ngugi wa Thiong'o got the Grinzane-Cavour-Prize for Literature in the area "literary inheritance" and 2009 he was nominated for the Man Booker International Prize for his complete works. Now he lives in California and lectures at the University of California, where he has the chair for English and comparative linguistics (Kozmus 2005-2010).

His first work was "Weep not, child" from 1964. After this followed "The River between" from 1964, this is about two lovers, who are from a traditional African and Christian culture. One of the most famous books

of his work is "A Grain of Wheat" from 1967. This book is about the political turbulences in the 1950th, when Kenya became independent from Britain under the President Yomo Kenyatta; the story plays in a village named Uruhu, where different people are confronted with the political changes; a young couple for example (Gikonyo and Mumbi) is separated because Gikonyo is sent to prison. After six years he comes back, but Mumbi is together with his rival. They are not able to talk about this, so a wall of rage is separating them (WA THIONG'O 1967).

Other works, which were following, are "The black Hermit" (1968), "This Time tomorrow" (1970), "Homecoming: Essays on African and Caribbean Literature, Culture and Politics" (1972), "Secret lives, and other Stories" (1975), "The Trial of Dedan Kimathi" (1976), "Petals of Blood" (1977), "I will marry, when I want" and "Devil on the Cross" (1980), "Detained. A Writer's Prison Diary" (1981), "Decolonising the Mind: The Politics of Language in African Literature" (1986), "Matigari" (1989), "Moving the Centre: The Struggle for Cultural Freedom" (1993) and "Wizard of the Crow" (2006). The newest work from 2010 is "Dreams in a Time of War. A Childhood Memoir" (KOZMUS 2005-2010).

Meja Mwangi

Meja Mwangi is said to be the most important author from Kenya together with Ngugi wa Thiong'o. In 1948 he was born in the village Nanyuki, which lies immediately in the region of the Mau Mau Rebellion. This had a big influence on his works. His first work and important for his career was "Kill me quick"; this is the ironical name for an illegal burnt schnapps which is sometimes dangerous to health and also lethal (NEUMANN 2010). The story is about two boys with high school diplomas, who come from a village and try to find work in a big city. They are faced to the problems with living in the streets, with policy and surviving. Then they are separated due to a violent street mob, but after years they meet again in a prison cell (MWANGI 1973 and 2008). The book is also made into a stage play. For this book he got the Jomo Kenyatta Prize in 1974, as well as for "Going down River Road" in 1977 and "The Last Plague" in 2001. Some other prizes he won were the Lotus-Award, the Noma Award for "Bread of Sorrow" in 1989 and the German Youth Literature Prize for "Little White Man" in 1992.

Very successful was "The last Plague"; the story is about a single mother, who is working for the health service in a village. She is fighting against AIDS in this dying village, which is dominated of conventions and African men with prejudices (KOZMUS 2005-2010). Another successful children's book is "The Mzungu Boy", which is the story of a boy living in the times of the Mau Mau Rebellion. For this book he got three awards.

In the eighties Meja Mwangi also worked in the film industry. He was assistant director in the film "Out of Africa". Other movies were "White Mischief", "The Kitchen Toto", "Gorillas in the Mist" and "Shadow on the Sun". All films are about stories which happened in Kenya and Rwanda, like the Happy Valley murder case or the life story about the naturalist Dian Fossey and her work with the mountain gorillas (KARASEK 1989).

Binyavanga Wainaina Margaret

Binyavanga Wainaina is an author of novels and short stories and a journalist. He was born in 1971 in Nakuru. For a long time he lived in South Africa, where he studied and work as a journalist for the Sunday Times. In 2002 he got the Caine Prize for the short story "Discovering Home". He is the editor of the magazine Kwani, Kenya's first literary journal, founded by the new generation of Kenyan writers. His works are "Beyond the River Yei. Life in the land where sleeping is a disease." from 2004 and "How to write about Africa". He was nominated by the World Economic Forum as a young global leader. This is a prize for people who are influencing and shaping the future of the world. But he rejected the prize. Since 2009 he has the chair of the Chinua Achebe Cen-

ter at the Bard College in the upstate New York (Kozmus 2005-2010).

Margaret Ogola

Margaret is a very intelligent and successful Kenyan woman. She was born in 1958. In school she was the best pupil and she got degrees in medicine and in planning and management of development projects. She works in Nairobi as a paediatrician in a hospice for HIV and AIDS orphans. She is very engaged in the empowerment of women. She is fighting against HIV and AIDs and she is involved in many organizations for children, health and women matters.

Important literary works are "The River and the Source", a book which describes changes in the lives of four Kenyan women (Ogola 1994), "I swear by Apollo", which is about the ethical issues in medicine and "Place of Destiny", a story about a woman, who is diseased with cancer (Ogola 2005). For "The River and the Source" Margaret Ogola won the Jomo Kenyatta Literature Award (1995).

Grace Ogot

Also Grace Ogot is a very successful engaged Kenyan author and politician. She was born 1930 in western Kenya and worked as a nurse and midwife, trained in Uganda and Great Britain. As the first African and female author she had got international success. In 1984 she was one of the first women in parliament; she was the only woman assistant minister under President Daniel arap Moi. She represented her country as an ambassador at the United Nations and in the UNESCO and she was a founding member of the Writer's Association of Kenya.

Her first book was "Land without Thunder", a collection of short stories, which are vividly told in a captivating and fast moving narrative. The stories are set in the region around Lake Victoria in a period where the Europeans still had power in Africa. They are about relations between people and changes, in which social patterns challenges the old conceptions of values and culture (Ogot 1968). "The promised Land" was her first novel in 1966 and is about the destiny of a Luo emigrant family in Tanzania and their personal problems with jealousy and materialism. The story explores in an ironic way Ogot's concept of the ideal African wife. Other works are "The strange Bride" (1989) and "The other Woman" (1992).

Kenyan Films

The film industry is dominated by the American mainstream and Bollywood. The supporting by the government has always been poor. In 2005 the Kenya Film Commission (KFC) was built by the government to promote and force the local film industry as well as the international appearance. Its mission is to create a gateway to economic growth through excellence in film (KFC 2011). It also offers detailed information about locations for international film makers (see next chapter) (KFC 2011).

Some Kenyan films, which had also international attention, are "Kibera Kid", which will be described above, "I want to be a pilot" (2006), a short story about a boy from one of the poorest slums in Nairobi, who is dreaming to become an airplane pilot (Quemada-Diez 2006), "From a Whisper" (2008), which is a realistic telling about the lives of the victims and families after the terrorist bombing the 8th of August 1998 (unknown 2008), and "Pumzi" (2010), a science-fiction short story, where water scarcity playes a central role (on Moswela 2010).

Kibera Kid International

"Kibera Kid" was written and produced by Nathan Collett together with the KFC in 2006. It is a short film located in Kibera, Africa's largest slum (in Nairobi) about the 12-year boy Orteno, an orphan, who has to take the choice between criminality and gang life and redemption of his deeds. The film is made with the children of Kibera, and although the story is not real, the film shows the circumstances in which the people and especially the children and teenager

have to live. But despite everything the people would stand up for a better life, doesn't matter how bad everything seems to be. The film got several awards among others it is the winner of the Best Student Film on the Hamptons International Film Festival in 2006.

For many young people the film is an inspiration and an education. The film is made by Hot Sun Films, a community-based charitable trust, which gives the chance to slum residents to tell their story to the world using local knowledge and resources to produce low budget films. The people can get hope through this film, there is an important lesson they take away. It shows that working hard is a solution and that it is not good to say: "I have no talent; I can't do anything because I'm living in Kibera" (Hot Sun Films 2007).

International Literature and Films

Kenya offers quite great and spectacular sceneries for producing films. This can only be compared to South Africa. There are a lot of international films, which are produced in Kenya, since 2005 in cooperation with the KFC. Some recent productions are "Nowhere in Africa", a German holocaust film from Caroline Link (2001), "Tomb Rider II" with Angelina Jolie (2003) and "The constant Gardener" presented below. Older productions are for example "The snows of Kilimanjaro" starring Gregory Peck, Susan Hayward and Ava Gardner (1952), "Born free" a film about the lions in Kenya (1966) or "Bwana Devil", a German production about the railway workers, who are confronted with two man-eating lions (1952) (KFC 2011).

The White Masai

One of the most famous works from Kenya is "The white Masai", published in 1998. The story is based on the autobiographic story of the Swiss Corinne Hoffmann. She went 1986 the first time to Kenya for vacation. At the end of her holidays she fell in love with the Masai warrior Lketinga from the Samburu District. Before leaving Kenya she promised to come back. In Switzerland Corinne sold her clothing shop and went to Kenya, where they got married. She went to live with Lketinga in his district and got a daughter, Napirai. But her relationship to Lketinga became every time worse due to his enormous jealousy and his believing she would have another boyfriend. The differences between the cultures were to strong, for her it was hard to accept the female oppression in the Masai culture, therefore after four years and some difficulties Corinne left Kenya with her daughter and went back to Switzerland (Hofmann 1998).

This book had great success in the German-speaking countries and was filmed by Hermine Huntgeburth in 2004. The book is part of a Trilogy; the second part "Back from Africa" describes her life back in Switzerland and the third part "Reunion in Barsaloi" is about a visit in Kenya and the changes in the village since her leaving. The book as well as the movie got also a lot of criticism: Catherine Silberschmidt (2005) for example writes that the main parts in the movie are erotic and sexuality and that the movie takes up all the classical prejudice we have about Africa (white European lady loves black wild man). There is no chance to get closer to the Samburu people, because the dialogs in the home language Maa were not translated. So the distance between European and African people is aimed and there is no will to tidy up with the critical commonplaces.

Out of Africa

The second famous book, which was filmed in 1986 by Sidney Pollack, is „Out of Africa". This story is also based on the autobiographic novel from the Danish Karen Blixen and other books, written by her, about her life. There are some differences between the film and the autobiography. The story is told in six episodes interrupted by the telling of Tanja Blixen alias Meryl Streep. It starts in Denmark, where Karen Blixen reminds herself to her time in Kenya (1914-1931). She immigrated in 1913 to Kenya because of her marria-

ge to her cousin baron Bror von Blixen-Finecke. Her husband was not able to manage the farm adequate; he spent her money for a coffee plantation instead of a dairy farm and preferred to hunt. He also was unfaithful. Therefore Karen Blixen had to manage the coffee plantation by her own. She fell in love with the big game hunter Denys Finch-Hatton. Syphilis, a disease which she got of her husband forced her to go back to Denmark and cure herself. After being cured she returned to Kenya. She parted from her husband and started an affair with Denys. But her love to Denys never became more than an affair, because he wanted to stay independent. He died in an air crash. After the First World War the coffee prices went down and she couldn't keep the farm. Therefore she went back to Denmark in 1931. In the film her farm and the coffee harvest was destroyed by a big fire, though she had to go back.

The film got a lot of prizes; among others it won seven Oscars and six Golden Globes. It got a lot of positive critics, it is said to be one of the great African and romantic dramas which were produced in film history. It has a phenomenal casting with Meryl Streep as Karen Blixen, Klaus-Maria Brandauer as the baron Bror von Blixen-Finecke and Robert Redford as Denys Finch-Hatton. The film shows wonderful sceneries. But some also criticized that "Out of Africa" is too sentimental and tragic and it doesn't correspond to the reality of the biography. Besides it is concentrated too much on the love affair between Karen and Denys (Schmitt 2008).

The biography of Karen Blixen was translated in 2010 again, and corresponds now exactly to the original Danish version. The book is an autobiography as well as a study about ethnology and geography (Urban-Halle 2010).

The Constant Gardener

The mentioned border between cold and warm tropics is the most important height border This film bases on the novel "The constant Gardener" from John Le Carré. It was filmed in 2005 by the Brazilian director Fernando Meirelles. The film is about illegal experiments of the pharmacy industry in Northern Kenya, where medicaments against tuberculosis are tested on people, which often resulted in death. A young diplomat, Justin Quayle, whose wife Tessa was killed mysteriously in a remote region, starts to find out the truth, after the British policy assured him that it was a murder case because of a love affair. He finds out, that his wife wanted to publish a report about the crimes of the pharmacy industry in Africa before her death. A big pharmacy company, which supported free AIDS tests in Africa, tested at the same time a medicament against tuberculosis without the knowledge of the patients. Justin is also in danger to be killed, because the case is of high significance due to the involvement of the international politics. The end is that Justin is sitting at the same place where his wife was killed and a death squad is founding him (Kinowelt 2006).

The topic is of high interest; even though it is more a love story, it shows the methods of the pharmacy industry in the developing countries, where the people can't defend themselves and their rights because they don't have any possibilities (Kinowelt, 2006). Besides the film there was also founded The Constant Gardener Trust, a foundation which helps and starts projects in the two main locations in Kenya where the film was made. So they know the communities and the donation achieve their aim (The Constant Gardener Trust 2006).

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Kenya in the global Context

by Ana Stoddart and Melissa Valladares

Introduction

In the last decades global trade has increased exponentially and although African countries have also benefited from it, they don't have a large share on the international trade. Exports from Africa account only for about three percent of the world exports, and this is due to different reasons, among which we can find corruption, political instability, poor infrastructure and lack of transparency (African Economic Outlook 2011).

Despite the obstacles to improve Africa's economic situation, some countries like Kenya have been able to achieve a good economic performance among the other African countries. Kenya is today one of the largest East African economies as well as the center for finances and transportation. After its independence they experienced a rapid economic growth, triggered by: public investment, support to small agricultural producers and incentives for industrial investment, which are often from foreign sources (USA Department of State 2011). Its geographical location is also an advantage for its "significant role in the regional trade" (Africa Business 2011).

There has been a significant progress in the liberalization and stabilization of Kenya's economy, improving indicators such as inflation, budget deficit and interest rates. All these aspects are favorable to increase foreign investment and international trade, helping with this to the development of the country (Africa Business 2011).

The main objective of this paper is to deliver a clear perspective of Kenya's role in the global context; starting with its general economic situation, its international trade and foreign relationships and the impact of the economy on the nation's development.

National Economic and International Trade

Kenya has a "strategic geographical location" in east Africa, which has helped it become one of the most important trade players of the region. After its independence the country became a successful example of economic growth (especially compared to other African countries) (Africa Business Pages 2011).

According to the World Bank in 2009 Kenya's GDP (PPP current international $) was $62.6 billion, and the GDP per capita $1,572.57. Both indicators have shown an increasing tendency in the last two decades, figure 1 shows the GDP growth, where it is possible to see that it slowed down in the year 2009, this was due to the world crisis in 2008 but in the 2010 it started to recover. The GDP per capita growth is not as high as the GDP because it is also affected by the population growth (World Development Indicators, World Bank 2011).

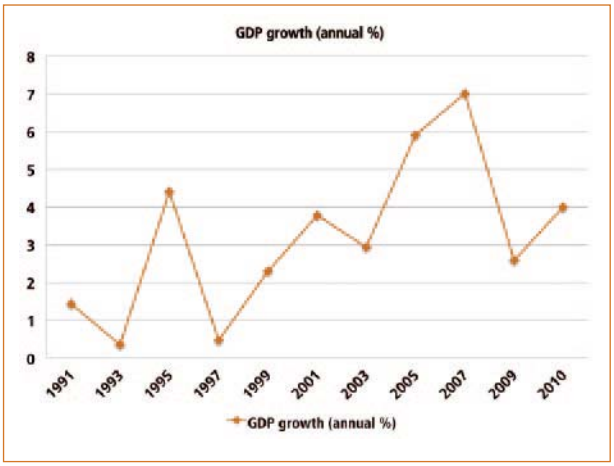

*Figure 1: GDP annual growth rate (Source: World development indicators. World Bank, 2011. *The indicator of 2010 was taken from the World Fact Book, CIA 2010.*

Among Kenya's GDP components, services have the highest share with 62.1% (2009), which considerably increased in the last years (almost 10% from 53.7% in 2005). At

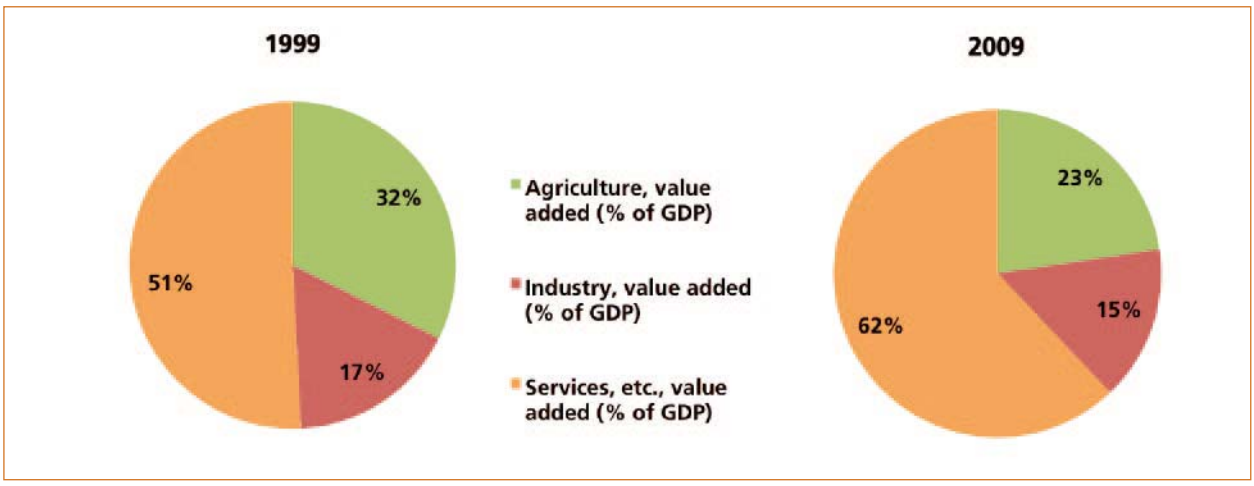

Figure 2: GDP components in 1999 and 2009 (World Bank 2011)

the same time, the share of agriculture has been decreasing and Industry's behavior has been somewhat variable. Figure 2 shows the change of GDP distribution during the last 10 years (World Development indicators, World Bank 2011).

Despite the fact that agriculture currently represents only 23% of the GDP, it is one of the most important economic activities in Kenya, with around 75% of the population living from it, and only 25% dedicated to industry and services (2007) according to the CIA Fact Book. Among the most important agricultural products in Kenya are tea, coffee, sugarcane, horticultural products, corn, wheat, and others on a smaller proportion (USA Department of State 2011). As evidence from the importance of the agricultural sector, according to the International Trade Center, agricultural products such as coffee, tea, mate and spices have the highest value share among Kenya's exports (see table 1).

Table 1: Kenya's top 10 exports in 2009 (International Trade Center 2011)

	Export value	Exports as a share of total exports (%)	Exports as a share of world exports (%)
Coffee, tea, mate and spices	697,004	29.07	2.51
Live trees, plants, bulbs, roots, cut flowers etc	251,258	10.48	1.63
Edible vegetables and certain roots and tubers	195,031	8.14	0.43
Articles of apparel, accessories, knit or crochet	107,168	4.47	0.07
Mineral fuels, oils, distillation products	104,705	4.37	0.01
Articles of apparel, accessories, knit or crochet	101,325	4.23	0.07
Vegetable, fruit, nut, food preparations	84,944	3.54	0.2
Inorganic chemicals, precious metal compound, isotopes	62,739	2.62	0.08
Boilers, machinery; nuclear reactors, etc	55,146	2.3	0

Kenya's top 10 exports in 2009 Exports in 2010 had a total value of $5.141 billion according to the CIA World Factbook, and the main export partners with their respective percentage (2009) are: United Kingdom (11.31%), Netherlands (9.81%), Uganda (9.07%), Tanzania (8.83%), United States of America (5.93%), and Pakistan (5.63%) (CIA World Factbook 2011). In 2010 the total value of imports was $ 10.4 billion, which is approximately double the value of the exports in the same year (CIA World Factbook). According to the economy watch on its report from Kenya "To enjoy a favorable balance of trade, Kenya has to diversify export products. Over-reliance on agricultural productivity hampers the economic growth of the country" (The Economy Watch). Table 2 shows Kenya's main import products.

Kenya's main import partners with their respective percentage (2009) are: India (11.67%), China (10.58%), United Arab Emirates (9.32%), South Africa (8.36%), Saudi Arabia (6.53%), United States (6.25%), and Japan (5.1%) (CIA World Factbook 2010).

As mentioned before the agricultural sector is still very important for Kenya's economy and because of this the agro-processing companies are still the largest part of manufacturing that represents 13% of the GDP. Mining products are also part of Kenya's production and among this is Petrol which is mostly used for subsistence and a small proportion for exports to neighboring countries. Regarding the service sector (62% of the GDP), it consists mainly in tourism, financial and communications services (World Trade Organization 2000).

The global financial crisis of 2008 and the violence after the elections, affected Kenya, especially on remittances and exports, resulting in a lower GDP and a GDP growth of 1.7%, but in the following year 2009, the economy started recovering (World Trade Organization 2000). One of the most affected sector was tourism, that suffered a great setback, having a big impact on Kenya's economy, since it is the "country's main source of foreign exchange" (Federal Ministry of economic cooperation and Development 2011).

Table 2: Kenya's top 10 imports in 2009 (International Trade Center 2011)

	Import value	Imports as a share of total imports (%)	Imports as a share of world imports (%)
Boilers, machinery; nuclear reactors, etc	800,302	11.24	0.05
Mineral fuels, oils, distillation products	783,129	11	0.05
Electrical, electronic equipment	742,235	10.43	0.05
Cereals	570,824	8.02	0.75
Vehicles other than railway, tramway	431,699	6.06	0.05
Iron and steel	327,191	4.6	0.13
Commodities not elsewhere specified	308,570	4.33	0.07
Pharmaceutical products	264,464	3.71	0.07
Plastics and articles thereof	207,590	2.92	0.06
Paper & paperboard, articles of pulp, paper and board	190,027	2.67	0.13

During the last years Kenya has made reforms which have resulted in a certain macroeconomic stability, reflected in lower inflation rates and fiscal deficit, although the GDP growth remains slow and unemployment high. The foreign trade of the country has increased in importance but its balance has been deteriorated. (World Trade Organization 2000).

Kenya is interested in increasing foreign direct investment and because of this, "grants national treatment to foreign investors". As a way to attract foreign investment the country offers different tax incentives, such as "tax holidays, accelerated depreciation, investment allowances, lower duties on intermediate capital goods, and gradual reduction of corporate tax rates". Since the WTO review in 1993, "Kenya has reduced the overall level of protection of its economy" in order to increase investment (World Trade Organization 2000)

Kenya is trying to be more open to trade, increasing the "overseas market access to Kenyan products and further integration into the world's economy". In order to achieve its objectives Kenya resorts to "unilateral liberalization, and regional and bilateral trade negotiations" (WTO 2000), which will be discussed in more detail in the following section of this paper.

International Framework

In this section it is intended to provide a brief summary of the main trading associations and foreign relationships Kenya has with multinational organizations.

In a regional context, Kenya is a member of the East African Community (EAC), a regional intergovernmental organization. The member countries are the Republics of Kenya, Uganda, the United Republic of Tanzania, Republic of Rwanda and Republic of Burundi; altogether they have a combined population of over 125 million people, 1.82 million squared kilometers land area and $73 billion (2009) of Gross Domestic Product. This organization bears great strategic and geopolitical significance, and prospects of a renewed and reinvigorated EAC. It aims at widening and deepening co-operation among the Partner States in aspects regarding political, economic and social affairs. In 2005, the EAC countries established a Customs Union and are currently working towards the establishment of a Common Market, subsequently a Monetary Union and ultimately a Political Federation of the East African States (EAC 2011).

The Vision of EAC is a prosperous, competitive, secure, stable and politically united East Africa. And the Mission is to widen and deepen economic, political, social and cultural integration in order to improve the quality of life of the residents of region. The means to achieve this are by increased competitiveness, value added production, trade and investments. Over the years, EAC embraced and benefited from technical and financial assistance from a large number of international aid and development agencies (EAC 2011).

In an international framework, Kenya is a current member of the Common Market for Eastern and Southern Africa (COMESA). COMESA is a regional free trade agreement among 19 African countries. Its aim is to promote regional economic integration through trade and investment (WTO 2011, COMESA 2011).

This important pluri-lateral regional trade agreement (RTA) deals mainly with goods. Among the principal topics of the RTA are: accession, anti-dumping measures, balance-of-payments measures, competition, countervailing measures, customs-related procedures, dispute settlement, environment, exceptions, general or for security, investment, rules of origin, safeguard measures, sanitary and phyto-sanitary measures, subsidies, technical regulations, standards, technical barriers to trade (WTO 2011, COMESA 2011)

Kenya is present in the WTO and participates

in different negotiating groups.

- African, Caribbean and Pacific countries (ACP): organization of 79 member states that have agricultural preferences towards the EU.
- African Group: organization of 49 regional member states that deal with general issues.
- G-90: a group that represents the African Group - ACP and the least developed countries.
- G-33 (also referred as "Friends of Special Products"): organization of 44 member states pressing for flexibility for developing countries to undertake limited market opening in agriculture.
- Paragraph 6 countries: group of 12 countries (with less than 35% of non-agricultural products), dealing with tariffs and binding coverage.
- "W52": sponsors group of 109 member states including countries from the EU, ACP and African Group. The main issue of negotiation is the intellectual properties (TRIPS).

(WTO 2011)

In addition, it is interesting to mention that Kenya only participated in passive way (as third party) in 3 international disputes in the WTO, all of them are related to "European Commodities – Export subsidies on Sugar" (WTO 2011).

After Kenya's independence in December 1963, this country became a Member State of the United Nations (UN). This was a significant step in the exercise of independence and sovereignty as well as an opportunity for Kenya to contribute to the ideals of the UN. The multilateral character of Kenya's particular cultural diversity poses very unique diplomatic challenge in all levels: national, sub regional and regional. Over the years, Kenya has earned the admiration of the international community and has very proud joined the privileged group of States in the Security Council as a temporary member periodically. In addition to the participation as a member of committees and commissions including statistics, population and development, program coordination, ECOSOC and others (UN 2011).

Kenya has also received support from the International Fund for Agricultural Development (IFAD), a specialized agency of the UN. IFAD was established to finance agricultural development projects primarily for food production in the developing countries and is in line with UN's Millennium Development Goals, in particular the target to halve the proportion of hungry and extremely poor people by 2015 (IFAD 2011, UN 2011).

IFAD fully committed to eradicating rural poverty in developing countries as food insecurity and famine are strongly related to structural problems and not so much failures in food production. Nearly 1.4 billion of the world's poorest people live in rural areas and depend on agriculture and related activities for their livelihoods. Therefore, IFAD's mission is to enable poor rural people to overcome poverty with country-specific solutions, which can involve increasing rural poor peoples' access to financial services, markets, technology, land and other natural resources (IFAD 2011).

Another UN intergovernmental body is the Intergovernmental Authority for Development (IGAD); this is a Regional Economic Community (REC) of six countries in the Horn of Africa: Djibouti, Ethiopia, Kenya, Somalia, Sudan and Uganda. IGAD works for development and drought control in the Eastern Africa region (IGAD 2011).

"IGAD mission is to assist and complement the efforts of the Member States to achieve, through increased cooperation: Food Security and environmental protection, Promotion and maintenance of peace and security and humanitarian affairs, and, Economic cooperation and integration" (IGAD 2011).

Kenya is also part of the African Union (AU), which group's vision is an integrated, pros-

Table 3: African Union's main interests in the region. (African Union (AU) 2011)

Core Interest	Concepts
Peace and Security	Conflict Prevention, Management and Resolution, and Combating Terrorism
Political Affairs	Human Rights, Democracy, Good Governance, Electoral Institutions, Civil Society Organizations, Humanitarian Affairs, Refugees, Returnees and Internally Displaced Persons
Infrastructure and Energy	Energy, Transport, Communications, Infrastructure and Tourism
Social Affairs	Health, Children, Drug Control, Population, Migration, Labor and Employment, Sports and Culture
Human Resources, Science and Technology	Education, Information Technology Communication, Youth, Human Resources, Science and Technology
Trade And Industry	Trade, Industry, Customs and Immigration Matters
Rural Economy and Agriculture	Rural Economy, Agriculture and Food Security, Livestock, Environment, Water and Natural Resources and Desertification
Economic Affairs	Economic Integration, Monetary Affairs, Private Sector Development, Investment and Resource Mobilization

perous and peaceful continent, driven by its own citizens and representing a dynamic force in international arena. The main objectives are to accelerate the process of integration in the continent, to enable a rightful role in the global economy while addressing multifaceted social, economic and political issues concerning the region (AU 2011)

To achieve greater unity and solidarity between the African countries and the population, to coordinate and intensify cooperation for development, to safeguard the sovereignty and territorial integrity of the countries and to promote international cooperation, the AU has establish core interests and is working in different programs related to each one (AU 2011))(see table 3).

Nations Development

In a macro-economic level, the general conditions between 2003 and 2008 helped improve the welfare of the nation; however rural and urban poverty remain a serious and sever drawback for sustainable and prosperous development. The Kenyan poverty profile shows significant regional disparities in the distribution of poverty and a high amount of inequality. Despite the decline of the national absolute poverty and the reduction of rural income disparities in the last years, when compared with other African neighbor countries, it is still considered high (World Bank 2011).

One of the key aspects of rural development in Africa and specifically in Kenya is the important role of female-headed households. In the latest FAO report the world crisis has dramatically impacted worldwide, the job losses and cuts in spending on social services as well as infrastructure have led to high pressures on women's care burdens and intensified unpaid work. Therefore, their financial contribution to household food security is vulnerable and furthermore aggravates the already existing poverty problem (FAO 2011).

Other emerging challenges faced by the local Kenyan economy is a weak exports performance attributed to underperforming manufacturing sector, remittances and tourism, and lower investor confidence due to

prolonged differences within the grand coalition. All this is reflected on the weakening of the exchange rate and deeper pressure on the current account. Once more, it is observed that the combination of output and employment losses has a direct impact on poverty. However, a positive signal in the domestic economy is that inflation is expected to continue falling due to lower food prices resulting from improved weather (World Bank 2011)

On an international level, the country is fully engaged and committed in following-up discussions and implementation of the outcome and recommendations of major UN conferences and summits, including Millennium Development goals (UN 2011) Major engagement of Kenya with the World Bank will be related to the improvement of infrastructure, such as transport, energy, water, and telecommunications. This investment is critical in order to reduce the cost of doing business and exceeding Kenya's competitiveness in the region and globally. Other priority affairs include strengthening the public sector management and accountability, reducing vulnerability and strengthening communities through investments in agriculture and environment, and investing in human capital by improving education, health, youth empowerment and social protection (World Bank 2011).

Conclusions

It is clear that Kenya still has to continue working hard in order to increase their export pattern, which today only represents three per cent of the world's share. This country is blessed with incredible landscapes, an enormous amount of natural resources, a vast and young population and a key geographical position (with easy access to the Asian Markets for example). It is a land of incredible opportunities for entrepreneurship, business investment, agricultural production and the creation and expansion of value chains. This young country, with a quite recent independence, will defy in a social, political, economic and ecological environment its tendency for the years to come.

One important aspect to highlight is the key role and presence of Kenya in the global context. This country is active in the international arena with presence in the UN and its different agencies, Regional and Continental Coalitions as well as international agreements. In the recent years Kenya has performed and showed great openness to trade and globalization and is continuously working on better and more efficient ways to expand its external relationships.

All in all, Kenya is an East African country with a great expansion potential in the international trade and national growth. There have been clear indicators of domestic growth, democratic stability and progress; however deep and more structural issues will be main challenges for the country, especially those regarding rural poverty, industrialization and transparency.

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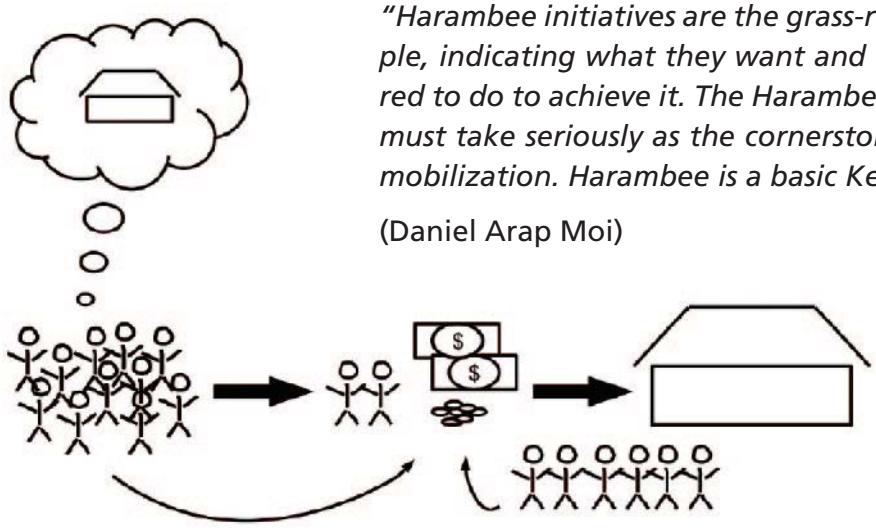
The Harambee System - formal and informal Economy in Kenya

by Marie-Luise Hertkorn



"Harambee initiatives are the grass-roots voice of the people, indicating what they want and what they are prepared to do to achieve it. The Harambee spirit is one that we must take seriously as the cornerstone for local resources mobilization. Harambee is a basic Kenyan institution."

(Daniel Arap Moi)

Definition

The term "Harambee" means "Let us all pull together". It represents the provision of local public goods such as schools or cattle dips through the organization of self-help events. (Wilson 1990, p. 1) The Harambee projects are funded commonly and managed by a project committee established for this purpose. (Thomas 1987, p. 464)

Principles of the Harambee System

The Harambee System is characterized by four main principles that the Kenyan scientist Kefa Chesire Chepkwoni defined in the following way (Chepkwoni 2008, p. 5):

- Bottum up approach: People at grass-roots level participate actively in the choice and implementation of the projects.
- Majority decision: The choice of the Harambee project is taken by the majority of the affected people and not by influential individuals like governmental agents etc. However, the possibility of a certain bias towards the interest of the more influential members of the society should not be neglected.
- Collective goods instead of individual gain: Most of the Harambee projects are implemented in order to support the whole community. Though, there are efforts to aid individuals in case of exceptionally high unforeseen costs, p.e. hospital bills.
- Local resource mobilization: As local people are involved in the process, theutilization of local resources (funds, labour, materials) can be maximized.

The Harambee Projects

Nearly 60% of the Harambee projects in Kenya are located in the educational sector. The most striking feature of Harambee has been the growth of Harambee schools – in nursery, primary, and, very importantly, also in secondary education. Today, there are around 600 Harambee schools in Kenya.

Furthermore, the church benefits from Harambee initiatives: Even costly projects like the construction of cathedrals can be funded in this way. A Transparency International investigation in 2000 to 2002 revealed that around 16% of the Harambee events were related to religion.

Another important sector is health care: 40 health centers were implemented on Harambee basis only within the two years of the Transparency International investigation.

Finally, the Harambee system plays an important role in agriculture – particularly cattle dips are built to improve animal health in rural areas. (Chepkwoni 2008, p. 9f)

Funding Harambee Initiatives

Prisoner's dilemma

Enormous amounts are collected from local people in order to fund collective goods:

Within the two years of Transparency International investigation time, 1.53 Billion Kenyan Shilling were donated, which equates to 19 Million US$. Size and number of Harambee events in Kenya are steadily increasing. The prisoner's dilemma is part of the game theory and is used to demonstrate the likelihood of cooperation between individuals. The Harambee system can be seen as a long series of games – the prisoner's dilemma is applied in this context in order to explain the success of Harambee.

	A cooperates	A defects
B cooperates	A: win B: win	A: win more B: loose more
B defects	A: loose more B: win more	A: loose B: loose

The prisoner's dilemma

The figure above shows the basic principle of the Harambee system: If everybody cooperates, a win-win situation develops as the common good can be used by all members of the society. In case nobody intends to participate, a lose-lose situation eventuates as no improvement for the community is achieved. But what happens, if an asymmetric constellation is generated? If some individuals do not participate, the remaining supporters have to take over their part. As demonstrated in the scheme above, the defectors in a regular prisoner's dilemma situation benefit enormously, whereas for the cooperators the "sucker's payoff", to speak in terms of game theory, remains. It becomes clear that for the community a cooperative attitude would be the most beneficial choice. On an individual level, the best strategy is always to defect: There is absolutely no risk and the chance to earn high benefits is 50%.

Likelihood of cooperation within the Harambee system

Despite this scheme pointing towards a great likelihood of defection, the Harambee system works. This is due to three aspects influencing the likelihood of cooperation within the community. (Wilson 1990, p. 12f)

- Communication: The better the individuals know each other, the more people are likely to cooperate.
- Transparency: If cooperation and defection are traceable, cooperation is more likely to occur.
- Punishment: The danger of being punished leads to a higher rate of cooperation.

Within the Harambee system, all three conditions are fulfilled: The people in typical communities organizing Harambee events customarily know each other, the organizing committee grants the traceability and defectors can be punished through the denial of public services or even through public embarrassment. This leads towards an obligation to pay for common goods which can create difficulties for low-income families. In some cases, even the confiscation of personal goods in order to encash a harambee contribution was registered. (Thomas 1987, p. 469) In small and stable communities, communication, transparency and punishment are more likely to eventuate. This is the reason why the Harambee system works best in rural areas. (Wilson 1990, p. 12)

Socio-economic impact of Harambee Projects

A cooperative attitude is present in all levels of society. „The middle and upper-middle groups [are] the strongest participants." (Wilson 1990, p. 13), stated Wilson referring to the number of Harambee participations in his investigation. Thomas highlighted that the more affluent households pay more for selp-helf projects than the poorer parts of the rural population, both relatively and absolutely: "Harambee encourages a transfer of individual resources from the prosperous to the poor". (Thomas 1987, p. 468)

Critical Thoughts

Although the Harambee system has a huge positive impact on the Kenyan society and supports the poorer section of the community, some critical points must be taken into account, as well. Firstly, there is a certain bias towards the more affluent households. If, for example, a farmer has ten cows, he will benefit ten times more from the common cattle dip than the family owning only one cow. This inequality can be mitigated through the implementation of a user tax. (Thomas 1987, p. 471) Secondly, the Harambee system in some ethnic groups works better than in others. Particularly the Kikuyu, a group of people with strong ethnic ties, have a distinct Harambee tradition. (Thomas 1987, p. 477) People originating from other ethnic groups cannot benefit from these cultural advantages. Thirdly, the transfer of individual resources does not challenge the general problem of unequal resource allocation within the society.

The Role of the Government

The Kenyan Government reveals a supportive attitude towards Harambee initiatives. There are two main ways of governmental aid. One opportunity is the co-financing structure, in which the community has to raise a certain amount of money in order to make the public authority finance the remaining part. Another way of governmental aid is the support of long-term projects. In this way, for example salaries of school teachers are financed, whereas the community has to construct the school building as a quid pro quo. (Wilson 1990, page 3; Chepkwoni 2008, page 10f)

In 2003, the Public Officer Ethics Act was enacted which prevents public servants from organizing Harambee projects in order to avoid corruption. (Chepkwoni 2008, p. 17)

Conclusions

The Harambee system is a self-help concept that is present in all social stratums of the Kenyan society. It conduces to a local public good provision and fosters development through the implementation of projects on a grass-roots level. The Harambee system leads to a transfer of individual resources from the prosperous to the poor. Furthermore, it creates benefits and responsibilities that are hardly to measure economically. The

Harambee system therefore is an important component of the informal economy sector in Kenya.

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Landuse Options for the next Century: Cimate Zoning, Vegetation Zones and Agro-Ecosystems under Climate Change

by Sonja Gässler

Introduction

Kenya is situated between the longitudes 34°E and 42°E and the latitudes 4°N and 4°S thus it is crossed by the equator. It is about as large as France and offers a diverse relief with the lowest point at sea-level (Indian Ocean) on the coast, extensive inland plateau regions between 915 m and 1,500 m and the highest point (Mt. Kenya) at 5,199 m. Due to Kenya´s various altitudes, the temperature, rainfall and humidity vary widely over the country. The different climates affect the soil types and the vegetation and this result in different agroecosystems.

Climate Zones

Kenya's nearness to the equator, the Indian ocean and the intertropical convergence zone and especially its topography influence the climate. Although Kenya lies in the tropics, 2/3 of it is regarded semi-arid and arid, rainfall over most of the country is low and variable from year to year. There are two rainy seasons per year: The long rainy season ("long rains") between March and June and the short rainy season ("little rains") between October and November. However the magnitude of the rain varies over the country. Usually the intertropical convergence zone is responsible for dry and wet seasons. However it passes rather quickly across Kenya in April and October, because the southern and northern winds run parallel to the coast and have passed over a large area of land already before reaching Kenya. The mean annual rainfall ranges from < 250 mm in semi-arid and arid areas to > 2,000 mm in high potential areas. Due to the altitude temperature is lower than elsewhere in equatorial Africa and the temperatures over much of Kenya are rather subtropical or temperate. The country can be divided broadly into four climatic regions, each with certain features of equatorial climates.

Northern and north-eastern Kenya

The semi-arid and arid region is a typical hot desert with low humidity receiving about 300 to 600 mm rain per year. Rainfall is scarce. In areas with an altitude above 1,200 m up to 600 mm are received e.g. in Marsabit. In north-western Kenya and to the east of Lake Turkana even as little as 250 mm rain falls per year. Temperatures are as high as 37°C during the day and drop to 21°C at night.

The Highlands

The highlands in the center and the western part of the country on either side of the Rift valley cover an area that lies between 1,220 m to 2,150 m. This area experiences the two rainy seasons and rainfall exceeds 1250mm per year on the higher parts. The altitude and winds make it a mild and temperate climate. Temperatures range from 27 °C during the day to 12°C at night. The sunniest time is from December to March while June to September sees many clouds and drizzles but little heavy rain. This period is chillier and often called "winter".

The higher mountain regions

A small part of the country consists of isolated mountains such as Mount Elgon and Mount Kenya that are higher than 2,500 m. Frost occurs here and some precipitation falls as snow. Mount Kenya has a permanent snowfield.

The coast

Only the coastal lowlands experience constantly high temperatures of 22 to 32°C and humidity of about 75% associated with equatorial latitudes however they are accompanied by a breeze from the ocean. Most of the rain falls in April to May as the intertropical rain-belt moves north. The short rainy season is less conspicuous. On average the coast receives more than 1,000 mm of rain per year.

The Lake region and western Kenya

The area at an altitude between 1,000 to 2,000 m in western Kenya near Lake Victoria is the most rainy area and receives up to 1,000 mm per year. There is rather more rainfall in each month here and temperature is higher. This is a consequence of the greater humidity picked up by winds crossing the lake and a liability for thunderstorms to break out during the night.

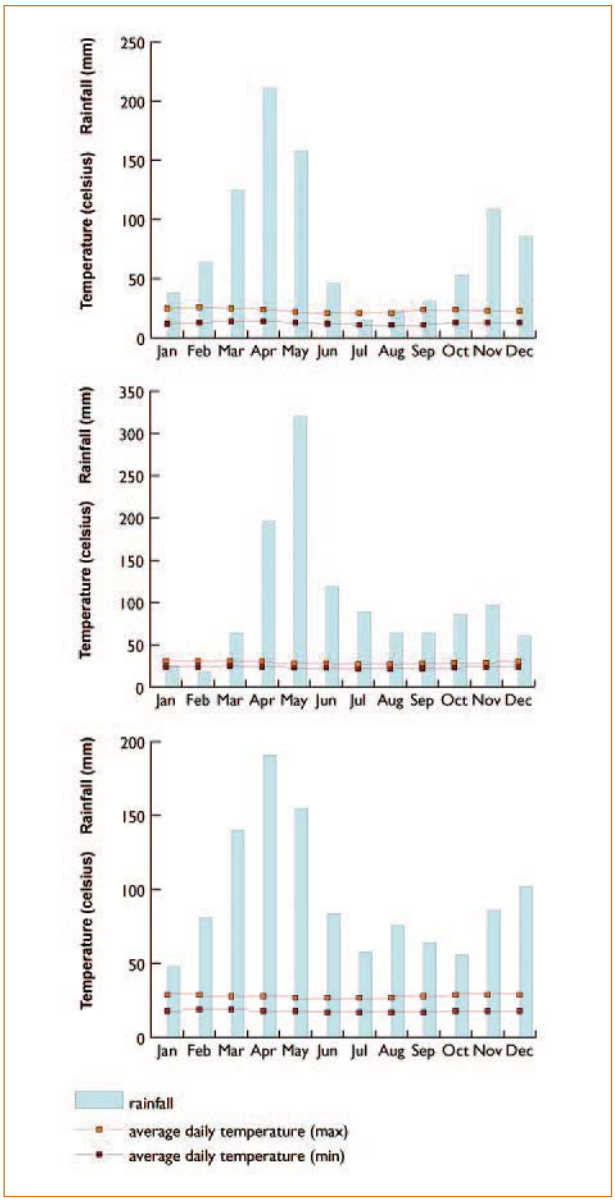

Figure 1: Rainfall, average minimum and maximum daily temperature for Nairobi, left (1,650 m above sea level), Mombassa, middle (0 m above sea level) and Kisumu near Lake Victoria, right (1,131 m above sea level) (http://www.bbc.co.uk/weather/world/country_guides/results.shtml?tt=TT000300)

Kenya´s vegetation zones are tropical mountain in the humid and sub-humid Southwest (with some patches of tropical rainforest), tropical shrubland in the arid and semi-arid North and tropical moist deciduous forest along the humid coast. Some of the vegetation types should be explained here more in detail.

Semi-desert Steppe and Grasslands

Due to the extension of the arid regions, the biggest part of Kenya´s land consists of deserts or semi-deserted steppes. Therefore shrubland and barren land dominate the semi-arid and arid north of Kenya. In these semi-desert steppes the vegetation is only sparse and consists primarily of thornbush and, further south, also tree cacti (*Euphorbia sp.*) and Giant Baobab (*Adansonia digitata*) can be found. Grasslands that are dominated by grass species that can grow up to 2 m tall are also present in large areas.

Savannah

The savannah is the most peculiar type of landscape and hosts large herds of wild herbivores. It is actually a transition zone between rainforest and arid steppe and consists of grasslands with some bushes or trees like *Acacia sp*.

Rainforest, other Forest Types and afro-alpine Vegetation

In the highlands, above 1,300 m, rainforest can be found, though it doesn´t exceed more than 3% of the total surface of the country. Rainforest is located in the Mount Kenya region and in the Kakamega forest for example. In the mountain areas the vegetation types change with increasing altitude. Some of the types are forests with African Juniper (*Juniperus procera*) or mountain cloud forest with the conifer *Podocarpus sp.* Bamboo forest can be found in some parts of Mount Kenya above 2,000 m. Above the timberline (above 3,000 m) the vegetation is predominated by afro-alpine vegetation with giant lobelias, heath and mountain prairies.

Mangroves

Mangroves are a vegetation type along the coast that consist of tree and shrub species which are flooded at high tight and have special adaptations like stilt roots. Beaches with coconut palm trees are also found along the coast.

Agro-Ecosystems

An agro-ecological zone is a land resource mapping unit, defined in terms of climate, landform and soils, and/or land cover, and having a specific range of potentials and constraints for land use (FAO). Kenya is divided into 7 agro-climatic zones using a moisture index (Sombroek et al. 1982) based on annual rainfall expressed as a percentage of potential evaporation. Areas with an index greater than 50% have high potential for cropping, and are designated zones I, II, and III. These zones account for 12% of Kenya`s land area.

The semi-humid to arid regions (zones IV, V, VI and VII) have indices of less than 50% and a mean annual rainfall of less than 1,100 mm (figure 2).

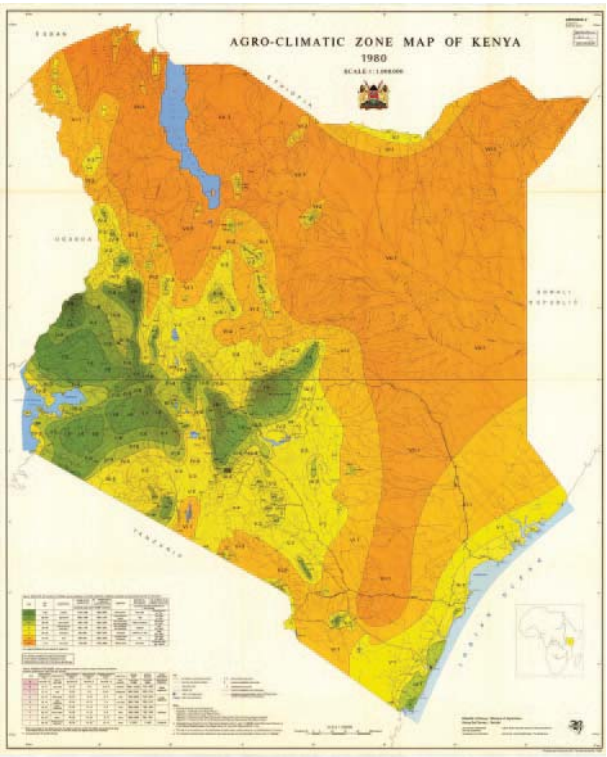

Figure 2: The 7 agro-climatic zones of Kenya

These zones are generally referred to as the rangelands and account for 88% of the land area. 75% of the Kenyan population are dependent on agriculture. However only about one third of the total land area is agriculturally productive. This includes the highlands, the coastal plains and the Lake Victoria region. The other two thirds of the land area is semi-arid to arid, and due to the low, variable, unreliable and poorly distributed rainfall, the soils are low in organic matter content. In areas that receive at least 800 to 1,000 mm of rainfall per year the herbaceous vegetation is of medium to high quality and is used by pastoral systems.

In areas where cropping is possible, various crops are produced. In the humid areas coffee and sugarcane can be grown. The area around Lake Victoria is suitable for cotton, the sub-humid zone for pyrethrum and the savannah for sisal production. Staple crops like maize and cassava can be grown in semi-humid to semi-arid areas (figures 2 and 3) give an overview of the distribution of agricultural crops and ranching areas.

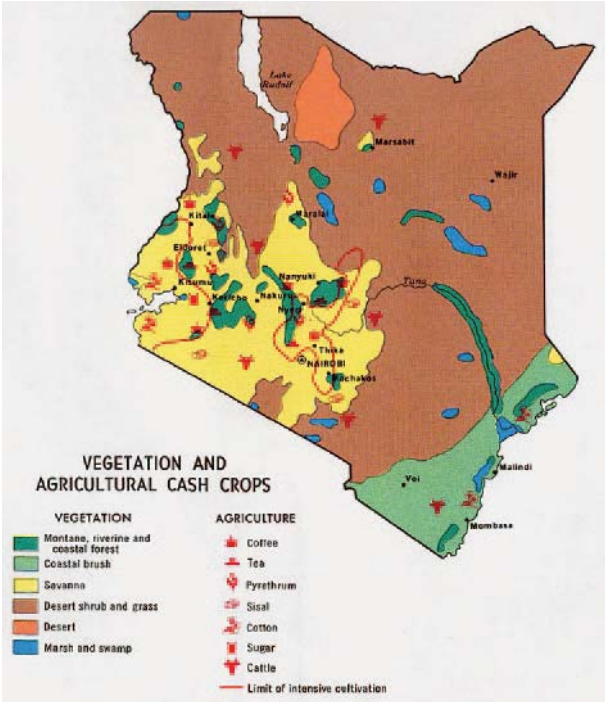

Figure 3: Distribution of agricultural crops and ranching areas (Source: http://map.primorye.ru/raster/maps/africa/kenya_veg_1974.asp?l=eng)

Impacts of Climate Change on Kenya

Climate change will affect the different African countries in various ways. As it is uncertain how and how fast climate change will influence Africa, there are different scenarios of what will happen in the future depending on different factors. A change in precipitation and temperature will result in more extreme weather events such as floods, landslides and droughts which then affect agricultural productivity. An increase in temperature may influence the length of the growing season (Rarieya & Fortun 2010). According to Thornton et al. (2002) this will lead to an increase in the length of the growing period over most of Kenya while the sub-Saharan African countries will face a decrease in 2050. The result of a case study of Simonett (1989) the impact of a temperature rise of 2°C on tea in Kenya is shown in figure 4.

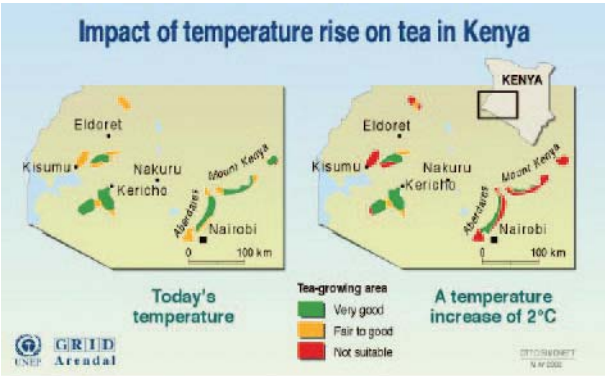

Figure 4: the impact of temperature rise of 2°C on tea production areas in Kenya (Source: http://www.grida.no/publications/vg/africa/page/3123.aspx)

The increase in temperature results in a reduced grain filling period and thus reduced grain yield and quality as higher temperatures accelerate the development but have a negative effect on sensitive development stages such as flowering. The higher temperatures make it necessary to expand the production into higher elevations that then become suitable and give up tea growing in the former elevations. In general the increase in temperature might also result in a yield decrease for staple crops such as wheat and corn that are associated with subtropical latitudes (Simonett 1989). Changes in precipitation, the onset, cessation or length of the rainy season influence the growing season (Rarieya & Fortun 2010). The degradation of natural resources such as decline in soil fertility due to soil erosion has serious effects on crop production and an increase of incidences of weeds, pests and diseases will lead to an increase of pesticide and herbicides (Rarieya & Fortun 2010). It is estimated that by the 2080s, the proportion of arid and semi-arid lands in Africa is likely to increase by 5% to 8% (Galvin 2009) and if climate change results in reduced precipitation in Kenya, then the area of arid and semi-arid land will increase, while the high potential areas would diminish in size (National Environment Management Authority 2004). An impact of climate change can be seen already as the glacier on Mount Kenya retreated 800 m in the last 110 years (UNEP). To mitigate the impact of climate change it is necessary to make use of climate forecast information (e.g. IGAD Climate Prediction and Application Centre, Drought Monitoring Center (DMC) in policy making, and adjust herd and farm management strategies (Rarieya & Fortun 2010). Furthermore it is important to take care of sustainable agricultural production and natural resource management at the community level (agroforestry, soil fertility).

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Kenya's Natural Forest Resources: between Conservation and securing rural Livelihoods

by Cory W. Whitney

Native Forests and Rural Livelihoods

Human well-being has many elements, including: access to food and shelter, security, good health, social acceptance, access to opportunities and freedom of choice. Poverty is defined as a lack of these elements. Human well-being in rural areas relies fundamentally on the ability to access a wide variety of ecosystem services. There is a strong need to protect native forests and to support rural livelihoods. In order to create a balance between these needs the role of forests in poverty alleviation and the role of poverty alleviation on forest cover must be identified (Sunderlin et. al. 2005).

There are a large number of poor people living in forested areas and a strong correlation between poverty and remaining areas of natural forest. Because of this link we should look to forests for the livelihoods of people who live there (Sunderlin et al. 2005).

Poor rural people who live in or near forests tend to be politically weak or powerless. They often have to compete with more powerful actors for forest resources. National governments, forest companies, agriculture or NTFP business seekers, miners and general infrastructure development compete with rural poor forest resource access. The political weakness of rural people who live in or near forests is exacerbated by their relative distance to the urban centers where political decisions are being made about how to deal with the forest resources (Sunderlin et al. 2005).

Rural poor tend to be more dependent on forests for their income. They often can't participate in timber harvesting and other high value forest uses due to inability to compete or cultural laws. Forest related laws are often written to give access to high value forest products to the relatively wealthy. Forestry is capital and skill intensive, and requires secure land tenure, which the rural poor in forests often do not have. Forestry operations are long-term, high-risk investment exactly the opposite of what the rural poor can work with (Wunder 2001).

FAO Forest Resources Assessment and the State of the World's Forests:

Kenya's forests contain 476 million metric tons of carbon in living forest biomass. 6.1% or about 3,467,000 ha of Kenya is forested, 5.7%. 197,000 ha of Kenya is classified as primary forest, the most bio-diverse and carbon-dense form of forest.

Between 1990 and 2010 Kenya lost an average of 12,050 ha or 0.32% per year, 6.5% of its forest cover, or around 241,000 ha (FAO 2005).

Deforestation data Kenya, 1990 - 2005

- forest cover (ha): 3,522,000
- forest cover (as % of total land area): 6.2
- other wooded land (ha): 34,920,000
- other land with tree cover (ha): 10,320,000
- total land area (ha): 58,037,000

Kenya: Forest Cover, 2010

- total land area (1,000 km^2): 56,914
- total forest area (1,000 ha): 3,467
- % forest cover: 6
- primary forest cover (1,000 ha): 654
- primary forest, % of total forest: 19
- other wooded land (1,000 ha): 28,650
- % other wooded land: 50.

Table 1: forest cover and deforestation data Kenya, 1990 - 2005 (FAO 2005)

	period	units	total forest area	primary forest
area	1990	ha	3,708,000	742,000
	2000	ha	3,582,000	716,000
	2005	ha	3,522,000	704,000
annual change rate	1990 - 2000	ha	- 13,000	- 2,520
	1990 - 2000	%	- 0.3	- 0.34
	2000 - 2005	ha	- 12,000	- 2,400
	2000 - 2005	%	- 0.3	- 0.34
total change	1990 - 2005	ha	- 186,000	- 38,000
	1990 - 2005	%	- 5.02	- 5.12
	1990s vs. 2000s	%	0	- 4.76

Resources for Informed Decisions, and possible solutions

Forest-based poverty alleviation (FBPA) is a way to look at using forest resources to increase well being temporarily or permanently (Sunderlin et al. 2005). FBPA can be realized through deforestation for income generation e.g. converting forests to permanent agriculture. FBPA can happen when the rural poor have access to forest resources through action that protects access and benefits sharing. FBPA can happen if rural poor in forests are paid for their role as protectors of the forest. FBPA can happen if the value of the forest products and work increases for the rural poor – this would include market access, forest-based value-adding activities etc. (Sunderlin et al. 2005).

Forest transitions (FT) theory and the environmental Kuznets curve (EKC):

FT and EKC point out that forests are healthy before economic development then the environment breaks down as development proceeds and forests become healthy and abundant again as soon as development is achieved. According to the EKC and FT arguments the reconciliation of poverty alleviation and forest conservation will take place on its own as part of the process of socioeconomic development.

The major problem with FT and EKC arguments is that the estimates to reach the top of the curve in Kenya are from US$ 4,000 to 6,000 GDP; this could take decades to reach.

Non Timber Forest Products (NTFP)

Many NTFPs are used for fuel, food, medicine, forage, fiber etc. Most NTFPs are consumed directly by collectors and their families. Some are important mainstays important as sources of food and emergency food. Many NTFPs are also produced for sale or barter. The extension of the market system to more remote areas has increased both the demand and the opportunity for increased cash incomes, and there is a growing international interest in NTFP (Sunderlin et al. 2005).

The problem with NTFPs is that when they have a high value, they tend to be accessed bought and sold by non-poor. Another problem has to do with economies of scale. Many of the organizations and businesses (FLO, FSC etc.) operating in these areas want to work with large producers due to the high transaction costs of working with many (poor) smallholders, compared to a few large landholders.

Socio-geographic statistical Analysis

Ongoing research concerning forest resources is being put into databases of geo-referenced statistical information. These databases can draw correlations between spatial data on forest resources and population and household statistics to yield a picture of how land, people, and the health of both are related in Kenya (Müller 2009). The displays of the statistics cannot help to determine the causes of poverty in Kenya and how ecosystems can best be managed to increase economic growth and improve livelihoods, but they are a first step toward starting to better understand the problems and guide the associated research (WRI 2007).

Possible Solutions for Ecosystem Services and the Poor

Possible functional solutions may have already been discovered. Some suggestions:

Work on getting more money to the poor living in the forests in the form of direct payments for forest environmental services such as carbon storage, hydrological protection, biodiversity conservation, and recreational values could make a big difference.

Increase market access for low impact NTFP for rural poor living in forests.

Use the insights from collective statistical analysis of the situation to find out more. Understanding more about how poverty and forest abundance are linked, and if they reflect other phenomena, for example, a remote location causing both high poverty and limited deforestation.

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Coffee & Tea - Cooperative Approaches to link Small Scale Farmers to international Value Chains

by Christine Weißenberg and Manuela Kühnert

Coffee and Tea – Production and Trade

Coffee

Coffee is one of the most important merchandises traded in the world (Lieberei/Reisdorf 2007, p. 288). In the African countries coffee is grown mostly by small scale farmers, whereas in countries like Brazil it is grown in large scale on plantations (Elzebroek/ Wind 2008, p. 11). All together smallholder growers produce most of the coffee worldwide (Lewin et al. 2004, p. 1).

When looking at the total export earnings then coffee accounts as an important cash-crop in some coffee-producing countries at least 20 percent. Coffee trade affects economically directly ca. 100 million people in more than 50 developing countries (Lewin et al. 2004, p. xi).

After the break-down of the International Coffee Agreement (ICA) in 1989 and the following boost in production by the supplying countries, especially Brazil and the new entering Vietnam, a global coffee-oversupply was caused (Muradian/Pelupessy 2005, p. 2029).

Brazil is by far the largest coffee-producing country in the world. Followed by Vietnam, Colombia and Indonesia. Kenya is taking the 22th rank in the worlds coffee production - concerning both value and quantity (FAO STAT 2008).

The area harvested in Kenya is slightly declining, but at the same time export values for Kenyan coffee is increasing. It is still one of the important export-commodities which contribute as a foreign exchange earner (Lewin et al. 2004, p. xi).

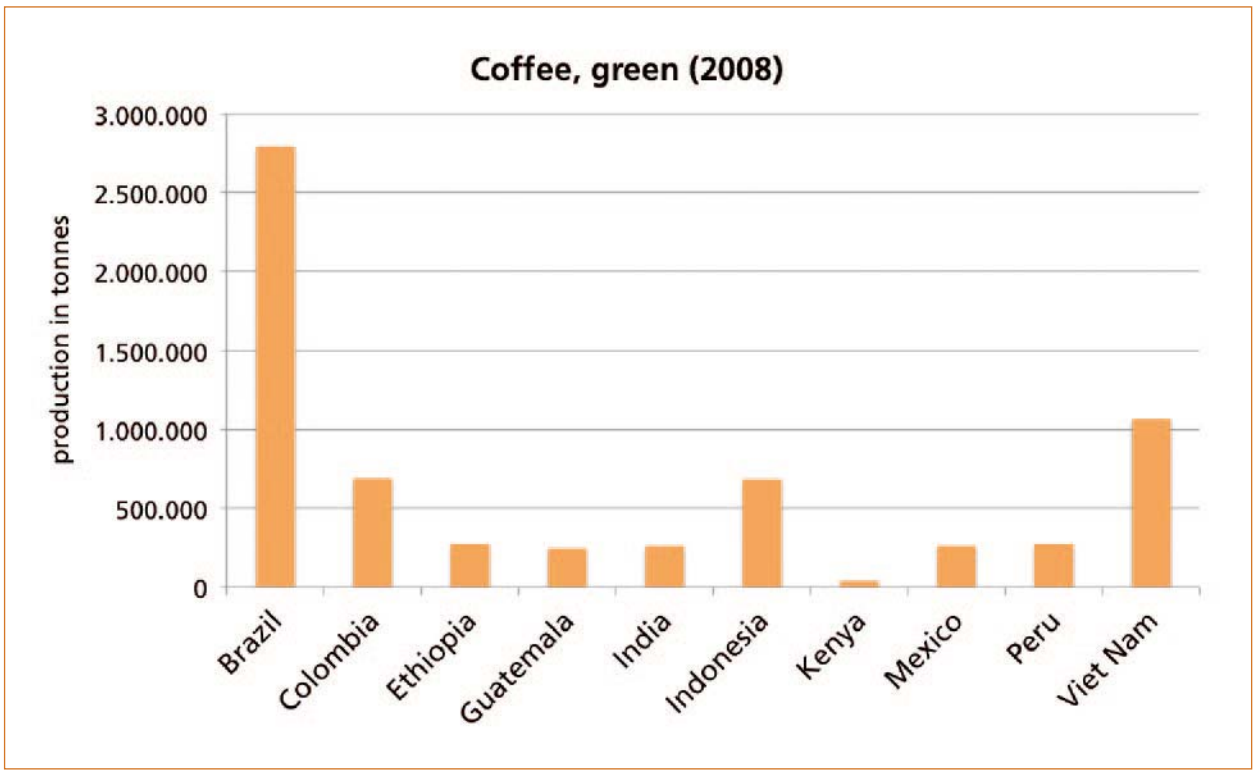

Figure 1: Coffee production 2008 (FAOSTAT 2011)

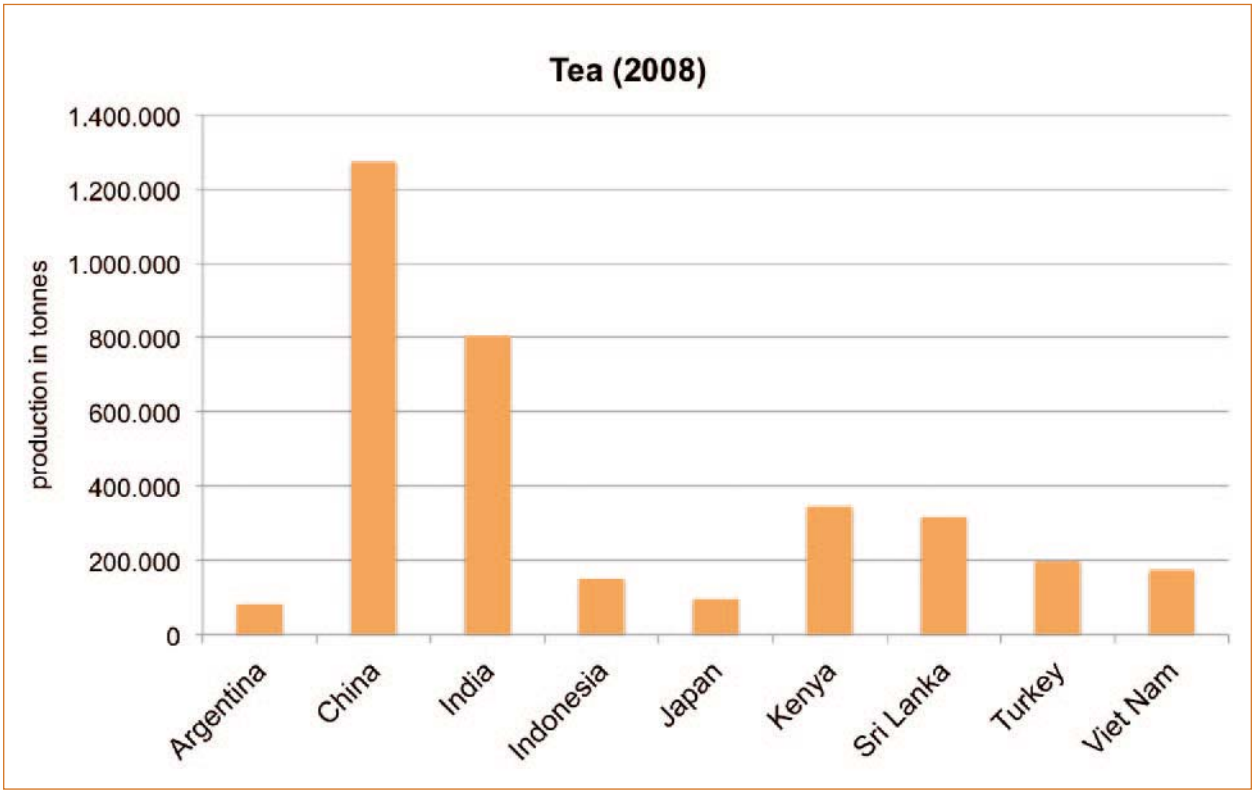

Figure 2: Tea production 2008 (FAOSTAT 2011)

Tea

China is the worlds largest tea producer and the third major exporter in the world. Kenya is taking the third rank in the worlds tea production and is one of the leading exporters of tea. Tea is the highest export-earning commodity in Kenya, followed far behind by fresh vegetables and Coffee (green).

In Kenya the export-value of tea doubled from 2002 to 2009. The area of tea harvested is slightly increasing. The export-quantity is going up, but shows fluctuations (FAO STAT 2008).

Small Scale Farmers

When talking about small farms or small scale agriculture it is a matter of definition, what is meant by these terms. Most common is the definition by farm size, which serves best for using the available data and providing percentages. The World Bank defined smallholders as those with a low asset base, farming less than 2 hectares of cropland (World Bank 2003). However, this categorisation lacks clearness as it covers a very diverse group regarding for example market access or household income (Nagayets 2005, p. 355).

On the basis of FAO data Nagayets (2005 p. 356) estimated the total number of the worldwide farms with about 525 million. 85% of these are small scale farms, due to the above given definition. They hold about 60% of the arable land worldwide and provide lifelihoods for 40% of the world population.

For information about the status in Africa the data is scarce, as Nagayets (2005 p.356) pointed out, while giving the approximate number of 33 million small farms on the continent. This would represent about 80% of all African farms.

In Kenya the proportion of small scale production is estimated by a government report and makes 75 % of the total production in the country - but accounts for only 70% of the marketed products (Government of Kenya 2010, p. 11, 12). The smallholder farms have an average size of 0,2 to 3 ha and produce 65% of coffee and 50% of tea in Kenya, while mostly not being adopted to modern

farming practice and its advanced inputs (Government of Kenya 2010, p. 11, 12).

International Value Chains for Coffee and Tea

Both coffee and tea are commodities traded on the world market in large quantities. The corresponding agribusiness value chains consist of different actors and their relationships and market power. In analyzing these chains the focus lies on how the individual chain members are linked together. For describing the structure power inequalities between the involved parties on different levels are addressed (Humphrey 2005, p.21,22).

In figure 3 the general agribusiness value chain is depicted.

Coffee is produced with varying input levels and harvested in form of coffee cherries. After removing the fruit pulp either in a dry or wet process parchment coffee is left for milling. In this stage the fruit residues together with the parchment layer are cleaned away resulting in green coffee, in which form coffee is then traded. These first processing stages happen in the country of origin at producer or small processor level. The roasting and all further processing is mainly done directly in the country where the coffee is sold to the end consumer via the retailers (Kaplinsky 2004, p. 9).

Tea is processed entirely in the country of origin, as all stages need to happen directly after picking. The leaves are withered, bruised for activating fermentation processes and finally dried for trade and sale. The packing and labeling is either done in the country of origin or mainly by other processors or a retailers in the region where the tea is sold (Lieberei/Reisdorf 2007, p. 289, 294).

Market situation and problems of small scale farms

Within the agribusiness value chains there are concentration trends on the one hand on the input side and on the other hand at processing and distribution level near to final markets mainly in Europe and the USA (Humphrey and Memedovic 2006, p. 31, Kaplinsky 2004, p. 13).

There are powerful transnational buyers operating within the boundaries of producing countries and a few multinational processing companies located in the major consuming countries, who source for example coffee directly from producers and also have commercial operations in coffee producing countries (Kaplinsky 2004, p.13-16).

This way the value chain became a so called „buyer-driven chain", where the market power is concentrated at the downstream end of the chain (Humphrey 2005, p. 22). This has implications for market access, returns, market structure, market power and leads to the rising importance of public and private standards (Humphrey 2005, p. 1). The leading companies try to influence the activities in the whole value chain via vertical coordination, which is also called „chain governance". These big companies prefer a small and ma-

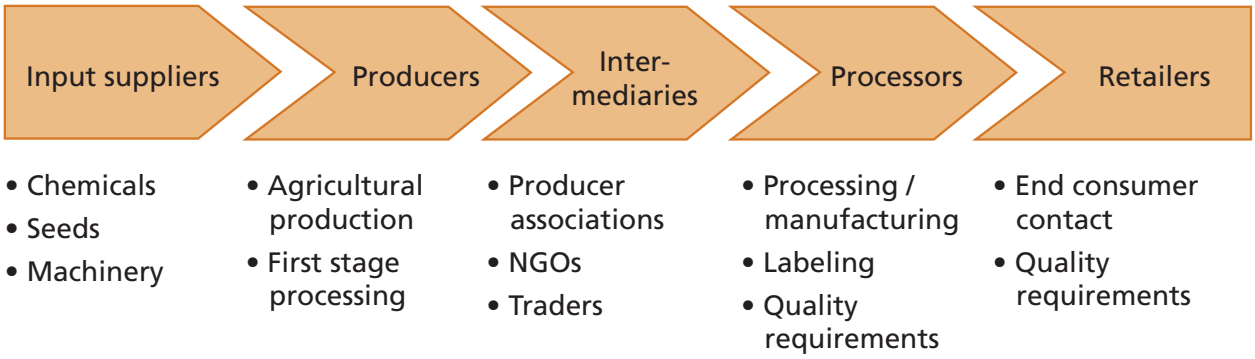

Figure 3: Agrobusiness value chain (own figure, according to Humphrey and Memedovic 2006, p. 31)

nageable number of suppliers and in consequence have to develop measures for reducing the risk of failures and associated costs (Humphrey 2005, p. 23).

In the whole agribusiness market a growing importance of standards can be seen: There are already some formulated by international bodies to govern production processes. Additionally special requirements of the chain-governors appear to reach traceability of the products along the chain and to determine delivery and quality schedules. These private-sector standards, however, become trade barriers for the supplier level. The raised level of competence needed for providing produce with the necessary certification especially challenges small scale farmers (Kaplinsky 2004, p. 4). Additionally, the described developments are accompanied by a continuous deterioration in prices (Kaplinsky 2004, p. 26).

The problem is that „concentration at one point in the value chain drives concentration at other points" (Humphrey and Memedovic 2006, p. 36) namely at supplier level where economies of scale are essential and small scale farms have to compete with large scale plantations. To link small farmers nevertheless with export markets, where is often more financial return achievable than in domestic markets, one possible way propagated by NGOs and development aid organizations lies in introducing cooperations at different levels in the value chain (Humphrey 2005, p. 32).

Cooperative Approaches

Why should small scale farmers be linked to international value chains? Humphrey (2005) argues that it would be the best chance to kick-start the economy in the world poorest countries (especially Africa). Other export merchandises such as manufactured products are often scarce there (Humphrey 2005, p. 33). The greatest prospects for growth exists in the non-traditional agricultural export, like livestock, horticultural products and seafood. The export of fresh-vegetable vegetables shows a very positive trend, while the prices for traditional export commodities (e.g. cocoa, coffee) decline. An other point is that poverty is concentrated in rural areas: Most of the poor (75%) in the developing world live in rural areas (World Development Report 2009). By raising the agricultural income the income of these poor could be raised and so the possibility to answer the demand for non-food products (Humphrey 2005, p. 33).

A few standard policies are mentioned to support small scale farmers. "A recent article by Peter Hazell (2004) refers to better infrastructure for linking to markets, education, new technologies, cheaper fertilizer, credit, property rights and producer-marketing organizations" (Humphrey 2005, p. 33).

When intending to link smallholders to global value chains one has to consider the fact, that producers facing an „[…] increasingly complex standards environment" (Humphrey 2005, p. 33). To be able to meet the requirements of theses standards and by that of the traders they are in need of knowledge transfer and acquisition of competences. For a single farmer the investment in the needed managerial and administrative skills and infrastructure would be far too high. Just as for traders, who would e.g. in an outgrower scheme need to provide for each single smallholder technical assistance. The formation of cooperatives would be a possibility to approach this problem (Humphrey 2005, p. 33).

The following three strategies (figure 4) to link small-scale farmers to international value chains are suggested by Humphrey:

A Promoting cooperatives

This has been a long-established way of coordination small farmer production. It enables coordination and pooling of production, and also acts as an efficient conduit for technical assistance. In some cases cooperative formation proceeds simultaneously with buyer linkages and outgrower schemes, providing the buyers with a coordinated group of farmers with which to work. […]

B Promoting outgrower schemes linking small farmers and large byers

The latter provide technical assistance and also take on some of the tasks critical for compliance with standards, such as pesticide spraying in export horticulture. Five schemes linking smallholders to supermarket buyers are described in Boselie et al. (2003). The role of buyers in some cases of export-oriented organic agriculture by small farmers is discussed in Damiani (2002). […]

C Seeking new marketing channels for the output of small farmers

Fairtrade initiatives are one example of developing alternative marketing channels. Even though these products are now increasingly sold through mainstream retail outlets the organisation of the chain close to the point of production – producer cooperatives, social spending and Fairtrade buyers – is very different.

Figure 4: Different strategies (original abridged from Humphrey 2005, p. 33, 34)

Farmer Cooperatives and Buyer Linkages

When aiming at linking small scale farmers to international value chains, meaning that they gain access to competitive export markets, the success depends upon working with other, larger farmers and with processors or exporters (Humphrey 2005, p. 20). In trade relationships with large multinational companies lies great potential as those drive the developments in the chain and on the market. And nowadays they are in the need for rethinking their role in the value chain as consumers more and more want to know about the social and ecological impacts of the products. NGOs are able to put public pressure even on the influential large companies to act responsibly. Therefore companies develop concepts of Corporate Social Responsibility (CSR) and often ethical sourcing is part of the considerations, when the production is located in developing countries. Ethical sourcing or trading means, due to Blowfield (2004, p. 2), „that a company at one part of the supply chain (typically a brand owner, retailer or other Western company with a public profile) takes responsibility for the social and/or environmental performance at other stages of the chain, especially for that of primary producers".

But as described in previous chapters, in a buyer-driven chain the required standards of the governors have to be fulfilled and monitored. The certification is more cost efficient for large scale production with economies of scale also in terms of bureaucratic procedures. To pool the production and to enable the participation of smallholders it makes sense to form a cooperative as business partner for the companies (Humphrey 2005, p. 33). The relationship then either bases on a so called „outgrower scheme", where the producers are contracted and supervised directly by the buying company, or on an accredited „third-party certification". The latter saves the buyers the effort to provide an own certification scheme.

What emerged are the so called public-private partnerships (ppp), since the 1990s more and more propagated by development aid agencies with the aim to create „mechanisms for the participation of all actors necessary for sustainable development" (Bitzer et al. 2008, p. 5). To fulfill this purpose farmers, NGOs, companies and governmental agencies cooperate for example to set up standards and certification schemes combining the requirements of the different stakeholders. Here especially the NGOs have a very active part in facilitating the economic relationships, whereas the governments have smaller roles and mainly provide financing programs (Bitzer et al. 2008, p. 4).

Government Support for agricultural Cooperative Approaches

Thimm (1990, p. 13) states that the problem with governmental support is that policy instruments seldom reach small scale farmers

when facilitating extension services and help financing inputs like machinery, chemicals, finance or marketing.

The situation in Kenya is the following: There are special policies for rural areas attaching great importance to cooperative movements in agriculture. In 2009 46% of the countries cooperatives were in the agricultural sector and gathered about 3 mio. members. There is an own Ministry of Cooperative Development and Marketing providing the legal environment and trying to strengthen the cooperatives. Through savings and credit cooperatives, which are called SACCOs, it is possible to mobilize savings and provide credit to producers.

Measures are planed by the government to review cooperative development policy and legal framework, to improve access to agricultural credit, to strengthen the capacity for marketing agricultural goods and to promote value adding to products as well as internal and external trade. Aim is also to improve the governance and the management (Government of Kenya 2010, p. 17).

Third-Party Certification - Fair Trade

Fairtrade is a third party initiative with a strong focus on the work with smallholder-cooperatives (Reynolds, p. 151). As Fair Trade International (formally the ‚Fair Trade Labeling Organization' and still used as abbreviation ‚FLO') states on its website: „Fairtrade is an alternative approach to conventional trade and is based on partnership between producers and consumers." (FLO 2011) Fair Trade International (FLO) is a NGO – based multi-stakeholder of nineteen national initiatives and is setting standards to reach this aim. These standards include the payments of farmers „[...] that aim to cover the cost of sustainable production[...]", an additional premium (charged from consumers), that can be used to invest e.g. in education- programs or the improvement of production. Furthermore there should be advanced credits and a long term relationship to the buyers provided. The aim of Fair Trade is to make it possible for small scale farmers to „plan for their future" and improve their livelihoods. (FLO 2011). In comparison with other third party certification initiatives in the coffee-sector „Fair trade has by far the strongest social justice and development standards across the commodity-chain" (Reynolds, p.154). A certification company owned by FLO, called ‚FLO-CERT' is ensuring the compliance with the Fair Trade standards by inspecting producers and traders (FLO 2011).

Impact

In a case study done on the impact of Fair Trade on coffee-farmers in Costa Rica it was found, that even though the Fair Trade farmers would have lower overall expenditures in comparison to non-FT farmers, they would spend more on education and also have a higher degree on self-sufficiency considering food (Saenz-segura/Zuniga-Arias 2008, p. 124). According to Ruben 2008 Fair Trade farmers enjoy an „improved income certainty" expressed i.e. in „higher willingness to invest" and a „larger time horizon". He concludes, that „[...] long-term delivery contracts and the assurance of stable and large-scale market outlets are fare more important FT features than the price advantage" (Ruben 2008, p. 43).

Kenya

Currently there are thirteen FairTrade certified tea-cooperative in Kenya, of which three are additionaly certified as organic. They are mainly Tea Factory Companies in the Central Province north of Nairobi and two Outgrower Empowerment Projects in Rift Valley east of Kisumu. The seven Fair Trade certified coffee producing cooperatives in Kenya can be found around Nairobi in the Central Province and in the Eastern Province (Fair-trade Africa, 2011). Exact location and more detailed information can be found on the website of Fair Trade Africa: www.fairtradeafrica.net/producers-products/producer-profiles/.

Third-Party Certification – Utz

Especially in the coffee production sector third-party certification is very common and there are several NGO-based systems besides Fair Trade (Raynolds et al. 2007, p. 151). The youngest is Utz Certified, founded as public private partnership in 1997 under the name of Utz Kapeh by Guatemalan coffee producers and the Dutch coffee roaster Ahold Coffee Company. The organisation's name is Mayan language and is translated with „good coffee" as they are specialised on coffee producers only (Utz Certified 2011). Utz Certified is independent from producers and roasters financing itself via administrative fees and funds provided by the EU and some Dutch NGOs.

Due to Bitzer et al.'s description (2008, p. 8) the focus of the certification lies on the farm management. Most important are aspects of efficiency and product traceability with a view on social issues also. In respect of environmental aspects, however, the there are no strict regulations. The buyers are mainstream coffee brands and roasters like IKEA, Sara Lee and Nestlé seeking to fulfill their corporate responsibility agenda (Raynolds et al. 2007, p. 151; Utz Certified 2011).

In Kenya there are 34 coffee producers certified by Utz Certified. Among them are 9 farmers cooperatives claiming to represent smallholders also. They are located in the area around Nairobi in Central and Eastern Province. For further information and exact locations we refer the reader to the website of Utz: www.utzcertified.org/index.php?pageID=141 (Utz Certified 2011).

Critical Points of Cooperation for Small Scale Farmers

Certification

Certification as a strategy to link small scale farmers to global value chains has got a large limitation considering the possibility of democratic participation by the producers. Usually certifications are are private and established by institutions located in the developed countries. The participation in certification through the Global South is very limited (Raynolds et al. 2007, p. 159).

An other problem can be, that the entry barriers for producers can be raised through standards made by certifications based on Northern norms and procedures (Raynolds et al. 2007, p. 159).

Looking at certification and the relevance of the standards which are set e.g. in the ethical sourcing "[...] we need a more rigorous approach to understanding whose rights

are being considered and whose are being denied" (Blowfield 2004, p. 8). A case study by Blowfield (2004) points out, that Kenyan small scale tea producers wish i.e. for land-tenure security and stable and long-term buyer–seller relations. These points are both not included in the issues which the ethical sourcing is mentioning.

An other challenge regards the growing certification market. Certifications which are having the potential to raise the bar of social justice-standards, development-standards and ecological-standards „[...]are facing growing pressure from lower standard initiatives" (Raynolds/ Murray/ Heller, p.160).

Fair Trade

There are several critics found on FT. One point for example is that the potential sale of FT certified coffee is is not fully utilized (Muradian/Pelupessy 2005, p. 2033). Only 60% of the FT produced coffee is purchased as such, the rest is sold on the conventional market (Saenz-segura/Zuniga-Arias 2008, p. 121). An other point regards the not significant difference of income for the producers to conventional value chains. The critics even go further, saying, that there is no significant difference in the income-distribution between producing and consuming countries when comparing FT to conventional supply-chains (Roldan/Pelypessy 2005, p. 2033).

Concerning the market share of FT „[…] the lack of a consistent quality policy and its fixed premium may impose some intrinsic

limitations" (Roldan/Pelypessy 2005, p. 2033).

Considering the possibility for small scale farmers to enter the FT- scheme it has been reported by Muradian and Pelupessy (2005) that the overall entry-barrier to FT certification for small scale farmers is low, but the actual participation after the registration can be difficult (Roldan/Pelypessy 2005, p. 2036).

Contracting

Contracting between producers and buyers can have a high advantage, i.e. guaranteed absorption of the produced commodity for the farmer and reliable commodity sources for the buyer. But there is also critics found on this subject. Contracting can increase " [...] local socioeconomic differences because private firms prefer to work with "progressive" farmers and dependency of the agricultural community on imported inputs" (Weatherspoon et al. 2001, p. 5). An other point mentioned is the possible land shift from food crops to export-oriented crops and the accompanying disruption of local production patterns. Also the evoked dependency in the trading-relationship trough matters of specialization, input only provided by contract-partners and dictate price are criticized. The high coordination costs when i.e. implying new requirements are making contracting with small-scale farmers often inconvenient for firms (Weatherspoon et al. 2001, p. 5y; Humphrey 2005 p. 36).

Conclusions

All in all it is a difficult task to link small scale farmers to the international value chains. There are quite a lot of attempts but there are also many obstacles. The main problem seems to be the high costs for coordination, which requires a strong buyer commitment to the task.

Some possibilities can arise from using the potential of alternative export markets or niche markets: In less demanding markets, for example in Eastern Europe, there could be appropriate buying partners of smallholders from developing countries. And another possibility could be the non-traditional commodity production like vegetables (Humphrey 2005, p. 35).

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Fruits and Vegetables: Perishable Commodities for urban Markets and Export

by Tina Roner and Vince Canger

Table 1: Area and production shares of vegetables (Muendo and Tschirley 2004)

Vegetables	Area shares		Production shares	
	1992	2001	1992	2001
Cabbages	25	17	32	22
Kales	21	25	25	31
Tomatoes	17	18	22	24
Onions	6	6	5	5
Carrots	6	4	6	5
French Beans	8	6	2	2
Garden Peas	8	7	2	2
Traditional Vegetables	5	10	3	5
Other Vegetables	4	7	3	4

Fruits and Vegetables

In Kenya, a huge diversity of fruits and vegetables is grown all over the country. The most important vegetables are cabbage, kale, tomatoes, onion, carrots, French beans, garden peas and traditional vegetables (table 1). (Muendo and Tschirley 2004).

Traditional vegetables include about 210 African leafy vegetables species, such as African cabbage (*Cleome gynandra*), red nightshade (*Solanum villosum*), butternut squash (*Curcubita moschata*), yardlong bean (*Vigna unguiculata*), purple amaranth (*Amaranthus blitum*), trossa jute (*Corchorus olitorius*), garden huckelberry (*Solanum scabrum*), slenderleaf (*Crotalaria brevidens*) and Ethiopian mustard (*Brassica carinata*) (Wambugu and Muthamia 2009)

The most important fruits grown are bananas, oranges, mangoes, avocados, passion fruits, pineapples and papaws. Less important fruits produced in Kenya are apples, plums, pears, watermelon, grapes, and strawberries (table 2) (Muendo and Tschirley 2004).

Banana is probably the most important of the fruits because it can practically be grown in every arable area in Kenya and is an important crop for food security and income. In contrast, most of the other fruits are concentrated in the warmer eastern and coastal areas, although they are often grown elsewhere (Nyoro 2004).

Table 2: Area and production shares of fruits (Muendo and Tschirley 2004)

Fruits	Area shares		Production shares	
	1992	2001	1992	2001
Bananas	63	55	58	49
Citrus Fruits	13	11	7	6
Mangoes	10	12	5	8
Avocados	1	3	1	2
Passion Fruit	1	2	1	4
Pineapples	6	10	22	28
Pawpaw	4	5	4	4
Other Fruits	2	2	2	1

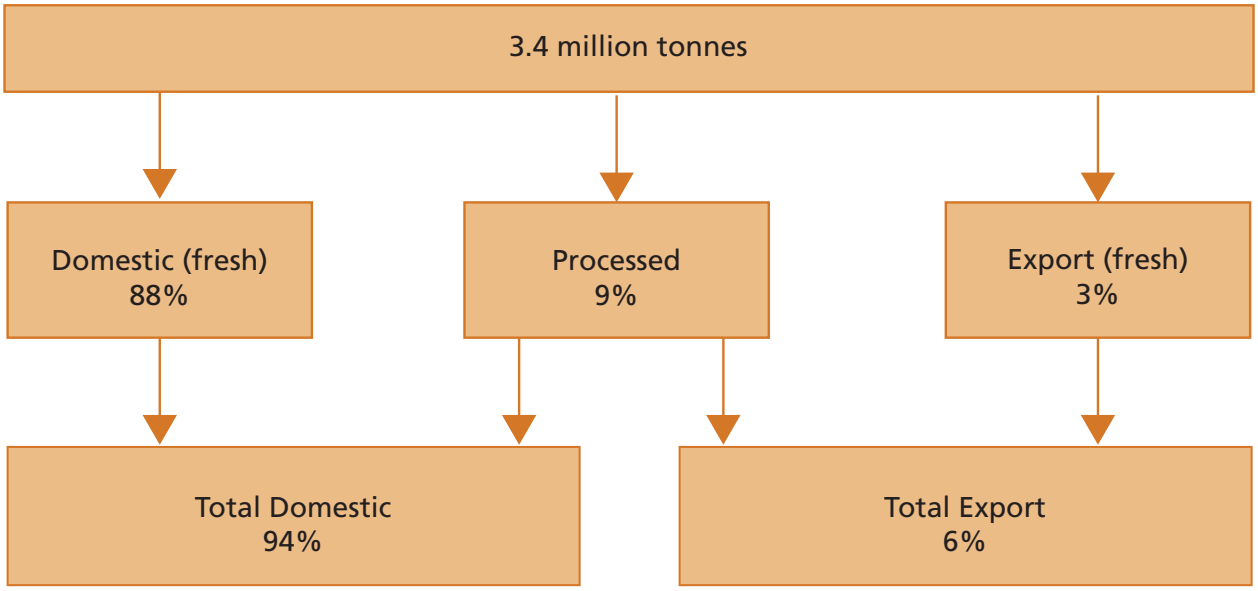

Figure 1: Shares of Export and Domestic production of FFV (Nyoro 2004)

Fruits and vegetables in Kenya are mainly produced by a large number of small-scale farmers spread throughout the country. These growers depend on their crops for food security, income generation and employment (Nyoro 2004) Therefore, more than 90% of the fruits and vegetables produced are sold only locally and account for 94% traditional domestic market share. On the other hand, growing for the export market consists of only 6% of horticultural production (figure 1). In addition, the majority of the production is sold as a fresh product and only a very limited portion, approximately 9%, is processed. As a result, Fresh Fruits and Vegetables (FFV) are in Kenya an important economic sector (Nyoro 2004).

FFV for urban Market

Domestic demand for FFV in Kenya is growing because of an increasing urban population and an increasing income within certain groups of people. The urban population buys fruits and vegetables from retail markets, like „wet" markets and kiosks, around their homes (Nyoro 2004). However, supermarkets are becoming increasingly popular, especially for urban citizens and higher income groups in big cities and smaller towns, alike. They also contribute to the fresh products sector and are becoming a more important source of FFV in urban areas (Neven and Reardon 2004). At the present moment, retail markets still remain the most important destination for FFV in Kenya. It is estimated that about 55% of the households buy fruits and vegetables from "wet" markets, 33% from kiosks, less than 7% from supermarkets, and 3% from hawkers (mobile sellers). (Nyoro 2004) „Wet" markets and kiosks offer competitive prices for the urban poor population but are often characterised by low quality products and rather unhygienic conditions. Furthermore, the producers as well as the retailer side are fragmented, including long supply channels with little quality control or grading and few standards (Neven and Reardon 2004).

Most of the FFV destined for domestic markets are consumed fresh and processing of FFV is presently limited to extraction of fresh fruit juice to sell in the local market. However, processed FFV consumption can be found, and is highest, in urban areas where incomes tend to be higher and where tourists and foreigners are most likely to be found (Nyoro 2004).

Figure 2: Example of kiosk (www.flickr.com/photos/32350061@N05/3039065991/)

Challenges and Opportunities for Small-scale Farmers

The introduction of FFV by supermarkets, and an increasing shift in urban consumption towards supermarkets, can cause fundamental structural changes in the supply chains. In comparison to the traditional retail market, supermarkets demand higher quality standards, a steady flow of supply and prefer a supply concentration in order to reduce costs (Nyoro 2004). Small-scale farmers who presently dominate supply may find it difficult to meet these new requirements by supermarkets and this can have severe negative implications for small-scale farmers. Therefore, there is a need for policies that ensure the sustainability of small-scale farmers that depend on these systems for income generation. Small-scale farmers should organise themselves into producer organisations to overcome the lack of capital and supply and to enforce their legal contract with supermarkets (Nyoro 2004).

However, the supermarket FFV sector has high hopes of being a driver of agricultural diversification for small-scale farmers. For the farmers that can adopt to these new requirements (even small-holders) is the opportunity to diversify their agricultural production into higher value products and market them in fewer intermediate steps for greater income generation (Neven and Reardon 2004).

FFV for Export

Approximately 15 years ago, Kenya was the only African nation identified as a "Newly Agriculturalizing Country," or NAC, along with China, Brazil, Argentina, and Mexico. Since then, other African countries, such as Côte d'Ivoire and South Africa, have surpassed Kenya in money earned from FFV exports (Barrett et al. 1999). Regardless, Kenya plays a vital role as an exporter of horticultural products, especially to the UK and other European countries, so much so, that the export of fresh vegetables has surpassed coffee, historically Kenya's most important crop. The top vegetables and fruits being green beans, peas, "Asian" vegetables, and avocados, mangoes and passion fruits, respectively. French bean crops alone account for the income of a half million people, and because export driven production tends to be centred in areas affected by "absolute" poverty, resulting significant local impacts can include, for instance, increased pack house jobs and new purchasing opportunities for small-holders (Solomon 2008). Part of Kenya's success as a NAC is due to its ideal growing conditions, its location in respect to air travel and shipment destinations, and to new consumer demands for products from market "niches."

More than 93% of Kenya's FFV leave the country by air, usually from Nairobi airport, travelling along a "cold chain" of intensively harvested, packed, and shipped goods under crucial temperature control. High technology, most of it imported from economically wealthier nations, is used to achieve uniform quality of the products as demanded by the supermarkets they ultimately end up in. As a result of this "supermarket chain," which accounts for 70% of Kenya's exports to the UK, the largest importer of Kenya FFV, industrial models are favoured and large scale production dominates. Some of the largest producers have set up their own export and freight companies, in order to increase income while cutting time and costs and meeting the de-

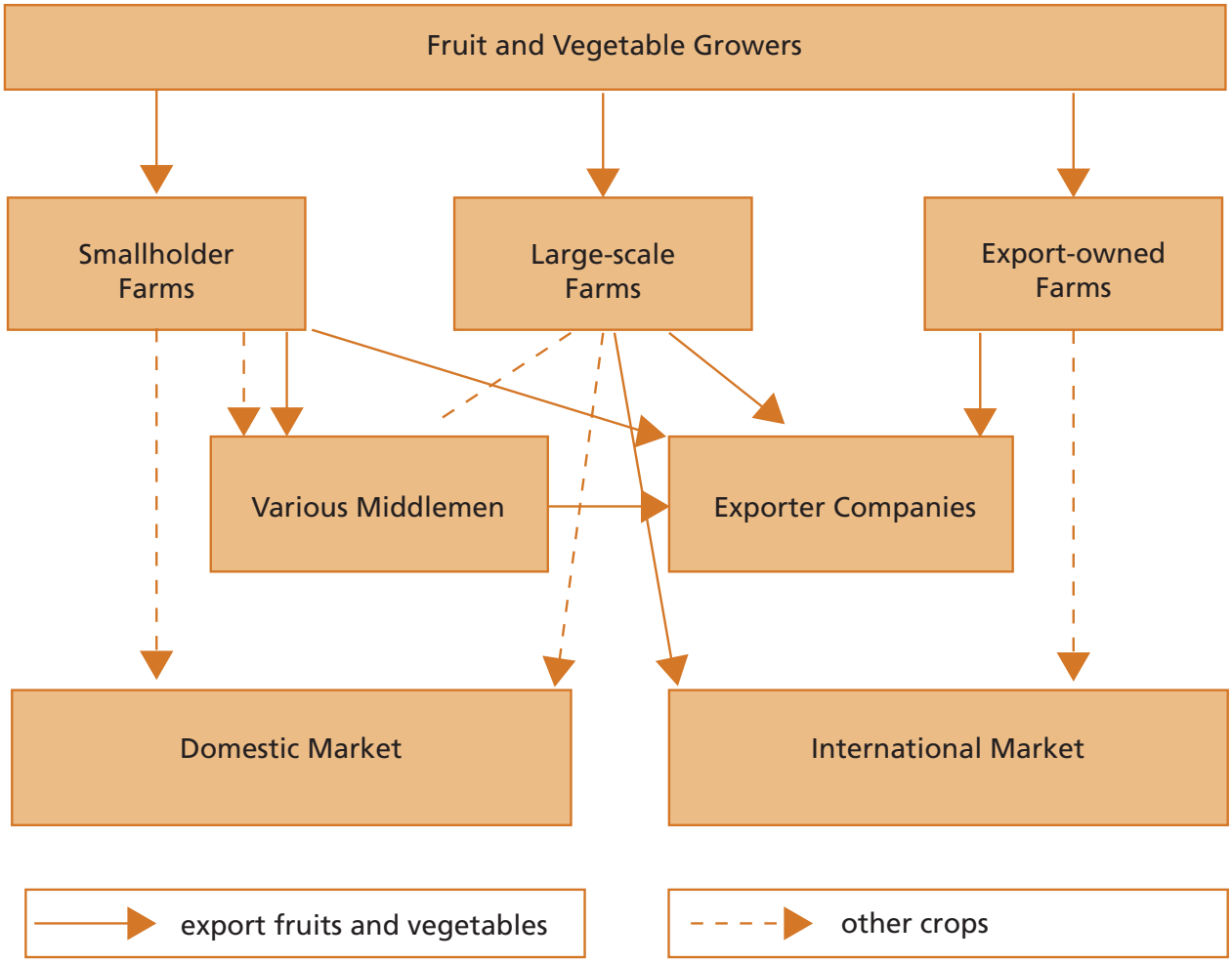

Figure 3: Supply chain of fruits and vegetables in Kenya (own illustration)

mands of multiple quality standards and regulations (Barrett et al. 1999). Consequently, the biggest constraints for the largest producers seem to concern the transport and traceability of the goods more than their method of production! Also, within this model, it is seen that small-scale growers are often disadvantaged as there is many more obstacles and middlemen between the production of their crop and its arrival in European supermarkets.

Challenges and Opportunities for Small-scale Farmers

In 1992, 75% of Kenyan FFV for export were grown by small-holders, but according to statistics gathered by Dinham, Homegrown, an employer of over 6000 workers across eight farms, now accounts for 15% of the country's total horticultural exports (2003).

Probably the most historically important shift from small- to large-scale dominated export-agriculture in Kenya comes from the 1990 UK Food Safety Act, which calls for an increase in control, traceability, and quality "assurance." A particular importer interviewed by Barrett et al. stated, "documentation about sourcing and traceability is all-important. That's why we don't use hundreds of little producers." In addition, policies such as the "Maximum Residual Levels" of pesticides, which came into affect in 2001 and requires "scientific testing," and the EU Retailers Protocols on Good Agricultural Practices (GlobalGAP), which requires 3rd party certification, are making it increasingly difficult for small-scale growers to enter into the export-oriented market due to insufficient access to information and initial funds (Solomon 2008). As a generalization, meeting "sanitary" standards stands to be the most critical obstacle

for export driven FFV production in Kenya.

It is an argument by some that although barriers to trade have been removed (i.e. high quotas, reduced tariffs, trade agreements), standards and regulations, such as GlobalGAP, have come to replace these barriers and concentrate the benefits of trade over to large farms, and processing and retailing companies. According to Jensen, throughout the entire year in Kenya there are roughly only 200 active "exporters" which account for 90% of the horticultural exports, the other 200 being only seasonally active (2005). This effectively constrains small-holders ability to compete in this market, and many of these farmers who have previously converted or set-up their land for export may find it difficult to reorientate towards domestic urban markets. In contrast, others suggest that the economic stimulation and new methods of production have a "rippling" or "trickle down" effect, ultimately spreading the benefits on to others (Solomon 2008).

Labaste suggests that in order to increase small-holder participation, market infrastructures must be upgraded, there must be "collective instruction" regarding technical aspects of production and risk management (i.e. pesticide use), "and collective action through producer organizations (2005)." This could be achieved through assistance from governmental programs and non-governmental organizations alike and through the increasing awareness and demand of consumers for ethical production practices (Barrett et al. 1999). In addition, the view of Dinham is a similar one, stating that "Farmers benefit only when organized into groups or economies to improve their bargaining position and coordinate supply," especially in the face of increasing marginalisation as industrial crop production models dominate (2003). But even as consumers and supermarkets become increasingly concerned with ethical trading issues and supporting the utilization of small-holders, these growers must meet import standards and provide the structures for the importers to assure "traceability" of the products back to these particular growers (Barrett et al. 1999). And as Solomon suggests, small-scale farmers that actually are able to adapt and conform to these regulations do receive a substantial economic increase and greater sense of security, but these producers tend largely to be advantaged with greater prior "wealth," education, access to capital, information and services (2008). When the barriers of entry into these markets are decreased for all small-holders, and the possibilities of economic stimulation are not merely considered only through the "trickle down effect," then a wider economic benefit can most likely be achieved.

Conclusions

Forest certification came up through the concern over rapid tropical deforestation in the As it can be seen, Kenya's FFV sector plays an important role for its citizens and its economy. With the increasing urbanization and focus on export-driven income opportunities comes increasing opportunity as well as increasing challenges. Concerning FFV for urban markets and export markets alike, similar obstacles appear, such as meeting demand for production, quality, and sanitation, among other aspects. These points make it difficult for farmers, especially smallholders, to adapt or compete in these markets. As Dinham stated, „Farmers benefit only when organized into groups or economies to improve their bargaining position and coordinate supply" (2003). Many others agree, and therefore, most suggestions given for overcoming these obstacles concern the Farmers' ability and need to establish cooperation in order to gain better access to information, capital, and assistance.

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Small is beautiful versus Economies of Scale - the Kenyan Dairy Sector

by Mario Cuchillo Hilario

Introduction

To maintain human health and well-being, basic nutrition standards must be covered. In less developed countries, low input farming produces high valuable protein resources and enhances food security (Pica-Ciamarra 2009, Poulton et al. 2010). In the last decades world population had increase a food pressure that require that current natural resources most be used efficiently to satisfy current and future food necessities (Omore et al. 1994). In Kenya, about of 20% of the ecological zones are arable lands, the rest zones are semiarid regions and only a small area is irrigated. Moreover, the agricultural economy maintains 30 million of people (CGIAR, 2003). Livestock subsector contributes about 10% of the Gross Domestic Product (Wabekbon 2009) whereas small dairy farming supported over 350,000 full-time job positions including employment in milk collection, transportation, processing and sales (Kaitibie et al. 2010). Therefore, is essential to understand the potential ways to empower small dairy keepers whereas food security is enhanced.

Kenyan small Dairy Farming (status quo)

The small farming in Kenya average 1 ha of land and lees than two dairy animals per owner. However represents a powerful economic value for the national dairy production. It is important to notice that women are normally the managers of the small dairy enterprises. Central and Rift Valley provinces of Kenya are most productive areas on this aspect (CGIAR 2003; Omore et al. 2004; Wabekbon 2009). Besides, Nairobi is a high milk density area dominated by small-scale milk producers, coming from as far as 100 km away. In the 90´s small-dairy farming provided about 75% of the milk consumed in Kenya. This average was almost steady; however, traditional dairy production in the last decade covered about 86% of dairy demand, whereas the per capita consumption ranged from 100 to 145 liters per year (CGIAR 2003, Kaitibie et al. 2010, Omiti et al. 2006, Omore et al. 1994). This consumption is five times higher in relation to other sub-Saharan African countries, demonstrating that Kenya possesses the most developed dairy industry in West- Africa (Kaitibie et al. 2010).

The milk is primarily produced from cattle, camels and dairy goats, the estimated total milk output are 84%, 12% and 4% respectively. These percentages basically indicate that cows are the main source of milk in the country; i.e., 25.9 % of total milk is produced from dairy breeds while 16.7% is produced by dairy x zebu crossbreeds, however, 57.4% of the milk is produced by zebu breeds (CGIAR, 2003, Omore et al. 2004, Wabekbon 2009). The population of major livestock species is estimate at nine million zebu cattle (e.g. East African zebu, sahiwal, boran), 3.5 million exotic and crossbreed cattle (7.7% Friesian and Aryshire and 10.3% zebu x dairy crosses), 9.9 million sheep, 11.9 million goats, and 895,000 camels (Wabekbon 2009). In central and western area of Kenya, where pastoralist activity is strongly located, 58% of the farmers and 46% of the small-holders indicated that livestock is their main activity. Small ruminants are ranked in second place of importance. 34% of the households keep only sheep, 18% only goats and 48% both species (Wabekbon 2009).

Organizational structure of small-scale dairy chain includes small producers, milk bar operators, milk transporter traders, mobile milk traders and hawkers (Kaitibie et al. 2010, SDP 2005). Milk is usually collected in the morning before 0600 h and transported by public vehicles, arriving at the market by 0900 h. In areas like Nakuru small-scale mobile traders and milk bars rule the dairy market. The informal milk markets dominate because milk

sold (raw milk) through informal markets reaches and satisfies the traditional taste of local and poor consumers who pay regularly a lower price for it whereas small-scale producers receive higher prices than they do via the formal sector (Kaitibie et al. 2010).

Familiar Context

Dairy products in Kenya constitute the largest food expenditure items for households, hence small scale dairy production is critical to the livelihoods. Each dairy unit enhances the mean income of households compared to those without them, increasing also the intake up to 1.0 litre of milk/week of family member (Nicholson et al. 2004). So, small dairy milk production not only meets essential food supplies, but also plays social aspects as a source of sustenance and self-employment (Bebe et al. 2003, Kosgey et al. 2008, McDermott et al. 2010, Nicholson et al. 2004, Omore et al. 2004, Poulton et al. 2010, SDP 2005). However, the regular cash income an insurance against emergencies is the highest priority (Bebe et al. 2003, Kosgey et al. 2008). The income of small dairy farmers is normally used to pay school fees (32%), purchase of food (22%), farm investment (18%), medical expenses (10%), off-farm investment (9%), social activities (5%) and re-stocking (4%) (Wabekbon 2009).

Policies and Implications

Since the restructuration of the dairy sector by the government of Kenya in 1992, more competitiveness of the Kenyan dairy market was generated (Omiti et al. 2006). The government reduced the level of support and intervention in many of its activities within the livestock industry, e.g., the Kenya Co-operative Creameries (KCC). These reductions have included federal support for veterinary and artificial insemination services, allowing a greater role of the private milk processors (Owango et al. 1998). With this national policy, an informal milk market in urban and peri-urban areas was developed where small scale milk producers played a vital role (Omiti et al. 2006).

With the liberalization of dairy market new trends in the economy and contrasting sceneries may be exhibited. On the one hand, private industry might improve the constant flow of supplies of dairy chain, which may have the potential to create contractual arrangements with producers, larger stability of prices for the products and better incomes to alleviate poverty; on the other hand, the intervention of few big enterprises may also signify important constraints for smallholder which could result in increasing disparities in the profitability and finally greater marginalization (Rao and Qaim 2011).

In 2004 the Kenyan governments implemented a new regulation and prohibit the uptake of any smallholder milk without license. The policy was actively rejected by small producers, traders, and consumers whose livelihoods depended on this informal sector. The Small Dairy Project (www.smallholderdairy.org/default.htm), arguments in favor of engaging small-scale milk vendors included the huge impact on employment creation and poverty reduction. Paid advertisements were placed in local newspapers showing the benefits of legalization, but these were met with arguments in the same media by large-scale processors, culminating, in the "milk wars". The dairy policy which essentially criminalized the activities of small scale milk vendors, was largely designed to protect the interests of large-scale dairy producers, yet professed to be based on concerns about food safety and quality. However, small-scale milk producers were required to act only as suppliers (Kaitibie et al. 2010). Although policy-makers have generally suppressed raw milk market for public health reasons, the importance these markets took greater relevance for informal economy and poverty alleviation (Owango et al. 1998).

However, with the publication in 2004 of the new dairy regulation, and with the inclusion of small producers into the formal market (after being trained and certified in basic milk handling), farmers avoided adverse police action as well as losses tied to

the confiscation of milk and milk containers (jerry-cans). Both options were translated into higher consumer prices. Further, direct benefits was observed, small-scale milk vendors were empowered (not all of them) and profited from quick, relatively high volume turnovers, and as a result, welfare benefits accruing to small-scale milk vendors were increased. Finally, some of these benefits were also captured by consumers. A cost-benefit analysis revealed that the policy change was highly profitable (Kaitibie et al. 2010).

Despite the fact that, Kenyan dairy market is still uncontrolled and the informal milk market is dominated by unlicensed hawkers or small-scale milk vendors, a class of vendors that includes both producers and non-producers. Illegal small dairy production in Kenya is challenged to survive against losses related to the milk production like the transaction costs and the retail milk prices. Joined to these disadvantages, quality loss associated with milk becoming sour and direct confiscation of milk and containers by the authority are key aspects (CGIAR 2003, Kaitibie et al. 2010, Omiti et al. 2006).

Key Constrains

The main disadvantage that small-scale farmers face is the limited availability of feedstuffs throughout seasons. They seem to overestimate the forage productivity in rainy season; in contrast, during the dry season the lack of adopted actions to feed with alternative forage is normally absent. This is closely related to the overgrazing and the relative high carrying capacity used. This phenomenon is larger on free-grazing farms in relation to farms practicing zero-grazing (cut and carry). Thus, the adoption zero-grazing farming has been encouraged to intensify milk production in the zones where facilities are accessible (McDermott et al. 2010, Omore et al. 1994).

Besides, Kenyan production rates per animal unit its low and preference and breeding practices have an important impact in this issue. Small-holder dairy producer's decisions are not entirely compatible with local resources for milk production. Livestock with smaller size (Guernsey and Jersey) are less preferred compared to larger breeds (Friesian and Ayrshire) resulting in higher nutritional demands, poor adaptability to environmental conditions, consequently low milk yields and low production efficiency. The "Attractive look" of Bos taurs breeds is a key decision for their preference (Bebe et al. 2003). Even though, indigenous genotypes are predominant among the pastoralists and mixed crosses are predominant among the smallholders, crosses are perceived less favorably than indigenous pure breeds. Additionally, 98% of the farmers have incidence of and livestock diseases, especially pneumonia (in pastoral/extensive areas), helminthiasis, diseases and diarrhoea (Bebe et al. 2003, Kosgey et al. 2008).

The current market scenario (payment of milk is based on volume) will contrast with future one (payment of milk would be based on volume and fat content). Therefore, breeding and farming objectives should be treated together (Wabekbon 2009). Additionally, some studies suggest that genetic improvement of milk production, growth, fertility, survival and longevity traits will have a positive effect on profitability of pasture based dairy production systems, especially where the availability of pasture is not a key constriction (Kahi and Nitter 2004, Kahi et al. 2004).

Small-scale keepers with relatively high unit costs of production compared to large-scale competitors may still facing great disadvantages, because large-scale firms with low profit margins can capture larger returns through greater volume of sales. Moreover, small farming systems by the family labor and complementary production e.g. poultry and pig farming can facilitate competitiveness and profitability (Omiti et al. 2006, Poulton et al. 2010).

Broadly speaking, in order to improve performance in livestock production has been recommended to develop a clearer policy on

milk production, processing and marketing emphasizing health and safety standards, promote animal health by reactivating breeding and clinical services including control of animal diseases, as well as to support the development of facilities for milk handling (CGIAR 2003, Owango et al. 1998, Wabekbon 2009).

Future Challenges

Improving the position of smallholders to actively engage in the dairy market is one of the most important development opportunities. Therefore, is essential to understand the potential ways to empower small dairy keepers whereas food security is enhanced.

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The Kenya Veterinary Sector: Livestock Diseases and Export Opportunities

by Merle Tränkner

The Department of Veterinary Services

The Ministry of Agriculture in Kenya has many entities, e.g. Ministry of Water and Ministry of Environment. Among those is also a Ministry of Livestock Development which is of all the entities of the highest importance for this paper. The Ministry of Livestock Development is subdivided into two departments: i) Department for Veterinary Services and ii) Department of Livestock Production Administrative Services. The Department for Veterinary Services is led by the director Dr. Peter Maina Ithondeka. He is the delegate for the "World Animal Health Organisation (OIE)" for Kenya and a registrar in the Kenya Veterinary Board. His current station is the "Veterinary Laboratories Kabete" in Nairobi.

The Department of Veterinary Services has a lot of functions. Among those are:

Laboratory Services

- research and diagnosis of animal diseases
- 2 national referral laboratories, Kabete and Embakasi, which also serve some neighbouring countries for laboratory diagnosis + 6 regional referral laboratories strategically located at Nakuru, Kericho, Eldoret, Karatina, Mariakani and Garissa to serve the respective regions. There are plans to rehabilitate/establish district laboratories, where laboratory services are out of reach.

Veterinary Disease Control

- Eradication of notifiable epizootic trans-boundary animal diseases of major economic and public health importance in order to promote sustainable livestock farming and to facilitate trade in animals and animal products. The major epizootic animal diseases include Foot and Mouth Disease (FMD), Contagious Bovine Pleuro-Pneumonia (CBPP), Rinderpest, Rift Valley Fever (RVF), African Swine Fever (ASF), and Lumpy Skin Disease (LSD). Other important diseases are Rabies, Anthrax/Blackquarter, Contagious Caprine Pleuro-Pneumonia and Newcastle Disease. The incidence of trans-boundary diseases in the country remains an effective barrier to trade and has continued to deny livestock access to alternative international markets.
- training for dip management; the department has retained tsetse control as a core function due to the trans-boundary nature of the vector and has embraced participatory approach as a means to ensure sustainability in tsetse control. The department has the regulatory role of tick control with respect to testing and registration of new accaricides and issuing guidelines on their use.

Veterinary surveillance

- collecting of disease information for early warning and reaction
- reports to OIE quarterly

Surveillance is done by a network covering most parts of the country. An animal health database is established that is GIS compatible and captures disease information at the national and provincial levels.

Veterinary Public Health

- hygiene inspection
- licenses to slaughterhouses
- quality assurance through enforcing the existing food laws and conducting testing and monitoring of chemical and veterinary drug residues

The department of veterinary services plays a major role in ensuring safety of foods of animal origin. It also inspects and licenses meat transport vehicles and carriers and has been encouraging the private sector to invest in new abattoirs.

Livestock Population

Kenya's livestock population is presented in the following table.

Table 1: Livestock population in Kenya, Germany and the USA

	Kenya	Germany	USA
Goat	13,384,400	180,000	3,043,000
Cattle	10,125,050	12,897,170	93,701,000
Sheep	8,642,100	2,370,000	5,630,000
Camelidae	877,900	-	122,680
Swine	304,000	26,841,000	65,327,000

distribution of goat

distribution of cattle

distribution of sheep

distribution of camelidae

distribution of swine

Livestock Diseases

The following lethal zoonoses in humans occurred in Kenya in the time period from 2007 to 2009:

- Bovine tuberculosis (6,712 cases, 929 deaths)
- Brucellosis (4,651 cases, 5 deaths)
- Rabies (20 cases, 10 deaths)
- Leishmaniosis (159 cases, 8 deaths)
- Anthrax (38 cases, 2 deaths)

This means in total at least 11,661 cases and 956 deaths! A selection of non-zoonoses occurring in Kenya from 2005 to 2010 is given below:

African swine fever, Contagious bov. pleuropneumonia, Contagious cap. pleuropneumonia, Foot and mouth disease, Heartwater (suspected, but not confirmed), Lumpy Skin Disease, Peste des petits ruminants, Theileriosis, Trypanosomosis.

Exceptional Epidemiological Events

In 2007, three took place in Kenya. The outbreak of Rift Valley Fever was probably the worst one because 70 people had to die due to infection with this zoonotic disease. The cause of outbreaks is due to vectors which had spread the disease, so that 235 animals were killed. As response to this event, a large vaccination campaign started and at the end 6,327,055 were vaccinated.

A second exceptional epidemiological event was the outbreak of the Peste des petits ruminants in the Rift Valley. By introduction of live animals, probably illegally, the disease entered the country and by contact with infected animals at grazing and watering points the disease was able to spread. Finally, 22 998 cases had been registered and 16 397 deaths.

The outbreak of African swine fever was

the third exceptional event, which had been caused by illegal movement and swill feeding. Out of 1 011 cases 630 animals died.

As response to the outbreak of the diseases, the following control measures were implemented: quarantine, movement control inside the country, screening, zoning, vaccination (except African swine fever), dipping/spraying, antibiotic treatment of infected animals, disinfection of infected premises/establishments.

Quantity of Veterinarians in Kenya

According to the World Animal Health Organisation, Kenya has 5,286 veterinarians, which means 0.00091 veterinarian/km^2 and rank 94 referring to the number of veterinarian/km^2. In comparison to that, in Germany are about 28,000 veterinarians registered. This means 0.07862 veterinarian/km^2 and rank 22. USA lay in between the ranking of Kenya and Germany with rank 75 (0.0156 veterinarian/km^2 and 150,644 veterinarians).

Transferring the data from the unit "veterinarian/km^2" to the unit area in km^2/ 1 veterinarian reveals the enormous difference between the countries: in Germany, 1 veterinarian has to occupy an area of 3.5 km^2, in USA it is an area of 8.00 km^2 and in Kenya it is 10.5 km^2.

Import and Export

The most exported livestock species is cattle, which is mainly exported to Uganda, Mauritius and Tanzania. Goats and sheep are exported to a lesser extend to the same countries than cattle with the exception of sheep, which is also exported to the United Arabian Emirates. Pigs are not exported.

In contrast to the relative high export quantity of cattle is the relative low quantity of import of cattle. Especially goats are imported, whereas the imports of sheep and pigs are negligible.

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The Kenyan Wildlife Sector - Backbone of the Tourism Industry and Source of potential Human Wildlife Conflicts

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Introduction

Kenya is rich in natural resources, including a vast array of wildlife. Because of its species' richness, endemism and ecosystem diversity, under the Convention on Biological Diversity Kenya is categorized as a mega-diverse country (Ministry of Wildlife and Tourism 2007).

Kenya is called the „Home of Safari" for many decades and has been attracting tourists and adventures from all over the world. On one hand the broad diversity in landscapes, human cultures and wildlife in Kenya features many chances for international tourism, economical and rural development and enhancing wildlife conservation. On the other hand differing interests of the economy, politics, communities and wildlife conservation practitioners cause various conflicts.

The political background of the country as well as governmental interventions influenced the development of the tourism and wildlife sector in many ways. They led to a diverse range of tourism offers and wildlife conservation programmes, but also caused and still cause conflicts regarding the economical, ecological and social sustainability of the sector. The challenges facing wildlife tourism and conservation in Kenya are many and varied. They include climate change, habitat degradation and loss, forest depletion, tourism market volatility, human wildlife conflicts as well as wildlife crime.

This report gives an overview of the development and current situation of the Kenyan tourism and wildlife sector – and tries to identify the most important economical, ecological and social impacts.

The economical impacts can be seen on the national as well as on the district or community level. Ecological impacts are identified regarding biodiversity and conservation of threatened animal and plant species, regarding the conservation of ecosystems and water resources. Social impacts are identified in particular on the community level: wildlife tourism and conservation causes changes and conflicts in the traditional way of life and land use systems.

Geographical and biological Diversity in Kenya at a Glance

Kenya shows a broad geographical, biological and cultural diversity within its borders. Around 25,000 species of wild animals and 7,000 species of plants have so far been recorded, along with more than 2,000 fungi and bacteria (Kenya Wildlife Service (II) 2010). This enormous range of species of plants and animals inhabit the country's varied habitats: crowded and colourful coral reefs, tropical rainforest, fertile highlands and icy alpine moorlands, snow capped peaks and vast savannah.

An important origin of Kenya's geographical diversity is the Great Rift Valley (figure 1), a natural divide that bisects the country. The rift valley is an ageold route for both human and animal migration. On the floor of the rift are a series of freshwater and soda lakes, each one supporting its own unique ecosystem. The rift valley is surrounded by volcanoes, calderas and mountains ranges.

Mount Kenya (5,199 m), East of the Rift Valley, provides equatorial snow - one of the world´s most rare sights. The surrounding highland forests and Aberdare ranges are alive with elephants, buffalos, Giant Forest Hogs and Bongo antelopes.

The northern plains are home to nomadic ethnical groups, who move with their camel trains following dry riverbeds across a great semi arid wilderness. In these plains rare species such as the Reticulated Giraffe, Grevy's Zebra and Gerenuk are found.

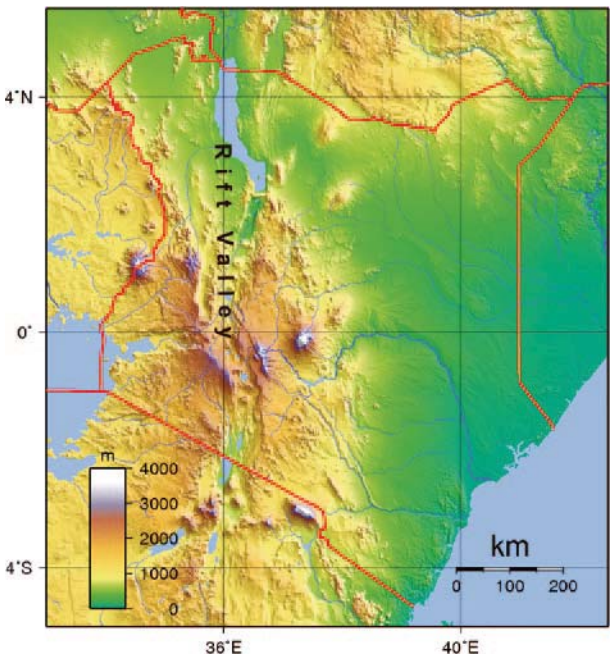

Figure 1: Topographical map of Kenya (http://reference.findtarget.com/search/Geography of Kenya/)

Figure 2: Map of the National Parks and Reserves in Kenya (http://www.unesco.org/water/wwap/case_studies/index.shtml)

In the south of Kenya Masai communities maintain a traditional way of life. The Masai Mara National Reserve with its open plains, grass- and woodlands and riverine forest supports many wild mammals like zebras, giraffes, gazelles and buffalos.

Further East the area the National Park Amboseli is located, where herds of elephants move across broad plains to wetland swamps. The vast National Reserves of Tsavo East and Tsavo West comprise 10 million acres of pure wilderness - with a considerable number of different endemic birds.

Western Kenya – around the western part of Lake Victoria – is covered with tropical rainforest. The lake is the home of the Nile Perch amongst others.

The Kenyan Coastline has palm fringed beaches and extensive coral reef systems with unique sea life.

In 2008 12.3 % of the total surface area was protected terrestrial area (284 areas) and 5.8 % protected marine area (11 areas) (World Bank 2010). About 7.7 % of Kenya´s total landmass are National Parks or Reserves: 22 National Parks, 28 National Reserves, 5 National Sanctuaries, 4 National Marine Parks, 6 National Marine Reserves (see also figure 3) (Ministry of Tourism 2010, Embassy of the Republic of Kenya 2009).

Famous National Parks and Reserves in Kenya are for instance the Masai Mara National Reserve, Amboseli National Park and Nairobi National Park.

History and Development of the Tourism and Wildlife Sector

Until 1957 Kenya was British-East African protectorate and the tourism and wildlife sector was mainly restricted to hunting tourism. The first National Parks (Nairobi, Amboseli, Tsavo and Mount Kenya) have been declared between 1946 and 1949 already, though. In 1948 the East African Tourist Travel Authority was founded and in the middle of the 1950s the tourism and wildlife sector began slowly to develop. The ecological potential of the country was opened up gradually for photography safaris. In 1963 Kenya became independent – and the economy,

tourism and wildlife sector began to develop rapidly (Job and Metzler 2003).

Yet in the 1960s Kenya had good assumptions for a further development of the tourism sector due to its already constructed infrastructure. At this time it was the governmental target to give the control of the economical development into the hands of the Kenyan companies. But from the beginning the government also supported the financial supply by foreign investors (Job and Metzler 2003). Important partners came from Europe and were owner of hotel projects for instance (e.g. Lufthansa and Steigenberger), so that a rapid further development of the touristic infrastructure became possible (Vorlaufer 1976). Nairobi developed to an international tourist centre and became the hub for all destinations in Eastern Africa.

In 1966 the government established the Ministry of Tourism and Wildlife. The Ministry was successfully focussed on attracting foreign investors: the tourist arrivals increased from 65,540 in 1964 to 446,000 in 1976 (Job and Metzler 2003). In 1968 the tourism sector accounted for more foreign exchanges than the export of coffee (Vorlaufer 1976).

The Ministry of Tourism and Wildlife as well as private investors were engaged in particular in and around Nairobi and in the popular conservation areas (e.g. Tsavo National Park, Masai Mara or Amboseli National Park).

Nairobi was the most important "gate" for international arrivals to East Africa until the 1970s. Also the transfer tourism was often combined with visits to nearby National parks (Job and Metzler 2003).

Since the opening of the international airport in Mombasa in 1978 Nairobi lost importance as the single touristic centre – and Mombasa was connected directly with the home countries of the tourists. In particular the transport to the coast of Kenya was reduced in terms of time and costs – and thus more attractive for the tourists (Job and Metzler 2003).

Due to the initiative of the government and benefits for foreign investors a new touristic centre developed in the coastal area North of Mombasa – and tourism started to concentrate more and more in the coastal area. The development of this economically peripheral area brought a number of jobs outside agriculture – mainly in the hotel industry in the centre of Mombasa (Job and Metzler 2003).

Because of negative publicity about the decrease of several wildlife species (Coupe et al. 2002), the Kenyan government prohibited hunting in the end of the 1970s, which caused a considerable decrease of tax income and a loss of employment in the hunting and hunting tourism sector. At the same time the Kenyan government declared five new National Parks between 1978 and 1983 – including two marine conservation areas. These areas were established with the expectation that enhanced park management would improve wildlife conservation and ensure sustainability. Nevertheless, the number of the species that attract tourists (e.g. elephant, giraffe, lion) continued to decline both within and outside the protected areas (Coupe et al. 2002). The declaration of National Parks also encouraged for further construction of hotels, to touristic snorkelling and diving offers and led to a development of mass tourism with partially negative ecological consequences (Job and Metzler 2003).

With the expansion of the mass tourism in Kenya the touristic offers also became more diversified. The combination of safari and beach tourism formed the development of tourism in the 1980th. In the following years the tourist arrivals increased steadily and by 1990 more than 800,000 tourists arrived in Kenya yearly (CBS 2001).

During the second Gulf war in 1990/1991 also the Kenyan tourism sector suffered from its impacts. In 1992 the sector observed another slump in tourist arrivals, because of unfavourable press: holiday visitors became victim of armed robbery (Vorlaufer 1996).

In 1994 the tourism sector had recovered and Kenya had already reached more than a million tourist arrivals per year. The sector accounted for more than 40% of the country´s GDP (Pearce 1995).

The rising number of visitors to Kenya had also consequences for the National Parks. To manage the biodiversity, to protect and conserve the flora and fauna the Kenyan Government established the Kenya Wildlife Service (KWS) in 1990 (Embassy of the Republic of Kenya 2009). But opposite to the Tanzanian government the Kenyan government had no interest in controlled tourism in the National Parks and Reserves and didn´t limit the numbers of visitors. Due to the landscape damages through mass tourism as well as the growing competition with South Africa and Namibia, the numbers of visitors to Kenyan National Parks and Reserves decreased within the second half of the 1990s. (Job and Metzler 2003)

The failure of wildlife and landscape conservation has resulted in the rise of an alternative approach – "community wildlife conservation" – in the 1990s (Coupe et al. 2002). Community wildlife conservation means the link between wildlife conservation and sustainable development using participation of local communities. The beneficiaries of wildlife conservation (the communities who life with wildlife) should get a greater opportunity to voice their preferences, needs and concerns about conservation initiatives. In this context a broad spectrum of community wildlife conservation approaches and programmes arose: community-based conservation, community wildlife management, community-based natural resource management and community involvement in wildlife tourism (Coupe et al. 2002).

In 1996 the (governmental) Kenya Tourism Development Corporation (KTDC) was established to enhance the touristic infrastructure and to coordinate the foreign and Kenyan investments (Embassy of the Republic of Kenya 2009).

Due to the Kenyan elections and an unfavourable press Kenya suffered a 60% fall off in tourism revenues between autumn 1997 and spring 1998 (Science 1998). The number of holiday visitors to Kenya dropped down from 820,800 in 1996 to 686,900 in 1998, but increased and became more stable again in the following years (Ministry of Tourism, 2010).

In 2002 the Tourism Trust Fund was established as a joint initiative of the European Union and the Government of Kenya - mainly to diversify the tourism by supporting ventures, projects and initiatives, and to create an enabling environment for sustainable tourism development (community- and eco-tourism) (Ministry of Tourism 2010).

Since the Kenyan elections and replacement of Daniel arap Moi in 2002, the country was considered to be one of the politically most stable and secure countries in Africa – and the number of holiday visitors and visitors to National Parks and Reserves increased considerably from 2003 to 2007.

In 2007 the tourism sector in Kenya had grown at historical highs. In 2007 the revenue was about 1 billion US$. Therewith the sector accounted for 10% of the GDP, making it the third largest contributor to the GDP after agriculture and manufacturing, and the third largest foreign exchange earner after tea and horticulture (TradeInvestKenya 2009).

Again in December 2007 presidential elections took place in Kenya and caused great irregularities and an escalation of brute force. The tourist industry was hit heavily by the events following the riots and the civil war between different ethnic groups: travel warnings of most European governments caused severe losses of tourist arrivals (Paesler and Job 2010). From 2007 to 2008 the volume of international arrivals declined by nearly 34% from 1.8 million to 1.2 million (including business visitors, visitors in transit and other visitors), the tourism receipts decreased by 19.2% to 52.7 billion K.Sh. (Republic of Kenya – KNBS 2009).

The riots came to an end in March 2008 and

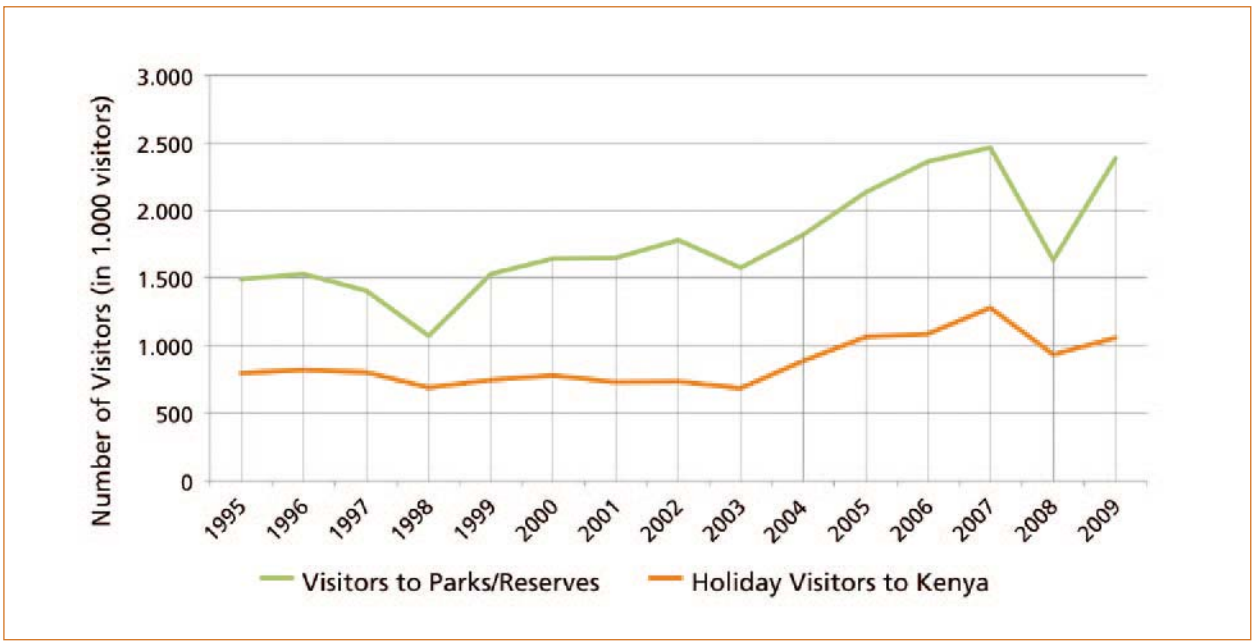

Figure 3: Development of the number of holiday visitors to Kenya and the number of visitors to parks and game reserves (Ministry of Tourism 2010).

since 2009 Kenya´s political situation is stable – and the international tourism is reclaiming its position as an important economical earner (TradeInvestKenya 2009).

Figure 3 shows the development of the numbers of holiday visitors to Kenya and the numbers of visitors to parks and game reserves from 1995 to 2009. The number of visitors to parks and game reserves includes also Kenyan visitors and is therefore higher than the number of holiday visitors. Further more it might be conceivable that also business visitors use the stay in Kenya to visit a park or reserve.

Economical Importance of the Tourism and Wildlife Sector

For many developing countries, like Kenya, tourism poses one of the most important sources of income (Vorlaufer 1996). Tourism is the second largest sector of Kenya's economy – and the wildlife sector forms the backbone of Kenya's tourism industry: most visitors travel to Kenya to view the wildlife.

The Kenyan tourism economy is ranked number 84 in absolute size worldwide, number 85 in relative contribution to national economies and number 88 in longterm (10-year) growth under 181 countries by the World Travel & Tourism Council (WTTC 2011).

The tourism industry in general accounts for 21% of the total foreign exchange revenues (Kenya Wildlife Service (I) 2010) and 11% of the gross domestic product (GDP) (Ministry of Tourism 2010). This number is comparable with percentage of tourism of the GDP in Spain, which accounted for 11% in 2006. In Germany the percentage of tourism accounted only for about 3% of the GDP in 2006 (OECD 2008).

In 2008 the international tourism receipts amounted to almost 1.4 billion US$. (To compare this number: The international tourism receipts of South Africa in the same year accounted for even almost 8.9 billion US$ and the receipts of Tanzania also almost 1.4 billion US$.) (World Bank 2010).

In 2009 almost 1.1 million international holiday visitors arrived in Kenya. In 2010 the tourism sector experienced an average monthly growth of 17% in tourism arrivals (Ministry of Tourism 2010).

According to the African Propoor Tourism Development Centre (APTDC) the Kenyan Tourism industry employs approximately

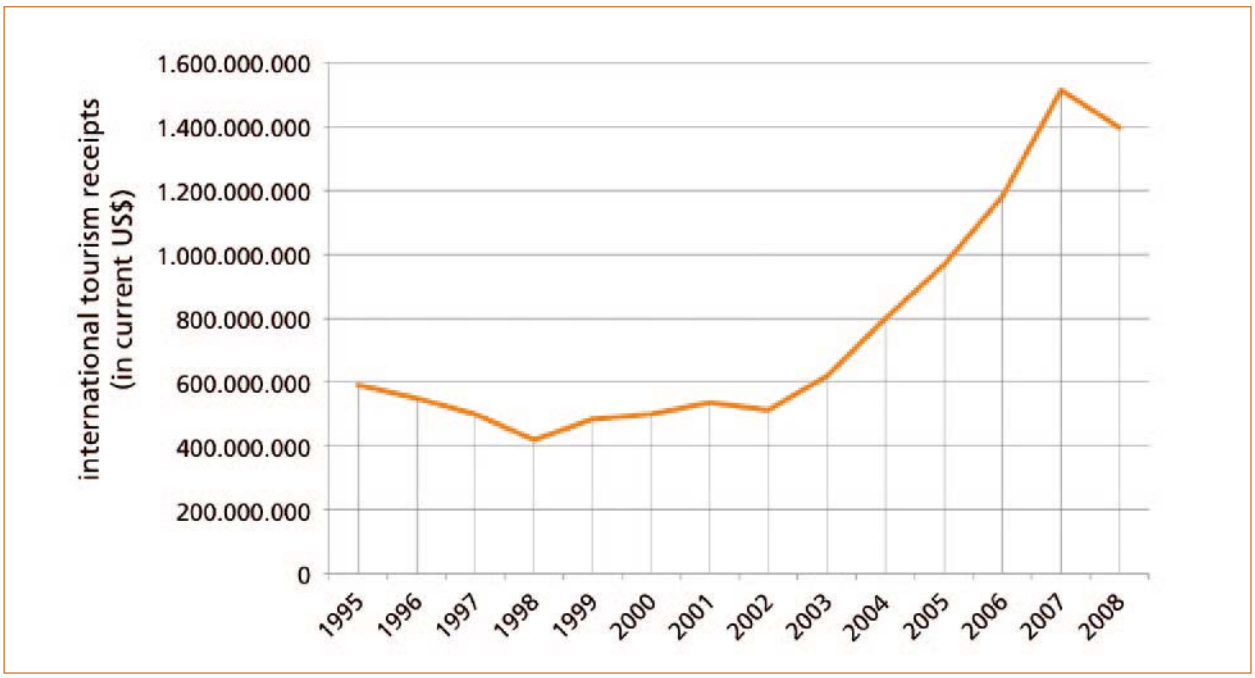

Figure 4: Development of the international tourism receipts from 1995 to 2008 (World Bank 2010).

500,000 people both directly and indirectly. It is also estimated that about 850,000 dependants relay on these employments for their livelihood (APTDC 2006). According to Kenya One Tours, a Kenyan Travel organisation, the tourism industry is providing employment to at least 400,000 in the formal sector and over 600,000 in the informal sector (Kenya One Tours 2010). The World Travel and Tourism Council (WTTC) announced a number of 439,000 jobs in the tourism sector in 2010, which accounted for 7.3% of total employment Kenya (WTTC 2011).

Wildlife resources contribute directly and indirectly to the local and national economy. In June 2006 wildlife accounted for about 70% of the gross tourism earnings and more than 10% of total formal sector employment (Ministry of Tourism and Wildlife 2007).

In 2009 National Parks and Reserves in Kenya recorded about 2.4 million visitors (international, African and Kenyan visitors) (Ministry of Tourism 2010).

Table 1: Economical data of the tourism and wildlife sector in Kenya at a glance (Kenya One Tours 2010, Kenya Wildlife Service, 2010, Ministry of Tourism, 2010, World Bank 2010).

Tourism Sector	
percentage of the the GDP	11 % (2010)
international tourism receipts	1.4 billion US$ (2008)
percentage of total foreign exchange revenues	21 % (2010)
number of holiday visitors (arrivals per year)	1.1 million (2009)
average monthly growth of tourism arrivals	17 % (2010)
number of formal employees (formal sector)	> 400,000 (2010)
number of employees (informal sector)	> 600,000 (2010)
Wildlife Sector	
percentage of gross tourism earnings	70 % (2006)
percentage of total formal tourism sector employment	10 % (2006)
number of visitors to National Parks and Reserves	2.4 million (2009)

Home Countries of the Tourists

During the last years most of the tourists who visited Kenya were Europeans (with a percentage of about 60 %), in particular from the UK, Germany and Italy – followed by Africans with 23 %, US-Americans with 9 % and Asians with 9 %, in particular from China, Japan and India. At this the developing markets in Eastern Europe and Asia are getting more and more important for the tourist and wildlife sector in Kenya (Embassy of the Republic Kenya 2009).

Institutions and Initiatives involved in the Wildlife Sector

The Kenya Wildlife Service (KWS) is currently responsible for wildlife conservation and management countrywide. This broad and centralised system has contributed to many challenges which are rescind today through a decentralisation to the lowest level in order to empower communities and other stakeholders to participate effectively in the conservation planning, implementation and decision making process (Ministry of Tourism 2010). An example of such an approach is described in chapter five.

Kenya Wildlife Service (KWS)

The Kenyan wildlife sector is managed by the Kenya Wildlife Service (KWS), which was formed in 1990. The objectives of KWS are to built partnerships to conserve biodiversity and to ensure the custodian´s benefit, to take a lead role in developing sustainable nature tourism with maximizing the economic benefits to the nation and minimizing its negative effects. The community wildlife program of KWS in collaboration with others encourages biodiversity conservation by communities living on land essential to wildlife, such as wildlife corridors and dispersal lands outside parks and reserves (Kenya Wildlife Service (I) 2010).

At a regional and community level the KWS is heavily discussed. The main problem pointed out is the poor relationship and communication between KWS and the local community. KWS is generally considered to be supporting wildlife at the expense of people´s livelihood assets and strategies, particularly since there is no compensation for wildlife predation or crop damage (Coupe et al. 2002). To ensure the success of the joint ventures between community groups and wildlife agencies considerably more support needs to be given to build local institutional capacity.

Tourism Trust Fund (TTF)

Tourism Trust Fund was established as a joint initiative of the European Union and the Government of Kenya in 2002. One of the key objectives of the fund is to diversify the tourism by supporting new and existing ventures, projects and initiatives, and to create an enabling environment for sustainable tourism development and enhanced quality. This involves identifying and supporting Community Ecotourism and funding community tourism projects.

From 2007 to 2010 TTF has funded ecolodges and camps, tourism management plans, cooperative projects between wildlife conservationists and communities, handicraft workshops and cultural centres. To date a total of 260 million K.Sh. has been distributed to community projects in various parts of Kenya.

The TTF funds have been used to develop and upgrade lodge facilities, conserve and protect local flora and fauna and develop new activities and experiences for tourists. The funding has also been used to develop tourism plans for areas such as Tana River, Western Kenya, Amboseli/Tsavo and Samburu (Ministry of Tourism 2010).

Impacts of the Wildlife Sector

Wildlife tourism in Kenya shows various impacts regarding the economical, ecological and social development of the country. The economical advantage of the sector also faces several economical, social or ecological downsides. Foreign exchange receipts, for instance, do not necessarily lead to regional development, poverty reduction and envi-

ronmental protection (Paesler and Job 2010). Two case studies in southeast Kenya from August 2000 showed that wildlife conservation had neither strengthened the livelihood of the local population nor significantly conserved the wildlife (Coupe et al. 2002).

To evaluate the sustainability of the Kenyan wildlife sector all three areas – the economical, the ecological and the social impacts – have to be considered.

Figure 5: Triangle of sustainability (own illustration)

Economical Chances and Risks

Economical Strength of the Country

Developing countries with a relatively high percentage at the global tourism market – like Kenya - are generally also among the countries with a comparatively high economic strength. In these countries the tourism industry provides a positive contribution for enhancing the countries balance of payments.

To assess the tourism as a positive source of foreign exchange, the net foreign exchange proceeds have to be observed, though. (Net foreign exchange proceeds are the foreign exchange proceeds excluding all imported services, e.g. interest rates for foreign credits, for imported goods for the tourists etc. The more luxury facilities are constructed the less net foreign exchange proceeds remain in the country, because for those often foreign products and foreign skilled personnel are required. (Vorlaufer 1996) This might also be the case in Kenya. Foreign tourism companies, like international (luxury) hotel chains and airlines, use the touristic potential in Kenya.

In many developing countries the net foreign exchange proceeds increased gradually, because the import of goods and services for the tourism could be substituted by inland production. Often the inland markets expand due to the additional touristic demand, so that the development of the inland production become more profitable and the dependence on imports decrease (Vorlaufer 1996), which might apply to Kenya too.

Kenya is depending strongly on the tourism industry, which can lead to economical problems during a crisis. For instance the post-electoral riots in Kenya in 2007/08 resulted in heavily declining tourist arrivals, and showed the problems, that may emerge from the sole dependence on tourism in case of an exogenous crisis (Paesler and Job 2010).

Potential Creation of Income and Employment

The tourism industry counts as a labour-intensive and less capital-intensive sector. That means that comparatively little capital investment can create relatively many jobs. Tourism in general - as well as wildlife tourism - does not only create jobs directly involved in the sector (e.g. employment in hotels and restaurants, parks and reserves). Due to the increasing demand of goods and services also induced jobs (e.g. agriculture as a supplier of restaurants) are created (Vorlaufer 1996).

The (wildlife) tourism offers also paid jobs for women, who are otherwise disadvantaged on the job market. In many developing countries women account for a high percentage of hotel employees and are often involved in the production of traditional handicraft (Vorlaufer 1996).

Economical Potentials of Wildlife Tourism for local Communities

Wildlife Tourism and Conservation provides a number of income sources for local communities. For example there is a potential income, particularly for women, for example from selling handcrafts and offering other tourism activities. However, this income may not reach the women involved. Up to 70% of the income is reportedly hived off by tourist guides, security guards and van drivers for example. (Southgate and Hulme 1996b, quoted in Coupe et al. 2002, page 23)

The "community involvement in wildlife tourism" is a strategy for diversifying rural economies and creating new enterprise opportunities. The target is to create a motor for sustainable development through a redistribution of the revenue of wildlife tourism back to the local communities – either directly to individuals, usually in form of employment, or via community livelihood initiatives.

Nevertheless, wildlife tourism as a strategy does have specific limitations. One is the leakage of total tourism expenditures out of the country (Smith and Jenner 1992, quoted in Coupe et al. 2002). The other limitation is volatility of demand, for example when the country suffers a fall off in tourism revenues due to riots or unfavourable press. Further potential limitations, such as unequal distribution of revenues, creation of low-skilled employment, limited participation and control remaining with outsiders, intrusion and cultural disruption, can be attributed to most projects promoting new economic activities as well as tourism (Coupe et al. 2002).

Case Studies in Kenya

In spite of the high level of income involved in wildlife tourism in Kenya, the financial benefit to local people is limited. Wildlife tourism – while a major economic factor at the national level – does not make a significant contribution to district economies (Southgate and Hulme 1996a, quoted in Coupe et al. 2002).

The expected benefits from wildlife conservation for the development of wildlife tourism - like increased income, promotion of local capacity development and improved services and infrastructure – have not been observed in the case studies by the ITDG (Coupe et al. 2002). This can – among other things - be attributed to the lack of marketing and promotional skills in (wildlife) tourism of the local people. They put these matters in the hand of outsiders, who then benefit from the revenues.

In programmes of the KWS for example the revenues are to be shared with the local communities involved. The case studies by the ITDG showed that the revenues were not sufficient to sponsor every community, which applied for revenue sharing. Further more a few community members in these case studies have been recruited as KWS wildlife scouts with a monthly income of 2,000 K.Sh. During the case study (in early 1999) they had not been paid for the previous seven months, though.

A positive example for a redistribution of revenues to communities within the case studies was the support of the Porini Initiative: The initiative paid a rental fee of 350,000 K.Sh. per year (at an increase of 10%) for the lease of the conservation area and also donated money for a school building, hospital bills and the wildlife scouts´ uniforms (Coupe et al. 2002).

Living with Wildlife

Living with wildlife brings negative effects on food security and income for the local people. Wild species prey for livestock, injure people, compete with livestock for natural resources and destroy crops. In many cases in Kenya there is no individual compensation for damage to crops or stock loss. During the case studies by the ITDG forty-nine cows were paid in compensation for the loss of a live through wildlife conservation. But crop damage through wildlife was not compensated (Coupe et al. 2002).

Further more, the expansion of cultivation in

the wildlife areas is further attracting wild animals (Coupe et al. 2002). Thus, wildlife conservation and living with wildlife is attended by a number of negative effects on food security and income for the local population.

Ecological chances and risks

Currently, of the total area of Kenya of 582,646 km^2, national parks and reserves cover 44,562 km^2, which is about 8% of the country (Ministry of Tourism 2010).

The process of establishing national parks and reserves in the past has not been inclusive of communities´ view and interest. Today, through the management of different institutions on a national level (KWS) and on a local communities level together with different international non-governmental institutions (NGO´s), a first awareness of the importance of ecosystems has been established. Through the development of monitoring systems and the establishment of guidelines in order to protect the ecosystem, the conservation areas (CA) and the national parks are increasing in numbers. The problem is found outside the CAs, which are largely under the control of private owners and communities. The cooperation between these and the KWS is essential for the success of conservation activities, as the majority of these lands is subjected to a multiplicity of uses, some of which conflict with wildlife conservation. Wildlife has critical ecological functions that are important for the interconnected web of life supporting systems. Significantly, Kenya's major water towers are found in wildlife-protected areas. Wildlife also has sociocultural and aesthetic values. Indeed any adverse impacts on the ecosystem can dramatically and negatively alter humans' capacity to survive (Ministry of Tourism and Wildlife 2007, Coupe et al. 2002).

With increasing number of tourists per year the ecosystem in Kenya is endangered because of over-exploitation of natural resources such as water and land for the production of plants and animals products. Correlated problems to this trends are overgrazing and the spread out of unpatable herbs and shrubs, expansion of cultivated areas increasing the competition with the wildlife. Other problems for the ecosystem are the construction of hotels facilities, the increasing amount of waste produced and the disturbance of wildlife due to safari-tours.

Despite many problems tourism has enhanced the awareness of the country to protect the environment being the living medium of many plants and animal species, which represent the main targets of tourists. With economic benefits attributed to the ecosystem there is a great potential to preserve nature.

Social Chances and Risks

With the expansion of population, people and animal increasingly find themselves in conflicts over land, food and water. The tourism development in Kenya contributed partly to this problem with the establishment of national parks and reserves, which has led to conflicts with the native population living in the areas. Moreover, the ban of hunting in 1978 and the fact that over 70% of all wildlife is living outside the national parks has lead to a high competition between these two groups in the last decades (Eriksen et al. 1996). Wildlife moves freely out of parks into pastoral land, spreading diseases to livestock and often causing stock and human deaths. Farmers near the Tsavo East National park have lost an average of 2.4% of the total herd per annum (Petterson et al. 2004), which represents 2.6% of their economic value and amounted to US$ 8,700. Farmer plots are destroyed by elephant, buffalo and other wild herbivores and in general water and land competition has increased. As a response to these problems, local communities poached and poisoned wildlife and enclosure water sources and pastures. For the loss of crops and livestock through wildlife the farmers are not receiving any compensation from the authorities. A second aspect, which leads to an increased human-wildlife conflict, is the shifting from nomadic pastoralism to semi-nomadic sedentary systems were people

relay not completely on the livestock producing but also on land cultivation (Coupe et al. 2002).

Tourism is playing from an economical point of view an important role for the Kenyan government. Only in the last years the awareness of rising problems on the community level has been of interest for the authorities. The potential of tourism to alleviate poverty in rural areas is very high due to job creation and so reducing migration to cities, infrastructure improvements like schools, hospitals, roads and additional income possibilities for rural people, who represent the poor in Kenya. Some action has to be accomplished to ensure a better livelihood for local people and promote tourism at the same time. The followings key points summarise the main important actions (FAO 2007):

- Compensation systems for farmers who lost crops or livestock through wildlife
- Insurance programmes
- Incentive programmes (subsidies)
- Physical barriers around crop fields or reserve borders
- Eco-tourism bringing employment to the rural people and better sharing of income from tourists
- Conservation education for local people
- Improve information sharing and promote the dialogue and cooperation among different stakeholders

The best scenario would imply integrated community development and wildlife conservation promoted by national park managers and supported by local population. Community-based conservation should give indigenous people the right to limited and sustainable use of natural resources while promoting tolerance towards wildlife and responsible interaction with their natural environment

Case Study of a Wildlife Reserve

The Eselenkei group ranch is situated in the Kajiado district, a few kilometers north of the Amboseli National Park. The group ranch, which was founded in 1979 has an area of 74,974 ha and is owned by about 1,200 members who are registered as the legal owners of this area. Because of the geographical situation near the national park of Amboseli, the Eselenkei group ranch is facing on the community and regional level all the problems related to wildlife explained above.

Since 1997 the group ranch is collaborating with an eco-tourism company, the Porini, which is an UK-Nairobi based private developement agency. The aim of the Porini eco-tourism project (PEP) is to bring additional income possibilities to the community, to avoid dependence on pastoralism alone with promoting a low tourism strategy compared to the mass tourism promoted by the government of Kenya and at the same time conserve the wildlife. Among the main problems of the group ranch, water scarcity due to the semi arid conditions, and diseases outbreak in the livestock population seem to be the most severe ones, which could have been alleviated through the project (Coupe et al. 2002).

From an economical point of view the community benefits from a fee that is paid for the lease of about 16 ha, which were transformed in a conservation area. Other income improvements for the community are guaranteed through gate fees and bed charges paid by tourists that visit the conservation area. About 26 people of the community have been employed and some 20 persons are working as seasonal workers for the tourism enterprise. The group ranch committee uses these earnings to support different community livelihood initiatives such as the construction of schools and the maintenance of boreholes. The community benefits from improved infrastructure systems such as a road network which was constructed for the tourists to reach the conservation area while

used from the community to reach the local market. The additional income was used on an individual/family level to cope with disease problems in livestock buying vaccine or improving the living conditions of the animals in general (Coupe et al. 2002).

The construction of three water pans and two bore holes had positive effects for the community being now able to face drought periods and for the wildlife which is not competing for water sources with the livestock.

Negative aspects through the establishment of the project at the community level are seen in the unequal distribution of benefits such as employments or accumulation of savings by individuals, which lead to social differentiation beyond traditional realms. The intrusion into different social realities through tourism and its social impacts is an aspect that needs more attention for the future.

Overall this pilot project shows that the active collaboration and integration between the group ranch community and the ecotourism project can provide economical and social benefits, prevent human wildlife conflicts although some negative related social aspects have to be taken into account.

In Kenya the community based tourism concept is just taking root and there is a need to harness this product and direct it towards the market in a more cohesive and systematic manner.

Conclusions

The Kenyan tourism and wildlife sector is a very complex subject influenced by many different and interlacing factors – and could be observed in this elaboration only along its general lines.

The Kenyan economy is depending considerably on the tourism and wildlife sector. The sector accounts for an important percentage of the countries GDP and the total foreign exchange revenues – and is also an important source of income and employment for the local population. Nevertheless, the tourism revenues do not remain completely in the country. A high percentage of the income is realised through foreign companies, such as international hotel chains and safari contractors. On the other hand the inland production of goods and services is possibly developing gradually to meet the rising demand of tourism – and therefore might strengthen the countries economy sustainably.

On the local level the chances of the tourism and wildlife sector are facing several risks, such as insufficient participation of local communities, short redistribution of revenues back to local people and barely compensation for negative effects of wildlife tourism and living with wildlife. Hence, sustainable programs for participation of local communities involved and affected by the tourism and wildlife sector are needed – including capacity building (education) of local people, adequate compensation for negative effects, fair prices for local products and services.

Negative impacts of the wildlife sector might also arise due to conflicts of aims in the activities of the Kenya Wildlife Service (KWS). The governmental institution is on one hand responsible for the management of National Parks and Reserves (economical interests) and on the other hand for the conservation of biodiversity and endangered wildlife (ecological interests).

Though, throughout Kenya there is a growing awareness of the benefits of community based tourism projects. Communities that have allowed access to their land have seen their lifestyles improving through increased revenues and wages, land leases and development funds. Examples of project initiatives have built boreholes, schools and clinics for the local community – and thus showed that a positive approach is possible.

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Masai Herders and Valentines Roses - the Flower Water Conflict

by Nancy Lira Valdes

Water resources are declining at an alarming rate in the world. The use of water resources for agricultural production has contributed to the rapid decline in quantity and degradation of water quality. Though sustainable agriculture must be economically viable, ecologically sound and socially responsible, water scarcity has challenged the sustainability of agriculture, especially in arid and semi-arid regions. There is a relative consensus among professionals that the increasing water scarcity through excessive use of water and mismanagement of the available water resources are major concerns for agricultural sustainability. Water has become an increasingly important determinant of agricultural sustainability, especially in arid and semi-arid areas of the world. Demand for water is increasing worldwide. The agriculture sector is known as the most dominant user of water in the world and in addition it is a primary source of provision and distribution of income in many of rural areas. However, the growing water scarcity and the misuse and management of the available water resources are major threats to sustainable development for the agricultural sector. So, as water scarcity intensifies in many regions of the world, better management of irrigation water is becoming an issue of paramount importance (Forouzani and Karami 2010).

Water in Kenya

Water scarcity in Kenya has been an issue for decades, as only a small percentage of the country's land is optimal for agriculture, and the year-round climate is predominantly arid. Kenya's natural water resources also do not provide an equitable delivery of water to the various regions of the country and the country's water basins do not reach an equitable area of the country. This leaves most of the population. Rapid urbanization has also pushed poor urban dwellers to the slums, where there is no water or sanitation, and overcrowding exacerbates the already hazardous health conditions. Kenya's water politics are also unique, as there has been a divide between areas that have been privatized and sectors where investors have been discouraged from developing. Rural areas of Kenya are left without water and urban areas aren't much better off, as Kenya's virtually bankrupt government does not have the funds to run pumping stations, and existing piping systems are often pirated and in disrepair. Lack of development here means a lack of piping, sanitation or tanker service. (Snyder 2010).

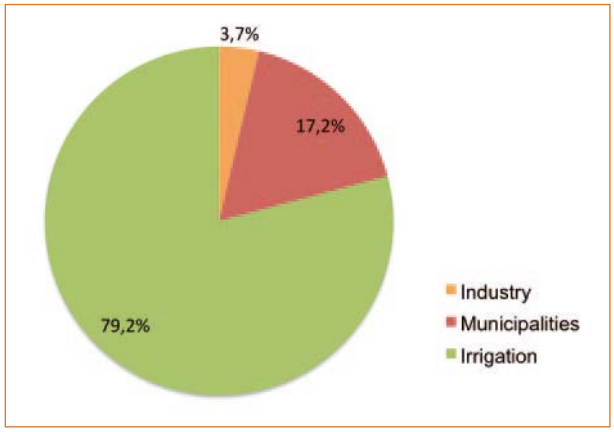

Figure 1: Total water withdrawal in Kenya, about 2.7 km³ per year. Agriculture is the main user of water and currently consumes about 80%, while municipal and commercial use accounts for the rest (Aquastat, FAO 2000).

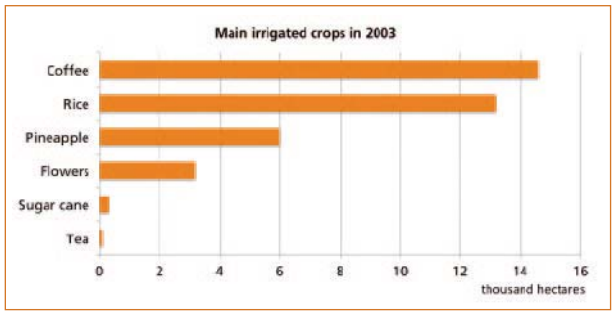

Figure 2: Main irrigated crops in Kenya in 2003, including coffee, rice, pinapple, flowers, sugar cane and tea. Flowers accounting for about 3.5 thousand hectares (Aquastat, FAO 2000).

Lake Naivasha

- Localization: West of Nairobi, outside the town of Naivasha. It is part of the Great Rift Valley.
- Surface area: 139 km².
- Situated at an altitude of 1,884 meters.
- Average depth of 6 m, maximum depth of 30 m.
- The lake is home to a variety of wildlife; over 400 different species of bird have been reported and there is a sizeable population of hippos in the lake.
- The human population in the area surrounding the lake has rapidly grown from 43,867 in 1969 to the current figure of about 250,000.

One of Kenya's big sources of freshwater is Lake Naivasha. The area contributes to about 70% of Kenyan flower exports, 15% of Kenyan electric power and is home to attractive tourist views. On one hand, Lake Naivasha is a success story, a profitable export business that has brought jobs to the area and wealth to Kenya. From a different perspective, it's a disaster. The farms rely on the lake for irrigation, and pipes run straight from the lake into the greenhouses. It is being drawn out faster than it can be replenished, and water levels have dropped considerably. In time, there just won't be any water left to drain out. The tragedy of Naivasha is not that it was developed, but that it has been developed unsustainably.

The area surrounding Lake Naivasha was occupied by the pastoralist Masai community prior to colonization of Kenya. In 1900 the Ugandan railway was built down through the Rift Valley and along the shores of Lake Naivasha. The centre that had begun as a tiny railway station grew into what is now known as Naivasha Municipality. In 1905, through a colonial agreement, the Masai were moved south of the railway line to make way for European settlement in the area. Most of the land around the lake was settled by Europeans who practiced mixed livestock and agricultural farming. Since independence in 1963 the area has witnessed rapid land use transformation from commercial ranching to a mixture of commercial ranching and rapidly growing smallholder (rural and urban) settlements. The changes in land use since independence have led to rapid growth in population, human settlement, intensive commercial farming, tourism and geothermal production. Nowadays, floriculture forms the main industry around the lake. However, the largely unregulated use of lake water for irrigation is reducing the level of the lake and is the subject of concern in Kenya. Fishing in the lake is also another source of employment and income for the local population. As a result the area has witnessed a high increase in demand for the scarce environmental resources and services (for example water, sanitation and forestry) leading to unsustainable utilization of the lake (Mireri 2005).

Rose Farming

85% of all roses sold in the UK come from Kenya. In 2008, 93,000 tonnes of flowers were exported. About 97% of exports are to the EU. The following year President Mwai Kibaki's government warned that nearly 10 million people – more than a quarter of the population– were at risk from food shortages (Vasagar 2006). Since the 1980s, industrial horticulture and floriculture farms in Kenya, centered for the most part in the Lake Naivasha region and they have grown into the largest suppliers of flowers to the European market. They ship more than 88 million tons of cut flowers a year, worth some $264 million. Many of the large horticultural and floricultural farms surrounding the lake were once farms owned by European settlers, but are now owned by their descendents, wealthy Africans and/or international interests. On the slopes of the lake's basin, the aftermath of the resettlement schemes continues to unfold, with land being increasingly subdivided as Kenya's population con-

tinues to grow (Food and Water Watch 2008).

There are quite a lot rose farms in Kenya, which are mainly western owned and who export the roses into European countries every day. Some of these farms are: Batian Flowers, Upendo flowers, Lobelia farms, The real flower company, Rose Path Petals, Athi Harvest, Sian Roses, Oserian roses amongst others. Kenya has become the European Union's biggest source of flower imports and overtaken Israel as market leader. The major market for Kenyan flowers is Holland with 65% of all the Kenyan flower exports through the Dutch auctions. The Netherlands, which dominates the trade in cut flowers worldwide buy flowers and through its auction halls Dutch wholesalers, buy flowers for re-export to markets as far away as the United States and Japan. But direct exports to the UK also account for a quarter of Kenya's sales to the EU, making it the country's second market and one that many growers focus on (Embassy Republic of Kenya in Japan 2011).

Main destinations for Kenya Flowers:

- Holland (major proportion re-exported) 65%
- Britain 25%
- Germany 5%
- France 2%

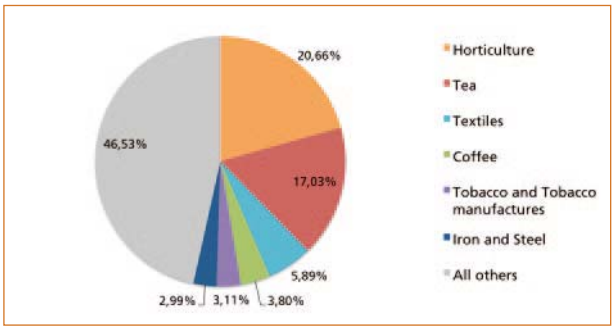

Figure 3: Kenya's export share of horticulture, accounting for 20.7% of the total export products (Kenya's Export Promotion Council, 2008)

In the agricultural sector, floriculture in Kenya is the second foreign exchange earner after tea bringing in more than $250million per annum and employing 50,000 to 70,000 people directly and more than 1.5 million indirectly. The sub sector has also recorded the highest growth in volume and value of cut flowers exported every year. It has had a growth rate of 35% annually in the last 15 years. The area under roses is expected to keep increasing every year (Embassy Republic of Kenya in Japan 2011). The people who defend the import of roses from Kenya do so because they say it provides money and jobs to the local people. However, the benefits are transient and superficial. At current rates of extraction the lake will be gone in 10 years (Kenya Flower Council 2011).

Water Problem

Three factors have led to the precipitous decline of the lake. More than a dozen invasive species have been introduced to the lake and they have restructured and simplified the food web. The destructive Louisiana crayfish for example, has eaten every blade of greenery and every slow moving animal under the surface of the water. The unsustainable extraction of water for agriculture, horticulture, urban and residential water supplies is sucking the lake dry, and as a result, crucial riparian swamp vegetation has been destroyed by large grazing herbivores able to access it as the lake level declines (Earth Watch Institute 2006). Water levels in Lake Naivasha are decreasing constantly as we can see in figure 4 that shows the water levels from September 1936 up to September 2009, plus the predictions for 2010.

There is growing evidence that irrigated horticulture around the lake is the main responsible for this reduction. But also the factors just mentioned above are responsible. It is said that the water from Lake Naivasha is transferred to the flower and fruit crops and then exported, largely to the United Kingdom and elsewhere in Europe. This global phenomenon is called the virtual water trade. This is the practice of using your water to produce or grow what you then export, effectively meaning that you are exporting water out of local watersheds "virtually."

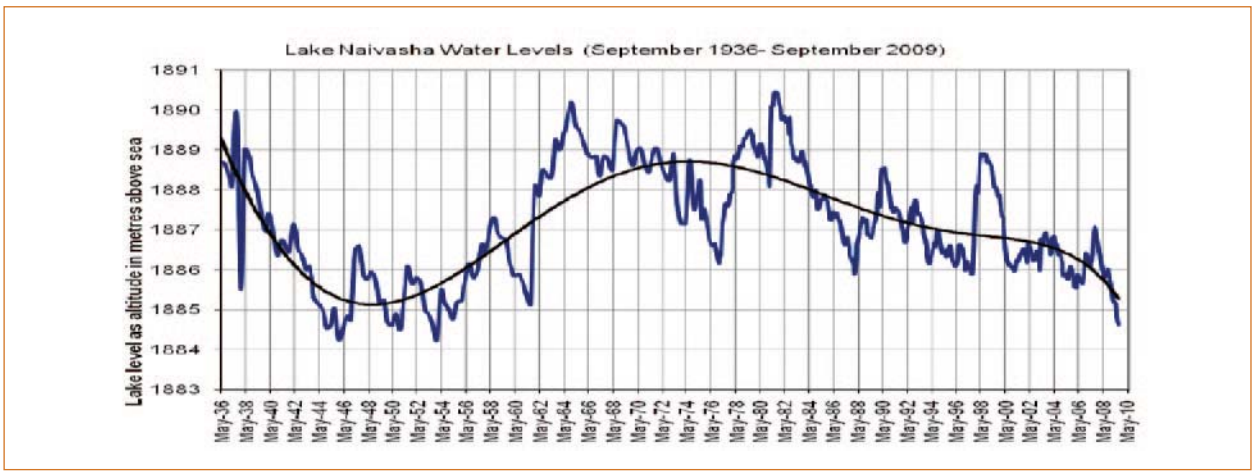

Figure 4: Annual fluctuations of the water level of Lake Naivasha since 1936 (Ndetei 2010)

Close to 20% of all daily domestic water use is exported out of watersheds around the world every day and is a major cause of water depletion. In this case, Europe is trying to save its own water because the rose growing business is water intensive. But in protecting its own water supplies, Europe is destroying the watersheds and futures of Africa. According to Severino Maitima, director of the Ewaso Ngiro River water authority: "The flower companies are exporting our water. A flower is 90% water. Kenya is one of the driest countries in the world and they are exporting water to one of the wettest (Food and Water Watch 2008).

It is estimated that the total area under commercial irrigation around the lake is between 3,000 and 5,000 ha with farm sizes of over 5 ha. Also, there are large farms of over 60 ha, which are engaged in flower production. The rapid growth of population and the associated (particularly unplanned) human settlements have led to increased demand for environmental resources (water and land) and degradation (soil erosion; increased siltation and nutrient enrichment). Without adequate lake access, poor residents are left to get their water from communal taps and form long lines to do so. Cattle herders, such as the Maasai, can only bring their cows to a small section of the lake where there is still public access – sharing access with women washing their clothes, hippos, and flamingoes (Food and Water Watch 2008).

Conclusions

Sustainable management initiatives of the lake should focus on: institutional framework and human resources; monitoring of the abstraction of water resources; waste management, physical infrastructure; soil and forestry conservation and farming technologies. Lake Naivasha has immense potential for sustainable, small-scale agriculture and ecotourism that could protect both the lake and the livelihoods of the communities around it. But still, there is little hope; the government is supporting the production and growth of the flower sector. They are seeing revenues and employment opportunities while they are turning around and avoiding the water loss issue. Although there has been an increasing international pressure and signaling of the problem, flower companies are growing and as the government, they are also avoiding the water scarcity problem.

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Organic Farming and Fair Trade in Kenya

by Carlos Quiroz Dahik

Agriculture

After tourism, agriculture is the largest contributor (24%) to Kenya´s Gross Domestic Product (GDP), more than 50% of export earnings are contributed by agricultural products, such us: tea, coffee, tobacco, palm, oil, cashew nuts, sisal and pyrethrum. The exportation of fruits and vegetables is increasing (ITC)

Definition of Organic Agriculture

As this paper is based on Organic Agriculture, I have chosen the most relevant concepts of it - the first concept given by the FAO:

Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system (FAO/WHO Codex Alimentarius Commission 1999).

And second definition given in March of 2008 by the IFOAM:

Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.

In general both concepts are talking about the same things, about a sustainable agriculture. For my point of view one of the most important things about these concepts is that both concepts mention, the first one "opposed to using synthetic materials" and the second one "use of inputs with adverse effects". These parts of the concepts are closely related with the "Green Revolution".

Green Revolution

The Green Revolution began in Mexico in 1944 when the Rockefeller foundation and the Mexican government established a plant breeding station in NW Mexico. The objective was to develop new varieties of food plants and alter agricultural practices that greatly increase crop yields. In this year Mexico was importing wheat, but with the development of a new variety, in 1964 the country was exporting wheat to the world. Due to the success in Mexico, its technologies spread worldwide in the 1950s and 1960s (Muir 2010).

Some of the articles that stand up for the Green Revolution, argues things like: "Places like India and China that once feared famine have not experienced it since implementing the use of IR8 rice and other food varieties" (Rosenberg 2010), the same writer states: the major problems surrounding the use of these technologies here (in Africa) though are a lack of infrastructure, governmental corruption, and insecurity in nations.

On the other hand, as says Dr. Vandana Shiva "we must forget that these chemicals were designed for welfare, they are the ultimate weapons of mass destructions, every one of them came out of the war system, and now they are in our drinking water" (FLOW 2008).

Some of the results from the Green Revolution mentioned in the documentary FLOW are:

- One crop needs 5 to 10 times more water to dissolve de chemicals and produce the same amount of food.

- Birth defects in Mexico increase near agricultural areas
- Fertility declines throughout Europe primarily in areas with heavy pesticide use
- Tasmanian cancer rates shoot up 200% after heavy use of pesticides
- In Texas, toxicologists find high levels of Prozac in tissues of every fish they sample
- Industrial toxins travel in water and have been found in seals, whales, polar bears, fish and in the breast milk of Inuit mothers

Organic Development

It was in the early 1980s when the first pioneer organic training institutions were established. Meanwhile some horticultural companies started growing organic vegetables for export. Rural non-governmental organizations (NGOs), individuals and community-based organizations (CBOs) initiated efforts to promote the organic agriculture.

The government has not yet recognized the importance of organic agriculture through its policies; this sector is relatively small but fast growing and led mainly by civil society organizations (CSOs) and the private sector. Organic products, mainly vegetables and fruit produced on large scale farms, have been exported from Kenya on the last two decades. Nowadays other products like essential oils, dried herbs, spices, and products for the cosmetic and pharmaceutical industries are been produced or collected. In the year 2005 the Kenya Organic Agriculture Network (KOAN) was formed to support the successful growth of the sector. UNEP/UNCTAD (2006).

In Kenya there are four main certifiers operating: the Soil Association (SA) from United Kingdom, EcoCert International from France, Institute of Market Ecology (IMO) from Germany and Bio Suisse. A national certification body EnCert was established in 2005 to certify the national markets.

Organic Marketing in Kenya

The organic markets are growing by the 15-20%, mostly in the vegetable sector. This shift has been pushed by widespread cultivation of vegetables along polluted rivers with a risk of heavy metal contamination. Also there has been rapidly increasing of herbal clinics all over the country with the same message, eat local, traditional organic foods (KOAN 2010).

The value of the organic market in Kenya is estimated to have reached 10 million Kenya Shillings (90,000 Euros) worth in annual turnover. Supermarkets, hotels, lodges and restaurants have shown interest in organic products. For example, the restaurant Bridges Organic Health Restaurant serves organic food and is situated in the heart of Nairobi (KOAN 2010).

Future Prospects

In the past, organic agriculture training had been focusing on food security and sustainability at household level, now the focus is to build capacity of producers so they can develop organic business enterprises that meet the exacting demand of the market place nationally and regionally.

Some of the topics of the capacitating are: farming planning, record keeping, logistics, selection of enterprises depending on the advantages of the locality, also encouraging women to participate in the training.

Main objectives of KOAN:

- Marketing: create motivation in the producers, by finding markets.
- Certification and standards: constantly improve the standards or organic producers, and certified more producers.
- Training: proper training to meet organic standards (actual and new producers)
- Extension and information exchange: provide the latest information about organic production to the farmers.

- Networking: create events that allow Kenyan Organic producers to meet potential customers, and also to get to know each other, and know what they all are doing.
- Policy and advocacy: non organic products have big budgets for advertising; KOAN will continue fighting to achieve more right that stimulates the organic production.
- Production: maintain actualized the advancements in organic production.

Acronyms

CBOs Community Based Organizations

CSO Civil Society Organization

EU European Union

FAO Food and Agriculture Organization of the UN

GDP Gross Domestic Product

Ha Hectare (10.000 square meters or 2.47 acres)

IFOAM International Federation of Organic Agriculture Movements

IMO Institute of Market Ecology

ITC International Trade Center

KIOF Kenya Institute of Organic Farmers

KOAN Kenya Organic Agriculture Network

KOFA Kenya Organic Farmers Association

NGO Non-Governmental Organization

OA Organic Agriculture; SA Soil Association

UN United Nations

UNCTAD United Nations Conference on Trade and Development

UNEP United Nations Environment Program

WHO World Health Organization

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Risk and Uncertainty - Climate-Index-based Insurance Systems for small Crop and Livestock Producers

by Kathrin Grahmann

Introduction

Adaption to climate change is an essential part for small farmers of the response to climate change risks. Climate-related weather extremes like floods, droughts, typhoons and other weather hazards are rising sharply and Africa has been considered to be one of the most vulnerable continents to climate change because of widespread poverty that limits adaptive measures of its residents (Akombo 2009). The adaptation to climate change is also important for the further development in Kenya. About 90% of all Kenyans are engaged in farming what leads to the statement that agriculture is the most vulnerable sector there. The conditions of temperature and rainfall dictate the performance of crops and livestock. Hulme et al. (2001) assumed that towards the year 2100 the temperature will increase by approximately 4°C. These extreme changes in temperature cause a shorting of the crop growing period what could result in losses that are estimated to be up to US$ 117/ha in 2030 (CEEPA 2006).

But there is a regional variation of the impacts of climate change. In eastern and southern Kenya, scientists expect a decrease in precipitation what leads to a reduction in agricultural production. In central and western Kenya, precipitation might increase, which would result in higher disease pressure because of higher humidity. The described situation has enormous impacts on small farmers because they are largely dependent on crop yields. The risk to fall into the poverty-trap is high, especially for nomadic pastoralists that do not practice agriculture. Another example of affected farmers is the dairy sector. 75% of all consumed milk in Kenya is produced by small famers. If the business will be affected by climate change and the population will be involved in a milk undersupply, there could be an increasing risk of malnutrition and hunger. Especially the poor economic situation of the government does not allow subsidizing and supporting affected famers.

The possible effects of global change on food production are not limited to crops and agricultural production. Climate change will have far-reaching consequences for dairy, meat and wool production mainly via impacts on increasing water scarcity and changes in the primary productivity of crops, forages and rangeland (Calvosa et al. 2007). Besides, there will be an increased spread of existing vector-borne diseases as well as the emergence and spread of new diseases. Another critical point is the loss of genetic and cultural diversity; the IPCC report 2007 assumed that 20-30% of all plant and animal species assessed could be at high risk of extinction. The climate-index insurance could be a real alternative for farmers to cope with climate-change caused risks, uncertainty and vulnerability.

Index-based Insurance

An index-based insurance is an insurance approach which does not require indemnification because a contract is written against a weather proxy or index such as rainfall, sunlight or temperature. If a chosen weather proxy exceeds a certain threshold, a payment is triggered.

This kind of insurance is designed around, for example rainfall data and if the rainfall amount is below the earlier agreed threshold, the insurance company pays out the premium to the farmer. The company does not need to visit the farmer's field to determine the premiums or to assess damages, they just have to observe the weather stations. Climate-index-based insurances exist as a crop index-based insurance for farmers

or as a livestock index-based insurance for pastoralists. It seems to be one of the most popular and promising insurance instruments to weather-related catastrophes with many advantages. So this kind of insurance system is more cost-effective to develop and to trade and it removes the "perverse incentives" of crop insurance where famers may actually prefer their crops to fail so that they receive a payout. But the outcome cannot be influenced by the insurer or policy holder, because it is not possible for an individual to influence temperature or rainfall in a certain area.

Case Studies: Crop index-based Insurance in Malawi

The first case study deals with the crop index-based insurance in Malawi. The involved organizations are the World Bank, the International Bank of Malawi and Rural Finance Corporation. Together, they want to provide an insurance against the lack of rainfall for groundnut farmers in Malawi. The success until now can be demonstrated by 900 farmers in four regions that already firmed the insurance contract, a full attendance of technical assistance and training for the farmers and an increasing productivity of groundnut yields, due to the fact that farmers could purchase hybrid groundnut seeds. The Malawi crop-insurance, but also works with micro credits because these farmers had little cash and no access to finance, they could not afford to purchase certified hybrid seeds. If there is a drought that triggers a payout from the insurance contract, the money will be paid directly to the bank in order to pay off the farmers' loan, because farmers have now received loans from OIBM (Opportunity International Bank Malawi Ltd) and MRFC (Malawi Rural Finance Company Ltd). The farmers have used these loans to purchase certified groundnut seeds. But the new introduced system implied also problems like the generalized presumption that all farmers use the same farming techniques and have the same soil type. The lack of education and knowledge may act as a barrier to develop the insurance scheme to a greater extent. So far, twelve countries have implemented a crop-insurance.

Livestock index-based Insurance in Kenya

The second case study addresses the livestock index-based insurance (IBLI). Currently there are only two projects of livestock index-based insurance worldwide: one in Mongolia and one in Kenya. The IBLI in Kenya is called "MARSABIT". Here the involved organizations are also the World Bank, the Financial Sector Deepening Kenya, the International Livestock Research Institute and the Equity Insurance that tried to find an insurance against the loss of livestock caused by drought or flooding for herders in ASAL (Arid and Semi Arid Lands). MARSABIT is a pilot project where farmers made contracts from March 2010 to February 2011 in the Kenyan Marsabit district and the achievements so far are promising: 2000 contracts were signed in the first month (Mude 2010). They used the NDVI (Normalized Differenced Vegetation Index) as an index to calculate and determine the insurance fees and premiums. The NDVI is a strong indicator to measure the available vegetation for livestock's consumption (Mude et al. 2009). The index threshold above payouts must be made is called strike level and the IBLI will compensate the farmer if the predicted livestock mortality is above 15%. These rates are applied to the value of the herd to be insured to give the amount that must be paid for the livestock insurance. The premiums in the upper Marsabit region are higher because the risk of livestock mortality is higher. As the risk is higher, the costs of protection must also be higher. Even now there can be found some problems like the low levels of literacy. Because of that, scientists and technical assistants of the IBLI developed a game for farmers where they can learn how the insurance schemes work. Another challenge is the low infrastructure, therefore farmers can use so called points of sale that will facilitate and provide the cash

transfer to the households. As the MARSABIT is a pilot, it is not sure yet, which kind of product the IBLI will be in future times. It can be sold as a commercial product on the real market or it could play a role in a productive safety net of development aid.

It is possible to insure different types of livestock: camels (1.4 TLU), cattle (1 TLU), sheep and goats (0.1 TLU) that will be transformed into Tropical Livestock Units (TLU). The total value of insured livestock is calculated by total number of insured livestock times the value of one unit of livestock, which is the replacement value of 1 TLU. The value of 1 TLU is 15,000 Ksh. For example, if you insure 10 TLU, the total value of insured livestock is 10 TLU × 15,000 Ksh = 150,000 Ksh. IBLI will only be sold within a specific time window that ends on February 28th 2010. Contracts must be sold within this time frame as the rainy season begins right after that may give the potential buyer information about the likely conditions of the season to come that would unfairly affect his purchase decision. Annual contract has two potential payout periods: At the end of the long dry season in September and at the end of the short dry season in February. At these points of time, if the index reads greater than 15%, the insurance company will pay out the clients.

Alternatives

There are other options for farmers to adapt to climate change in larger scales. The first idea is the credit guarantee scheme that is a contract in which the guarantor promises the lender to act as surety for the fulfilment of an obligation of the borrower. This encourages the financial institutions to lend to small farmers by means of reducing lenders´ risk and information costs and offers a managerial and technical extension service, besides this type of credit scheme strengthens good long-term relationships between them. There exists a program in Kenya by the Friedrich-Ebert-Stiftung since 1984. This guarantee scheme contains two stages consisting of different credit guarantee associations and of a counter guarantee fund established by the small farmer's enterprise finance company. The risk fund is financed from annual risk membership subscriptions of its members.

Another example of a non-traditional livelihood option that could increase the economic growth in arid and semi-arid regions are dry land commodities that are tree crops and shrubs that grow naturally and in abundance in arid and semi-arid areas. The interest and demand to use these plants is fast growing, especially in Africa. They are used for production of charcoal and firewood, e.g. Acacia senegal, Jatropha curcas or Azadirachta indica. Acacia is used for gum arabicum, forage, and food (seeds), Jatropha for oil and biodiesel fuel and A.

indica is also known as neem, an insecticide and human medicine. It seems that dry land commodities can potentially be used as sustainable source of alternative income.

Conclusions

It can be summarized that climate change causes an urgency to investigate and to introduce new innovative products like index-based insurance systems and programs that provide small farmers and livestock keepers alternatives to manage their risks. Index-based insurances can be an innovative opportunity for protecting farmers´ assets and livelihoods. They have a great potential to help protect people and livelihoods against climate shocks and climate risks. In Kenya, the IBLI is entering the implementation stage and can be seen as a sustainable tool for pastoralists to cope with livestock mortality, caused by droughts. Modern risk management strategies as IBLI can be provided through the collaboration of researchers, donors, government, financial institutions and insurance companies.

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Gender Differences – Different Roles in rural Areas in Kenya

by Timo Wilmesmeier

In Africa women produce nowadays most of the agricultural products. They produce 90% of the staple and 30% of the market crops. They provide 70 to 80% of the total workforce in agriculture but there are many economical, political, cultural and agricultural restrictions and inequalities.

The most important and serious problems for women in Africa are access to land, disadvantages concerning heritage and social-cultural restrictions.

Women's access to land and access to property are severely restricted by customs, which essentially exclude women from owning land. In fact, women only own 4% of land in Kenya. Even if women are able to acquire assets, their husbands often act as intermediaries in the transaction. Women experience a wide range of discriminatory practices, limiting their political and economic rights and relegating them to second class citizenship. The Kenyan Constitution grants equal protection of rights and freedoms to men and women, but only in 1997 was the Constitution amended to include a specific prohibition of discrimination on grounds of gender. Constitutional provisions allow only males to automatically transmit citizenship to their children. The Government has not passed domestic enabling legislation to implement international conventions on women's rights

The problem of gender differences in Africa has strongly been influenced by the colonial times. In the colonial era men were tax-burdened and because of this committed to work in mines or on farms. This led to fundamental structural changes in rural development. Traditional mixed cropping systems like millet and vegetables changed to maize monoculture. The colonial government didn't provide tax incentives for these nutritional cropping systems. The farmers were forced to convert to single-cropping-farming to gain enough revenue for paying school fees and medicaments for their children. They were able to sell maize for export products and use some for home nutrition, but the disadvantages of emaciating soils and malnutrition were only recognised after some years of cultivation.

After independence migratory work was still an important source of revenue for most of the men, but employment opportunities shifted from the rural areas (in mines and on farms) mainly to cities. Because of high living expensive in cities, it became more difficult for men to send enough money back home to their families. This development forced many women to take over jobs from their husbands. In consequence of the migratory work there is an imbalance of differentiation of labour, because women had to undertake the traditional male tasks of field cultivation and to learn immediately new cultivation techniques. Women had to bear more and more the responsibility for the whole production process. This also concerns the cultivation of typical male crops like manioc, yams and millet. But this did not result in more respect for women in society. Moreover there was still a lack of technical innovations in agricultural production for simplifying women's field work. The men still held power of decision in economical terms. They decided how to use the surplus and the profits from the harvest.

Women are also mainly responsible for household duties, and the pressures from HIV/AIDS, climate change, and other livelihood stresses require women to spend more time to collect water and fuel wood and care for the sick. Poverty among female-headed households is about five percentage points higher than among male-headed households, and is especially widespread in urban households headed by widows

Two essential restrictions in terms of gender gaps are the bride price and the customary

law. If a man pays a monetary price to marry a woman, he has more or less discretionary power of the woman. For statutory marriage, the minimum age for women and for men is 16 years, but for Moslem or customary marriages, there is no age limit. The percentage of early marriage is relatively low taking into account the fact that only a minority of the population performs statutory marriages. The customary law, a colonial construct to manage society, is another cultural restriction for women. This law is still widespread in rural areas in Kenya. It is a very rigid and statute law in terms of gender inequalities and social hierarchies. It concerns the pride price, unequal land use rights and unjust hereditary regulations. Most customary law disadvantages women, particularly in property rights and inheritance. Under the customary law of most ethnic groups, a woman cannot inherit land, and must live on the land as a guest of male relatives by blood or marriage. These traditional cultural restrictions are nowadays still widespread in rural areas of Kenya and many women suffer from this inflexible and rigid system.

Although nowadays in Kenya the number of boys and girls attending school is roughly equal at the primary level, men substantially outnumber women in higher education. Seventy percent of illiterate persons in the country are female.

Women make up for about 75% of the agricultural work force, and have become active in urban small businesses. Nonetheless, the average monthly income of women is about two-thirds that of men, and women hold only about 5% of land titles. Women have difficulties moving into non-traditional fields of work, are promoted less easily than men, and bear the brunt of layoffs.

Women Movements in Kenya

The nation's best known women's rights and welfare organization, Maendeleo Ya Wanawake („Development of Women" in Swahili) was established as a nonpolitical NGO during the colonial era, but now is aligned closely with the ruling party.

A growing number of women's organizations are active in the field of women's rights, including FIDA, the National Council of Women of Kenya, the National Commission on the Status of Women, the Education Center for Women in Democracy, and the League of Kenyan Women Voters.

Gender equality in Kenya is promoted by the National Policy on Gender Development from the year 2000. The Government is also in a process of developing a Gender Mainstreaming Implementation Plan of Action for the National Policy on Gender and Development, since the implementation of national Gender Policy needs to be strengthened. Women's participation in decision making at the household and national level has been found to be an important ingredient in development. The various plans and incentives show that there is rising awareness in Kenya towards gender equality.

Although women's participation in all aspects of societal life is increasing, it remains below that of men. In recent years there has been an increase in the number of women at local government level. In five years the percentage of women in local governments has increased by three percentage units.

It is recognised that a lot needs to be done to promote gender equality in local governance in Kenya. Institutional aspects are one part of this project and national wide efforts, implemented by the national government are needed. One crucial aspect is the implementation of laws that reflect gender equality and women's human rights. At the moment women's organisations are pressuring for the promotion of quotas for women. In the meantime Kenya is in a process of new Constitution formulation, where the equal treatment of men and women is expected to be included and highlighted in many ways.

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Preserving and adding Value: decentralized Solutions for post-harvest Handling and Food Processing in Kenya

by Gertrud Wohlfahrt

Introduction

Kenya is located in East Africa between Somalia and Tanzania and is bordering the Indian Ocean. Other than in most Western countries, agriculture plays still a major role in Kenya and is seen as the "backbone" of its economy. In 2010, the agricultural sector contributed 22% to the overall GDP of Kenya and employed - according to numbers from 2007 - around 75% of Kenya's labour force (Central Intelligence Agency 2011; KARI 2010; Kilambya 2004). "About 66% of the manufacturing sector is agro-based" and food processing is counted to the largest single activities within the manufacturing sector (EPZA 2005).

According to Jaffee & Gordon (1992) Kenya is an exporting high-value food commodities and successfully trades fresh vegetables to Western Europe, especially the UK. The success mainly comes from the demand for fresh vegetables by Western countries in "off-seasons" and the export of specialty fresh vegetables to niche markets (Jaffee & Gordon 1992).

In spite of the large agricultural production, frequent food shortages are prevalent as a consequence of post-harvest losses. In order reduce food losses and hence ensure food security and preserve the values of food, actions have to be taken (FAO 2010).

Post-harvest losses

According to the Food and Agriculture Organization (2010), a significant amount of food that is "produced in developing countries is lost after harvest, thereby aggravating hunger".

Causes of post-harvest losses

Total post-harvest food losses are estimated to range from 15% up to 50% of the total produce (FAO 2010). Causes for these losses are various: Wrong harvesting time; Excessive exposure to rain, drought or extremes of temperature; Inappropriate handling during harvest; Contamination by micro-organisms, pathogens (moulds & fungi) or pests (insects, rats & mice); Inappropriate storage, packaging and transport (physical damage from inappropriate tools or rough handling, chemical contamination). If food is not lost as a consequence of the mentioned causes, at least the value of the products will be reduced. These problems could be the result of uninformed farmers (lack of knowledge about proper food handling) or limited possibilities (e.g. no place for proper storage or money to buy machines). (Anonymous 2007; Bet & Nguyo 2007; FAO 2010; Irungu 2010; Kiburi Food Processors 2011; Kimondo 2008)

High post-harvest food losses can have a great impact. Firstly, food security could be in danger as food shortages and therefore hunger arises. Secondly, due to the losses, food prices are raising, as the demand is higher than the supply, with negative influence on rural poverty (FAO 2010; Hagenimana 2011). Thirdly, environmental degradation and climate change are driven forward as the "land, water, human labour and non-renewable resources such as fertilizer and energy are used to produce, process, handle and transport food that no one consumes" (FAO 2010). A lot of food that would be suitable for consumption is dumped in the Western countries, since fruits and vegetables are exported to Europe and cannot meet the general trade standards due to bruises, wrong ripeness, shape or size (FAO 2010).

Strategies to reduce post-harvest losses

To reduce post-harvest food losses and improve the competitiveness of local growers in the market, effective, affordable technologies and methods as well as provision of information and training are needed that will

preserve or add value throughout the entire food chain, especially from the point of harvest on (Bachmann & Earles 2000; Bett & Nguyo 2007; FAO 2010; Wongo 1997).

There are three main strategies used at the moment in order to reduce the bulk of food that is lost after harvesting and to add value to the harvested products: Commodity development, technology development, research, as well as knowledge management and training (Gebremedhin 2010; Bett & Nguyo 2007; Irungu 2010; KARI 2010).

The development of commodities includes the improvement of the productivity and profitability of crops by using different varieties or by developing varieties that are resistant or tolerant to pests and diseases (EPZA 2005; Gebremedhin 2010).

The development of technology includes the promotion of existing or innovative production and post-harvest technologies regarding food processing, storage, packaging and transport methods (Bett & Nguyo 2007; FAO 2010; Hagenimana 2011; KARI 2010).

Research, knowledge management and training include the communication of existing knowledge in order to make farmers understand the problems and possibilities. Furthermore, new knowledge is created by investing in research in order to find long-term solutions for prevalent problems. Finally, farmers have to be trained, encouraged and supported on how to utilize their knowledge in order to preserve and add value to their crops (Gebremedhin 2010; Irungu 2010; FAO 2010).

The FAO (2010) found out that food losses can significantly be reduced by adequate training and improved technology. In collaboration with the World Bank and other institutions, the FAO "has trained thousands of people in three continents to handle harvested food properly" (FAO 2010).

The Kenyan Agricultural Research Institute

An important role in the realisation process of the strategies for reducing post-harvest food losses plays the Kenyan Agricultural Research Institute (KARI).

It is a national agricultural research organisation of Kenya that consists of 36 research centers located throughout the country. KARI is doing research within agriculture sciences (e.g. development of improved crop varieties and crop management techniques [metal silos]) and veterinary sciences. KARI's food crops research "aims at developing, validating and releasing technologies (improved crop varieties management practices) to farmers. (An adoption) of these technologies by at least 50% of the target farmers will significantly increase food security, (reduce poverty) and thereby contribute to the national goal of improved livelihood of Kenyans (KARI 2010).

Examples of value preservation and value adding in Kenya

Grains (Maize)

As seen in the graphics below, the processing grain sector - especially maize - is one of the leading agricultural industries in Kenya.

Maize is Africa's second most important food crop, after cassava, and serves as basic food in Kenya (staple food for 90% of Kenya's population; Irungu 2010). About 75% of Kenya's maize production is done by small-scale farmers, while the remaining 25% of total maize production is contributed by large-scale farmers (EPZA 2005). It is estimated that around 30% of all produced maize is lost after the harvest (Irungu 2010; Kimondo 2008). Reasons for that are insect pests that are causing around 10-20% of the grain loss, microorganisms and fungi (contribution to losses: 5-10%) and diseases (5% of the grain losses).

Insect Pests in Maize

At its physiological maturity, the moisture content in maize ranges from 30-35%. When stored at this point, the heat and moisture provide ideal conditions for the development of insect pests and moulds. Common insect pests found in maize include the com-

mon weevil and the larger grain borer (see picture below; Bett & Nguyo 2007; Kimondo 2008; Wongo 1996).

Aflatoxin as a consequence of fungal invasion in maize

Aflatoxins are "toxic, carcinogenic by-products of fungi that colonise maize" and are poisonous to humans and animals (Anonymous 2010). From 2004 to 2006 about 200 Kenyans died after the consumption of maize contaminated with aflatoxin (Ngetich 2010). The government's Cereal and Produce Board buys contaminated grains at a reduced price and destroys them in order to prevent people from eating these infected grains (Anonymous 2010).

Post-harvest methods and technologies to prevent food losses in maize

There are different methods and technologies to prevent post-harvest food losses in maize.

Insect pests and fungal invasion for example can be reduced by drying (Anonymous 2007; Kimondo 2008; Wongo 1996). By keeping grain dry and cool by using aeration-cooling systems, insect development is retarded (FAO 2010). After harvest, the maize should be shelled and dried in the sun (see picture) for 3-4 days to prevent moulds. Further methods for reducing moulds as well as insect pests are: Sorting, removal of moulded and damaged cobs before storage, fumigation, pesticides, and chemicals to prevent aflatoxin development (atoxigenics). Not every method is suitable; especially the fumigation is not easy to do and very costly. The biological way of fighting against pests would be the use of natural predators (Anonymous 2007, 2010; Kimondo 2008).

Another way to eliminate insect pests, fungi and diseases is the appropriate storage management. It includes: Storage preparations (cleaning, disinfecting), a cool and aerated storage environment, storage in clean and closed containers (Anonymous 2007; Kimondo 2008). To protect grains physically from moisture, rats, and insects, metal storage-silos are promoted by the KARI and the Catholic Relief Services (see picture) (FAO 2010).

Fruits and vegetables

Fruits and vegetables comprise a significant portion of Kenya's horticultural products. Over 7 million tons of fruits and vegetables are produced per year. Most of the fruits and vegetables are exported, primarily to Europe (HCDA 2011; Jaffee & Gordon 1992). Due to inappropriate harvest and post-harvest handling, food losses of 30-40% occur (Kiburi Food Processors 2011). As the transportation by sea is cheaper than by airfreight, the fruits and vegetables need an extended shelf life and special care in order to prevent physical and other damage (HCDA 2011; Bachmann & Earles 2000).

Preserving value of fruits and vegetables

The appropriate post-harvest storage and transportation of fruits and vegetables that help to prevent post-harvest food losses include proper handling, cooling, packaging and sanitation. Different cooling methods can be used to slow down the ripening process and therefore reduce softening, textural and colour changes of perishable crops. Furthermore, cooling prevents spoilage and moisture losses during storage / transportation.

It is important to use the right packaging for perishable crops. Waxes can be used to prevent physical damage and the growth of moulds. Boxes not only facilitate handling of fruits and vegetables, but also prevent mechanical damage. The right transport / storage environment plays an important role as well. That is why special gases are used on fruits to keep them fresh. The use of disinfectants when washing the crops prevents post-harvest diseases (Bachmann & Earles 2000).

Adding value to fruits and vegetables

In order to add value to fruits and vegetables after harvest, the following post-harvest food processing actions can be taken: Drying, canning, freezing, production of fruit

jams and other products, e.g. fruit/vegetable juices.

These methods are also used to make fruits and vegetables available in off-seasons and to extend the shelf-life of fruits, e.g. by drying them (Kiburi Food Processors 2011; Wongo 1996).

Root and tuber crops (sweet potatoes)

The utilization of sweet potato in East Africa is quite narrow, even though this crop is serving as a classic "food security crop" due to its high nutritional qualities (Hagenimana 2011). Sweet potatoes are mostly consumed boiled or roasted. The biggest problem of this crop is that storage of the fresh crop is not possible and there are no wide-spread preservation methods. As a consequence, up to 50% is lost due to moulds and pest infestation during in-ground storage (Hagenimana 2011).

Methods to prevent post-harvest losses and add value to sweet potatoes

Besides the disadvantages and problems that the sweet potato brings with it the crop can be a great potential for exploring new markets and reduce poverty when handled appropriately and used in different ways. Post-harvest losses of the sweet potato can be reduced by improved crop management, i.e. development of improved varieties. To prevent sprouting, pest infestation and spoilage, sweet potatoes should be stored cool after harvest. Drying technologies, e.g. the production of potato chips as well as processing into flour could open the way for new markets (Hagenimana 2011; Wongo 1996).

Conclusions

Despite apparent successes, post-harvest losses still are a problem in many African countries including Kenya (FAO 2010).

High-quality and disease-free products with a good shelf life can be achieved with good production practices, proper post-harvest handling and storage management. Value-preservation and addition of crops can increase the food security and reduce poverty of the rural poor due to higher market flexibility, better marketing opportunities and therefore higher income of farmers.

In order to further succeed in reducing post-harvest losses in Kenya, more research and training is needed and improvement of knowledge on management is needed.

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