

Oasis of Loiyangalani Kenya Combat Desertification - Water Resources Management

Lorenzo Vallerini, Giancarlo Ceccanti

Abstract: The “OASIS ECOSYSTEM” project carried on by the *Water Right Foundation* (WRF-Florence, Italy), *Wings For Earth* (WFE - Principality of Monaco, France) and *Acquifera* (Florence, Italy) has been developed to promote and improve local economic development for the populations of Loiyangalani, village-oasis located in the district of Marsabit (north Kenya, along the Turkana Lake) by providing training and information for the management and protection of local ecosystem-resources.

The three main goals of this program are:

- 1) To protection the ecosystem-resources by increasing food productivity by a program of reforestation and the fight against desertification, to kick start economic self-sufficiency;
- 2) To reinforce the community and social-economic structure through:
 - a federation of ethnic groups;
 - promoting primary & secondary school education;
 - sanitary improvement;
 - improving food self-sufficiency;
- 3) To promote product yields and their differentiation: micro and medium credits.

The main interests of the “OASIS ECOSYSTEM” project are to:

- 1) Support the activities of the “NANYORI GREEN BELT” program, mainly in relation to the protection of the Loiyangalani Oasis ecosystem and to fight desertification in this area;
- 2) Realize a prototype of “new vegetation” finalized to widen the Oasis ecosystem, to increase food productivity for the local populations and to supply new areas of pasture for the domestic animals that effects of increment of the loss of ground are one of the main causes;
- 3) Enhance the water resources available both for potable and irrigation purposes;
- 4) Provide the know-how for the construction and management of water resources to the local populations, the area-prototype and other areas for new vegetation.

Keywords: oasis, ethnic-groups, soil ,vegetation, desertification, water

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Riassunto: L'associazione monegasca *Wings for Earth* (WFE) ha avviato nel 2006 un programma quinquennale di lotta alla desertificazione denominato *NANYORI GREEN BELT* per la protezione delle risorse e degli ecosistemi e per l'autosufficienza socio-economica, coinvolgendo direttamente istituzioni e associazioni avviando una incisiva azione di sensibilizzazione delle popolazioni stanziali e agro-pastorali di Loiyangalani (Turkana, Samburi, El Molo e Rendile), villaggio-oasi situato nel distretto di Marsabit, nel nord del Kenya, vicino al lago Turkana. Il programma *NANYORI GREEN BELT* punta ad attivare modalità di sviluppo economico locale, di formazione/informazione per la gestione e la protezione degli ecosistemi e delle risorse propri delle popolazioni.

Il lavoro svolto sino ad oggi dal programma ha avviato una azione incisiva di sensibilizzazione e coinvolgimento delle popolazioni locale ma non sono stati ancora affrontati i problemi e le questioni scientifiche di base che potrebbero realmente invertire la tendenza in atto (miglioramento della fertilità del suolo, piantagione di associazioni vegetali in grado di autoriprodursi, sistemi di piantagioni, incremento e gestine della risorsa idrica, ecc.).

Il progetto *OASIS ECOSYSTEM* della *Water Right Foundation* (WRF) costituisce, dunque, in partnership con la WFE, il supporto del programma *NANYORI GREEN BELT* sia dal punto di vista tecnico-scientifico con l'apporto di ricercatori ed esperti, che economico e/o di attivazione di fondi specifici dopo la redazione del progetto stesso.

Nelle sue linee principali il progetto mira a:

- Supportare l'azione del programma “NANYORI GREEN BELT” specificatamente in relazione alla protezione dell'ecosistema Oasi di Loiyangalani e alla lotta alla desertificazione;
- Realizzare un prototipo di rivegetazione finalizzato ad ampliare l'ecosistema Oasi, ad aumentare la produttività alimentare per le popolazioni locali e a fornire nuove aree di pascolo per gli animali domestici che sono una delle principali cause di impoverimento e perdita di suolo;
- Implementare le risorse idriche disponibili sia per finalità irrigue che idropotabili;
- Coinvolgere ed istruire le popolazioni locali nella realizzazione e nella gestione delle risorse idriche dell'area-prototipo e di altre aree rivegetate.

Durante la missione del 2008 fu individuata una situazione particolarmente critica riguardo alla disponibilità di acqua, per l'intera ed ormai esigua comunità degli El Molo (una delle etnie che popolano la regione nord del Kenia ai confini con l'Etiopia).

Gli El Molo, dediti da sempre alla pesca, vivono completamente isolati lungo le rive del Turkana senza alcuna fonte utilizzabile perchè l'acqua del lago a causa dell'alta concentrazione di fluoruri e di alcuni metalli pesanti, tra cui ferro e manganese, risulta essere assolutamente non idonea per il consumo umano.

L'inevitabile sfruttamento ai fini potabili di questa unica risorsa disponibile, per questa popolazione attualmente a rischio di estinzione, ha portato allo sviluppo di numerose patologie soprattutto a carico dell'apparato scheletrico oltre alle altre malattie legate all'inquinamento di tipo organico.

Ritornando nell'area nel febbraio del 2011, se possibile, abbiamo trovato una situazione ancora peggiore.

A seguito di una epidemia di colera la comunità El Molo, è stata letteralmente decimata e per questo le autorità locali grazie ad aiuti internazionali, in stato di assoluta emergenza hanno realizzato una condotta idrica alimentata da una sorgente distante ben 15 chilometri.

Ciò che è maggiormente indicativo di uno stato di cose realmente drammatico, è che l'acqua ha cominciato a scarseggiare anche all'interno dell'oasi per la oggettiva diminuzione della portata delle sorgenti e perchè un numero di persone sempre crescente, spinte dalla generale penuria d'acqua, si insedia in quest'area ormai troppo densamente popolata.

L'Oasi di Loiyangalani si è potuta sviluppare intorno ad un allineamento di sorgenti termali, e per una vasta area rappresenta effettivamente l'unico punto dove è possibile approvvigionarsi di acqua potabile, svolgere la pastorizia e provvedere ad un minimo di sostentamento.

L'Oasi si viene a trovare di fatto nel punto di raccolta di grande parte della rete di drenaggio del versante occidentale del Monte Kulal, rilievo costituito da un imponente scudo basaltico che supera i 2300 di altezza e costituisce il bordo orientale del grande bacino imbrifero tributario. Lungo questo massiccio montuoso si scaricano sotto forma di pioggia, le correnti umide provenienti dal lago che rappresentano una fonte continua di alimentazione per gli acquiferi alluvionali formati lungo i corsi d'acqua.

Lo studio svolto ha messo in evidenza la possibilità di reperire buone aree di ricerca in corrispondenza della parte sud occidentale dell'oasi, lungo uno uadi che lambisce il villaggio Turkana. Nei Paesi del Terzo Mondo ed in Africa in particolare dove si manifesta prepotentemente la necessità di alleggerire la pressione dovuta al fabbisogno d'acqua, il problema principale è quello di raggiungere un compromesso tecnico accettabile tra l'assoluto bisogno di individuare una risorsa idrica sicura e possibilmente abbondante e la necessità di renderla fruibile per quanto possibile a facili condizioni di utilizzo ed a costo nullo. Questi sono presupposti fondamentali da tenere in considerazione nel modo più assoluto se si vuole evitare di intraprendere progetti con scarse prospettive che obbligano alla ricerca di tecniche di captazione facilmente realizzabili e preferibilmente a buon mercato.

In estrema sintesi, il progetto cerca di dare delle risposte concrete alle necessità delle popolazioni locali tramite una ricerca applicata sul campo che si sviluppa su basi scientifiche e pratiche utilizzando per quanto possibile, le conoscenze tradizionali locali (*Promotion of Traditional Knowledge - The United Nations to Combat Desertification, 2005*) ed anche tecnologie innovative semplici e sistemi rinnovabili di produzione di energia.

Aims and objects

The association Wings for Earth (WFE) has started in 2006 a program called "Nanyori Green Belt" for the protection of the resources and the ecosystems and for the socio-economic self-sufficiency in Loiyangalani, directly involving institutions, associations and launching a vigorous action to raise awareness of local people key to any future activity.

The program WFE "Nanyori Green Belt" is subdivided in 3 phases and heads to activate modality of local economic development, of formation/information for the management and the protection of the local ecosystem-resources of the populations of Loiyangalani, village-oasis located in the district of Marsabit, at the north of the Kenya, along to the Turkana Lake.

The main aims of this program consist in:

1) Protection of the ecosystem-resources through an increase of the alimentary possibilities, a program of reforestation and fight to the desertification, finalized to start an economic self-sufficiency;

2) Reinforcement of the communitarian and social-economic structure through:

- federation of the ethnic groups;
- formation/attendance to the primary and secondary school;
- improvement of the sanitary situation;
- improvement of the activities of local development and self made food production;

3) Promotion of the activities to product yields and their differentiation: micro and medium credits.

Funding for the project WFE for the first five years (2006-2010) are in € 2,893.00, of which € 600.00 as the financial contribution of the local community. The work done so far since that program has certainly launched a vigorous action to raise awareness and involvement of local communities (Turkana, Samburu, El Molo and Rendile), critical to any future activity, but has not yet addressed the problems and the scientific issues (improvement of soil fertility, planting, plant associations capable of self-systems, plantations, irrigation, etc.) that could actually reverse the trend.

In fact we are in a barren area with sterile soils, much warmth and with strong winds, with a great mass of water, the Turkana Lake, apparently available, but, cause the strong alkalinity of waters, not usable for irrigation; moreover, the local tradition of pasture much diffusing based essentially on the goats, with a continuous cut of arboreal and shrubby vegetation to feed the domestic animals, increases the advance of the desertification.

The presence of an oasis and some sweet water sources, also thermal, intensely used and with some signs of degradation, constitutes moreover a resource but, at the same time, an environmental future problem.

During a first travel in such area, the contacts with the responsible of the plan and a visit at some new plantations and at the Nursery showed that the job carried out until now from the WFE's program has surely started an incisive action with the local populations and some first good actions, but it's far away to face the complex situation of the entire ecosystem of the Oasis.

While the activity of the Nursery constitutes a first tangible step for future initiatives against the desertification, the sporadic and isolated plantations, the lack of an action of control of the pasture, the absence of acknowledgements to improve the soil in order to proceed to more massive and coordinated plantations, constitute a strong limit to the possibilities of a good resolution of the plan.

Obviously also the deficiency of funds constitutes a strong limit to the completion of the plan.

And of this the coordinators of the WFE's program are aware and asked a contribution, at least in the earlier stage, of technical-scientific character in order to begin to know the problems and, later, to start together some actions and to raise new funds.

The project Oasis Ecosystem of Water Right Foundation (WRF) is, therefore, in partnership with the WFE, the support of the program "Nanyori Green Belt" both as technical and scientific help of scientists and experts, and economic with the activation of specific funds for the project itself.

The project Oasis Ecosystem in its general lines is:

1. To support the action of program "Nanyori Green Belt" mainly in relation to the protection of the ecosystem Loiyangalani Oasis and to fight the desertification in such area;

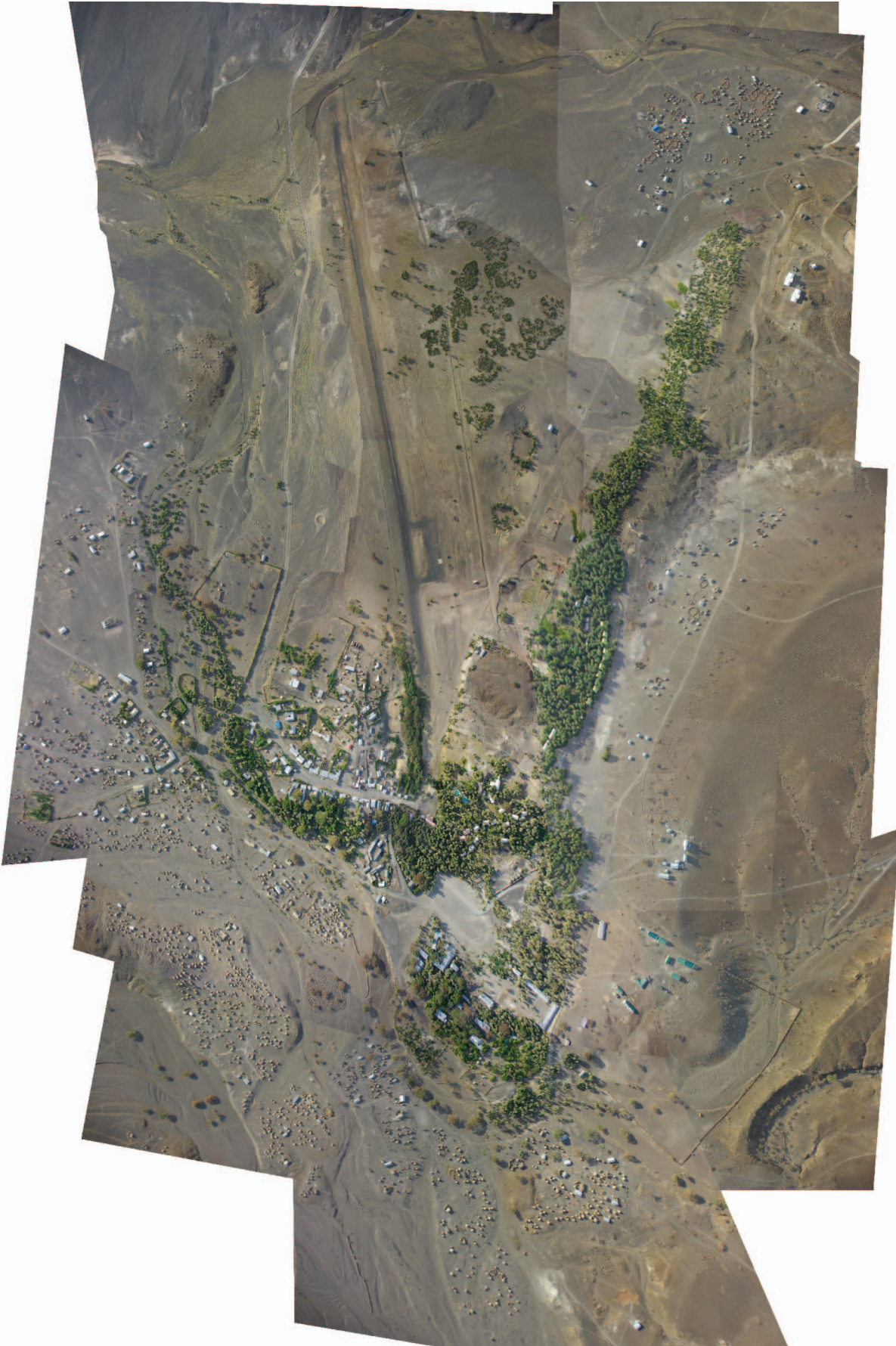


Fig. 1: Detection photographic zenith plane (August 2008).

2. To realize a prototype of “new vegetation” finalized to widen the ecosystem Oasis, to increase the food productivity for the local populations and to supply new areas of “pasture” for the domestic animals (goats, camels and donkeys) that effects of increment of the loss of soil are one of the main causes;

3. To implement the water resources available both for potable and irrigation purposes;

4. To be involved and to instruct the local populations about the realization and the management of the water resources, the area-prototype and other areas for new vegetation.

The project Oasis Ecosystem seeks, in summary, to provide practical responses to the needs of local populations through applied research on the ground that develops scientifically-practical realization using, wherever possible, local traditional knowledge (Promotion of Traditional Knowledge - The United Nations to Combat Desertification, 2005), as well as innovative technologies “simple” systems and “renewable” energy production (Figure 1).

Present situation

The area around the Oasis of Loiyangalani is dry and infertile soils, hot and covered by strong winds, with a large body of water, the Lake Turkana, apparently available, but due to the strong alkalinity of the water, not usable for drinking or irrigation purposes. In addition, the local tradition of widespread pastoralism based mainly on goats, with a continuous tree and shrub cutting in order to feed

domestic animals, increases the advancement of desertification.

The area is characterized by low rainfall with less than 200 mm. year. The rainy season usually starts in March-April until about the end of May, the driest starts in October-November until the end of December. In the hottest season evaporation is very high and far exceeds the total rainfall during the year. The average temperature ranges between 27-29 ° C with the minimum at 13-20 ° C and maximum at 26-38 ° C. The coolest months are July, August and February, March and October are the warmest.

As mentioned, the winds are very strong and are generated by a flow of low altitude known as “*Turkana Channel Jet*”. This strong current blowing all year round from the south east through the valley between the East African and Ethiopian highlands stretching up from the ocean to the deserts of neighboring Sudan.

The wind then accelerates further at local level in the areas located between Mount Kulal (2300 meters) and Mount Nyiru (2750 m) but, due to the thermal shock (hot land and fresh water lake), blow less violently during the day and full speed and powerful gusts overnight (Figure 2).

The morphology of the area is essentially flat with undulations at low and very low slopes, with “difficult” soils and a very poor surface water system would not allow the survival of local populations, if they were not backed from numerous springs, including the main one of Loiyangalani, who are the real source of drinking water in the area.



Fig. 2: The southern part of the Turkana Lake before Loiyangalani with the old vulcanoes.



Fig. 3: *El Molo village.*

The environmental situation as a whole is subject to an increasing state of degradation, due to both natural and human factors.

A major source of degradation is due to a natural strong soil erosion, especially in areas without vegetation, further enhanced by human activities related to grazing and the cutting of vegetation for supply of building materials and/or as fuel. In Loiyangalani we have pollution and open dumps, due to the concentration of people (Figure 3).



Fig. 4: *Aerial photo of the Oasis.*

Despite this difficult background conditions exist many factors of great biological-natural interest, both for animals and vegetation.

In the Turkana Lake we have the presence of numerous species of birds and fish, and of crocodiles and hippos, but in the vast spaces of land, because the scarcity of vegetation, animals are rather poor attendance (there are still gazelles, hares, hyenas, jackals and ostrich). Large mammals such as elephants, giraffes, buffaloes, zebras, antelopes, etc. that until some decades ago still populate these areas, are disappeared, but as compensation the area is full of snakes and scorpions.

The three letter **S** of the Turkana: a land of stones, snakes and scorpions !

And to think that the elders of the community Loiyangalani recall that many years ago this area was covered with a lot of vegetation. In fact the name “Loiyangalani” means “place of trees”! (Figure 4).

The area of Lake Turkana, despite its state of neglected area and at the edge of the world, during next years will be affected directly or indirectly by two big projects:

- the construction of a wind farm (Lake Turkana Wind Power Station) for energy production, located in an area of 150 sq. km. located between Mount Kulal and south east of Lake Turkana near Loiyangalani, managed by the Lake Turkana Wind Power Ltd, a consortium of Kenyan and foreign companies; the 300 MW of power generated from 365 turbines will cover 30% of the national energy needs;

- the construction of Gibe III, a colossal 240 meters high dam whose reservoir will stretch for 150 km. in the lower Omo Valley in Ethiopia (211 sq km) and built by the Italian Salini Constructors (€ 1.55 billion investment); it will become the largest of Africa (1.870 MW) and will change drastically the carrying capacity of the Omo River, the main tributary of Lake Turkana in Kenya, eliminating the natural cycle of floods and endangering crops and pastures of a big area in Ethiopia. Nobody knows the impacts on Turkana Lake!

Regarding the wind farm (it will be adjacent to the area of action of this project) the Lake Turkana Wind Power Project. Environmental Impact Assessment (March 2008), reports that the investment for the “Environmental Management “, which includes the “social projects “, is € 181.300,00 (about 18.15 million Kenyan Schillings): a dish of lentils compared to an investment of € 700,00 million and to the huge profits from energy production!

Content and project phases

The project develops a “Conservation And Reconstruction Plan For The Oasis Ecosystem Of Loiyangalani”

that consists of an information and education phase of all ethnic groups, supported by technical studies on desertification, and of an other phase to define the actions to protect Oasis ecosystem of Loiyangalani, to limit desertification in this area and to identify underground water resources available for potable uses.

The project is an application-experimental project and is characterized by interdisciplinary collaboration and consists of three phases:

1. Survey technical knowledge:

- Collection and documentation of existing researches on combat desertification realized in African countries in arid zones;
- Collection and documentation of existing researches regarding the area of Lake Turkana;
- Top soil analysis to determine the level of fertility (including determination of N, organic matter, etc.), the granulometric composition (sand, silt, clay), pH, electrical conductivity, etc.;



Fig. 5: Oasis vegetation with Doom Palm predominant.

- Analysis of existing surface waters (springs) and the lake water;
 - Research and acquisition of aerial photos and satellite images to study the geostructural of rock masses;
2. Surveys and participation project:
- Timing of the research in collaboration with the Wings for Earth and local communities;
 - Inspection in Loiyangalani for collecting data and information on site including some analysis of the soil and collecting samples of soil and plants aimed at identifying the most suitable areas for one or more experimental actions ;
 - Reconnaissance surveys for assessing the geology of areas of action;
 - Meetings with local people to provide information / education on the proposed action;
3. Project and proposals for experimental actions with:
- The identification of areas of action;
 - Techniques for soil improvement;
 - Techniques for the conservation of moisture in the soil and water harvesting;
 - The plant associations to be planted and their timeline for planting;
 - Techniques for the planting of vegetation;
 - Types and modes of realization of protective systems for vegetation;
 - Methods of implementation and maintenance of the plant systems;
 - Enabling information practices / instructional management of irrigation water and drinking water;
 - Information campaigns and training required by the local people about what action to perform.

The project should be the basis to realize (after specific funding available through international, national and regional public bodies and organizations and private companies and people) a prototype of a “revegetation” seeks to expand the ecosystem Oasis, to increase food productivity for local people and providing new areas of “grazing” for domestic animals that are a major cause / effect of increasing soil loss (Figures 5, 6 and 7).

During both phases of research and project proposal, it will be activated a series of meetings with local people to provide information / instruction on the action. The Project plans to implement the avail-



Fig. 6: The old Nursery made by local people with the help of WFE.

able water resources both for irrigation purposes and drinking water through “simple” techniques to improve the waters of Lake Turkana and the identification of new wells and, at the same time, how to activate informative / instructive methods for water management.

The project will provide guidelines to be used in other ecosystems adjacent to Lake Turkana and/or in other areas of Marsabit District: Korr, Karga, Biosphere Kulala Mountain, areas south of Baragoi.

All steps should be to support the existing activities of Wings for Earth that, however, with the help of the Research Group, will conduct all the actions related to inform and educate the local people, together with the Kenya governmental and nongovernmental organizations involved in the project.



Fig. 7: Planting of trees and traditional systems of protection against wind and goats.

Research activities

An initial phase of work involved:

- Some first analysis of soil and water and such tests have been conducted using samples of soil and water collected on site by the association WFE it with the support of the local population and sent to Italy in September 2006;
- The samples were analyzed and the findings of this analysis have been a first step to determine which activities need to undertake on-site visits planned in Kenya during the summer of 2008;
- The research and acquisition of aerial photos and study of satellite images for geological aspects.

Later on, in view of the mission of 2008, have defined the different operational tasks with specific programs of the Research Group and, at the same time, the relationship with the Association partners WFE Wings for Earth, in relation to their project “Nanyori Green Belt” which had been considerable progress with the establishment of a Kenyan centre. It was made a mission to the Principality of Monaco (October ‘07) to consider all points of mutual cooperation.

Other activities in Italy for the preparation of the mission concerned, in general, research and collection of all documents or other scientific assistance to prepare for the mission, the search for aerial photos and maps available at any scale and type of plant associations that characterize the area.

The mission to Lake Turkana and Nairobi between 26 August and 8 September 2008 has concerned:

Activities carried out in Loiyangalani on an area of 390 hectares

Surveys (GPS) and aerial photos

Detailed survey of the action area including the Oasis, villages and areas of sampling points of water, soil and vegetation, prepare a base map 1:10.000 and 1:5.000, drawing from a photomosaic flight made on site, collection of original maps 1/100.000;

Geological surveys

Acquisition of basic knowledge of geological character pointed to the reconstruction of the hydrogeological structure of underground aquifers in the features of the present and expected water movement, aimed at the next phase of study on geophysical exploration aimed at identifying the most suitable sites for identification of new wells; collection of researches and texts;

Soil survey

Reconnaissance of the distribution features of the landscape forms and of the relationships between the distribution of Landforms and distribution of types of land cover ; sampling of representative soil profiles with sample collection and transport in Italy for analysis; collection of researches and texts;

Collecting information and data on water

Survey of all available water in the area, sample collection and transport in Italy for analysis; check of the location and feasibility for a “compost plant” and testing of materials useful for the formation of organic compost; collection of researches and texts;

Collecting information and data on vegetation

Detailed analysis of species and varieties grown in the Loiyangalani Nursery and in all area of action; check of the new plantations already made in the area by the Nanyori Group; on-site examination of the modalities used for protection against prevailing winds and animals (dead plant body , artificial ground relief , wall stones, etc.) ; collection of researches and texts;

Activities with the local population

The local group of WFE Nanyori Group has assisted the Research Group to collect numerous samples of soil, water and vegetation and to detect numerous other information; it has been organized a public meeting with local communities to expose the work and the idea project.



Fig. 8: One of the Oasis springs.



Fig. 9: Effects of the erosion and overgrazing; loss of fertile soil around the Oasis.

Activities carried out in Nairobi

Collection of basic cartography and various documentation, as well as important texts and books for research, project, etc.;

Meetings with institutional bodies

Subjects contacted (primarily the National Museum of Kenya spread throughout the country) have become available to credit the work even through “agreements” with the Water Right Foundation and the University of Florence, or to activate cooperation agreements and mutual exchange of information intended to give strength and substance not only to the feasibility study (for “applications” to EU, Ministry of Foreign Affairs, Tuscany, etc.), but also for operational support in Kenya to future implementation phases (for a project 3 +3 years).

Feasibility project

In Italy, after the mission, has been developed the Feasibility Project that contains a Report and Scale Drawings at different scale with all the analysis and the surveys done and the proposals of action. After the definition of the lines of action in synergy with the program of Wings for Earth “Nanyori Green Belt” have been focused four main projects to combat desertification and to improve the quality of the life of local people.

These projects aims to be demonstration projects in order to face the three main problems related to the desertification such as Wa-

ter, Soil and Vegetation, using wherever possible, local traditional knowledge (Promotion of Traditional Knowledge - The United Nations to Combat Desertification, 2005) (Figures 8 and 9).

The four projects listed below are, however, also and above all, the starting point and a practical demonstration for local people that, once acquired techniques and construction capabilities, may have to put to work to a larger scale by improving the soil, expanding areas of vegetation and managing the water resource as a whole. This to expand the Oasis Ecosystem, now in progressive depletion, and to develop a truly sustainable economic and social development.

A key role in the process of empowerment of local populations will be played by information and education activities on various themes of the project, to involve the inhabitants, who are the real end users of the actions.

The project was handed in to Water Right Foundation in June 2010 with the provision of public presentations also require activation of funding for the project, as well as the activation of a partnership with the Association AQUIFER - NGO for the implementation wells for the people of Loiyangalani (Figure 10).

Project 1:

Drinking water for the population of Loiyangalani (geophysical investigations, research aquifers, drinking water supply identification, realization of wells, realization of a small water distribution network)

During the mission in 2008 was identified a particularly critical situation regarding the availability of water for the whole El Molo community.

The Loiyangalani Oasis developed around hot springs and for a large area is actually the only place where they can draw off drinking water; but the Oasis is quiet far from the village. So they drink the Lake’s water.

Always devoted to fishing, El Molo live completely isolated along the shores of Lake Turkana without any other exploitable source because the water of the lake due to high concentration of fluorides and heavy metals, is totally unfit for human use.

Using this unique resource, led to the development of several diseases especially the skeletal.

Returning to the area in February 2011, if possible, we found a situation even worse.

Following an outbreak of cholera, El Molo community, has been literally decimated and the local authorities thanks to international aid, in absolute emergencies have developed a water pipeline from a spring 15 kilometers away.

What is really tragic is that the water now begins to fail even in the oasis and a growing number of people, driven by the general shortage of water, is setting up this area, already too densely populated.

So, now the problem is to find drinking water evenly around the oasis.

For a number of factors related to geological history of this region, were found very interesting areas; this initial summary review showed the possibility of finding good research areas at the south western part of the oasis, along a wadi (which is an important element of drainage from Mount Kulal shield) that flows around the village Turkana.

In the Lake Turkana region, the range of the annual rainfall lies between 200 and 250 mm and the evaporation due to high temperatures is very high compared to normal conditions so, the amount of water that can infiltrate the soil is low.

However, the presence of the Mount Kulal shield, in our case represents a positive condition because it facilitates abundant rainfall for the passage of warm moist air from the lake.

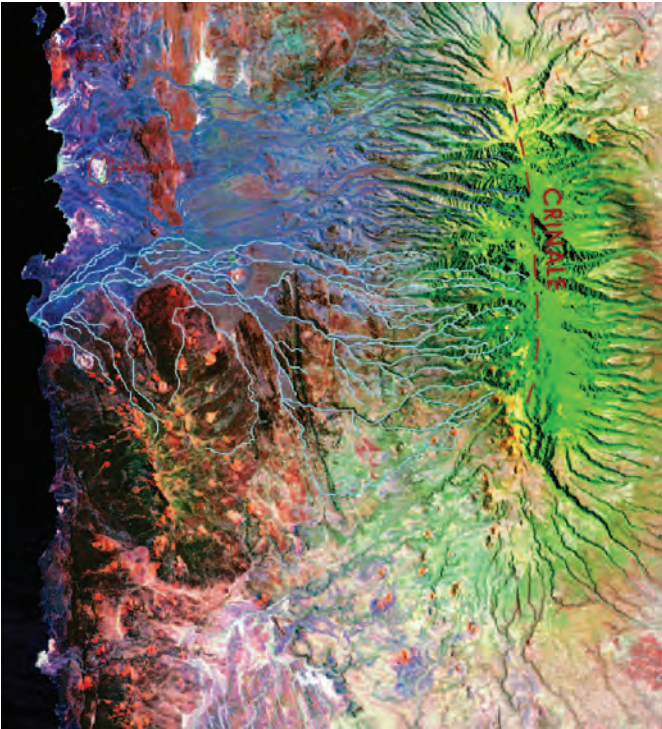


Fig. 10: Drainage system from Mount Kulal to Loiyangalani and the Turkana Lake.

The search for new sources of water must be done through the identification of places where are associated favourable topographical and geological conditions. However, the preparation of such projects requires good knowledge of the hidrogeological conditions of the country.

Considering the low income of the rural families low-cost projects using simple technology or improving indigenous technologies have better chances of success.

After remote sensing and geological survey we are able to reconstruct the structure of the subsurface and gather information on thickness of the shell by the performance of indirect investigation techniques such as geophysical exploration. After this phase it will be possible to locate the area where to realize the well..

Activity 1.1 - Localization of the proper area for well digging, Reclamation of land, Well digging and construction

After remote sensing and geological survey it has been reconstructed the structure of the subsurface and gather information on thickness of the shell by the performance of indirect investigation techniques such as geophysical exploration. With this phase it has been possible to locate the area where to realize the well. The area of the well is located at south-west out of the urban areas, because these urbanized zones are polluted by cemetery and black waters. The well area has to be kept free from any development to conserve the water quality.

Activity 1.2 - Realization of a small water distribution network for the village dwellers and the New Nursery for plant growing

The water distribution system to the population of the area starts from the new well; from this with a solar pump the water will be brought up to a tower tank located on an hilly part and distributed with a pipeline to the villages of this western area. Moreover this water will be used for the New Nursery and the Monitoring and Information Centre.

Project 2 :

Reconstruction of the oasis ecosystem vegetation (soil, compost, plants, and protection from wind and animals, etc.): two areas, one characterized by a decline in grass cover, the other one characterized by rarefaction-degradation of the tree cover

How did the Oasis Loiyangalani form? It is what is remaining of a larger ecosystem or certain natural actions (groundwater from Mount Kulal) have supported his evolution?

We do not know, but perhaps what we can tell that some times ago (when?) the whole area was a great Savannah with fertile soil and the presence of many species of animals.

Gradually unfavourable climatic conditions (increased drought and strong winds) and over-grazing, goats today, (many people still remember the great herds of cattle grazing until a few decades ago, now migrated to the green slopes of Mount Kulal) broke a very delicate balance favouring the desertification of vast areas.

The Oasis Loiyangalani therefore remains a last outpost of control against the advance of desertification, but very, very fragile.

This second project aims to rebuild environments, at the edge of the oasis, which could limit the loss of soil and then establish a progressive new vegetation: the trees and shrubs on the one hand, complete the typical varieties of the Oasis (now we have almost a monoculture in Doum Palm) to enrich the ecosystem and make it more stable, the other is to support food and / or commercial products for the inhabitants.

The two selected areas are adjacent to a tract to the east, upstream edge of the oasis and the buildings of the Police Station. They are characterized by loss of turf for erosion outside the Oasis and by depletion of shrub and tree structure more inside Oasis, and this despite the close proximity to one of the most important spring of the Oasis. This is mainly due to strong human and animal pressure.

The first zone (3-4.000 square metres), outside the Oasis, will be treated only with the reconstruction of turf in a first stage and then, after a two-year and verification of quality of the soil and if it is positive, proceed to the shrubbery.

The second one (1-2.000 square metres), inside the Oasis, will be treated only with the integration of the existing shrubs and trees in an area where depletion is occurring.

The techniques used include the construction of dry stone walls for protection and moisture retention, the creation of “dead bodies plants” for protection from the winds and animals, a “scattering” irrigation network of canals, the use an innovative material made by the Polyter crystals mixed with soil to save water and to fertilize the soil (already used in many parts of Africa).

Project 3 :

Experiments on areas for “grazing” with the cultivation of *Vetiveria zizanioides* Linn.

An important contribution to the advancement of desertification is certainly given by over-grazing, until a few decades ago cows, today thousands of goats. Local people for feeding the animals destroy the last pastures and cut the trees, increasing the reduction of vegetation mass in this area and giving further problems to the human community itself.

It cannot be asking local people to abandon this important resource (together with fishing is the main source of income) or to reduce the number of present or future herds, but perhaps it is possible to direct and to change habits by feeding methods.

The purpose of this project is therefore the creation of areas that are capable of producing a plant mass available for feeding livestock. This plant mass could, in an early stage, constitute a sort of reserve for use during dry periods of reduced food availability and then, extending the cultivated areas, become a permanent nutritional supplements. The replacement of natural pastures is not possible because, especially during the rainy seasons, they are growing again with acceptable coverage.

The chosen area (10.000 square meters) is adjacent to the airport at west and it is still used for grazing. It is characterized by severe loss of turf for over-grazing and erosion. It is a bit “a land of anyone”, outside but adjacent to the city centre and away of Oasis, crossed by the trail leading to the village of El Molo and the Italian museum.

Bounded by earth banks topped by dead bodies of entwined plants (Sand Fencing) that eventually become protective dunes and useful to create a more humid microclimate. The area will be planted with an herbaceous perennial, Vetiver zizanioides Linn. Coming from India, already used in various parts of Africa and not weed, it adapts to difficult conditions of soil, withstand drought, heat, wind and salinity and it develops by itself with deep roots producing large quantities of grass tufts. It is used for animal feed, to make paper, rope, mats, hats and baskets and oil from its roots that has pharmacological properties and is used for perfumes, soaps, etc. So, it has many uses; for feeding cattle and making commercial products.

Project 4 :

New Loiyangalani Nursery: nursery and catalogue of plants; compost plant from manure of goats and donkeys and vegetable scraps; Nanyori Group Area (computers, wireless communication, laboratory-monitoring, a small library).

The purpose of this project is to help the local NGO Nanyori Group (a very important reference at local level) with logistics facilities, the expansion of their other functions-services in relation to the development of the previous three projects and the improvement of their technical skills in both cultivation-botanical and computer through staff training.

The strengthening of this local NGO is the basis for a future success.

The area of action, home of the new Nursery Nanyori Group, is located within the Turkana village to the west, an area of urban development, adjacent to a Public Fountain, very crowded.

The actions are:

- Supporting infrastructure Nanyori Group Area: Center for Monitoring and communications, Nursery, Energy sources (sun and wind) for electricity generation for the Centre;

- Materials: Computer, printer, wireless, software, etc..

- Vocational training for adaptation of scientific and technical knowledge of some local actors (technical skills improvement): 3 technician scholarships for Botany, Cultivation techniques nursery and Computer;

- Compost Plant;

- Open air nursery of 1.000 square meters for growing plants for food integration (dates of *Phoenix* and *Balanites aegyptica*), the production and sale of commercial and pharmaceuticals products: arabic gum from *Acacia senegal*, oil of *Neem Tree*, roots of *Salvadora persica* for dentistry uses, grains and fruits of *Tamarindus indica*, *Moringa oleifera* oil, etc.

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Actions' Plan.

YEARS	ACTIONS
1st PHASE 2007/2010	Purchase materials for research
	Research, site inspections and missions, analyzes and survey
	Feasibility Project and evaluation of project costs
	Information
2nd PHASE 2011/2013	Project 1 - Drinking water for the the people of Loiyangalani (geophysical investigations, research aquifers, drinking water supply identification, realization of wells, realization of a small water distribution network)
	Project 2 - Reconstruction of the oasis ecosystem vegetation: research, design and realization
	Project 3 - Experiments on areas for "grazing": research, design and realization
	Project 4 - New Loiyangalani Nursery: research, design and realization
	Education (technical skills improvement, scholarships) and Information
3rd PHASE 2014-2015	Monitoring
	Education and Information

Synthesis of the Project.

REGION	Marsabit District, KENYA 21.000 inhabitants
LOCAL COMMUNITIES LOIYANGALANI	1.000 people
BENEFICIARIES	Local Society, Plant Ecosystems and Water Resources
COSTS FOR RESEARCH AND FEASIBILITY PROJECT - FIRST PHASE (2007-2010)	€ 20.000,00 WRF + € 2.902,00 DUPT = € 22.902,00
COSTS FOR PROJECTS, CONSTRUCTION, EDUCATION-INFORMATION, MONITORING - SECOND AND THIRD PHASE (2010-2014)	€ 310.000,00
COSTS FOR PROJECT 1-WELLS EL MOLO OF THE SECOND PHASE (2010-2011)	€ 10.000,00 WRF + € 25.000,00 Financing 2010 <i>Acquifera onlus</i>
TIMING OUTPUTS	3-4 years
RESPONSIBLE OF THE PROJECT	Water Right Foundation - WRF
HEAD OF THE TECHNICAL AND SCIENTIFIC PROJECT	University of Florence DUPT - Lorenzo Vallerini
ITALIAN PARTNERS	University of Florence DUPT <i>Acquifera Association – Onlus</i>
FRENCH PARTNER	<i>Wings for Earth Association</i> Principality of Monaco - Anne Wattedled
KENYAN PARTNER COMMUNITY GROUP	Nanyori Group Loiyangalani District, Kenya

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RESPONSABLE AND PARTNERS OF THE PROJECT



The **Water Right Foundation** is an **O.N.L.U.S** (Organizzazione non lucrativa di utilità sociale), non-profit social organization for the Italian Ministry of Foreign Affairs under the Legislative Decree. 12/04/1997 Nr. 460, located in Florence, Italy. It is funded by local governments of the Italian region of Tuscany, and the main public utilities companies managing drinking water provision. The Water Right Foundation goals are the promotion of decentralized cooperation actions on the theme of the fundamental right to water access and the sustainable use of drinking water. In particular, it aims at: promoting educational and knowledge actions on the theme of environmental safeguard and water right; executing research and technology innovation activities on water economization and re-cycle; promoting and executing training and research activities on the topics related to water management. carry out research activities on water recovering; manage cooperation projects on water and public utilities. The Water Right Foundation will play the key role in the technical management of the project, and in particular in staff management and assistance to the experts in the implementation of their missions in beneficiary Country. Moreover, the Water Right Foundation will actively contribute in the works of completion of the water infrastructures and will provide specialist technical experts for short term missions and for the realization of training and awareness on water resources and infrastructures efficiency.



The Association "**WFE-des Ailes pour la Terre**" located in 8, Avenue des Papalins Galerie Princesse Stéphanie Monaco, carries on activities in Kenya since 1999. It 's an environmental **N.G.O.** apolitical and non-denominational and works for harmony between people and their environment. The priority tasks of WFE cover the preservation of ecosystems, education, health, and maintaining a balance between sustainable development and environmental protection. The main tasks which is aimed WFE are cultural, environmental, educational and health. Specifically in Kenya, WFE operates as a scientific, socio-economic, educational and cultural body in the global strategy against poverty in the service of World Natural Heritage.

The Project Nanyori in Loiyangalani aims to activate a local economic sector, access to education and the care and protection of ecosystems, resources (enhance food security, reforestation programme and anti-desertification for the emergence of a self-sufficiency economy), and to reduce inter-ethnic tensions among the sedentary populations and Loiyangalani pastoral village oasis.



Acquifera Onlus is a non-profit organization **O.N.L.U.S** for the Italian Ministry of Foreign Affairs (Legislative Decree 4.12.1997 n. 460) located in Florence, Italy. Its primary aim is to bring water to all those third world countries where there are problems related to its lack or scarcity or where there are persistent difficulties in its supply or public health safety concerns. To achieve this goal, the organization proposes to promote the search for funds to be used for hydro geological studies carried out using the best and most in-depth technical and scientific methods. The aim of these studies is the valorisation of the environment and in particular the creation of wells through perforations, the collecting of water springs, the planning and construction of conveyance structures and other manufactured works for the correct use of the resource; all of this has as its exclusive goal social solidarity.



UNIVERSITÀ DEGLI STUDI DI FIRENZE
DIPARTIMENTO DI URBANISTICA E PIANIFICAZIONE DEL TERRITORIO

The Department of Urban and Regional Planning of the University of Florence, founded in 1992, offers three courses of study to achieve a degree, such as "City, Region and Landscape Planning", "Regional and Urban Planning and Design" and the second level two-year course "Landscape Architecture". Its goal is to offer the professional specific skills pertinent to analysis, design, planning and landscape management. Moreover the Department offers postgraduate studies, such as School of Specialization, Masters and PhD in Territorial Government and Landscape Design.

At the department, numerous research projects are taking advantage of PRIN (intra-university research programs) funding, of European funding or of funding arranged by ad hoc connections to public offices (towns, provinces, or regional offices) for planning projects and research projects having to do with sustainable development and town planning problems.

"Contexts. Cities, Regions, Projects" is the journal of the Department and participates in the national and international debate on the problems inherent in the description, the planning and the management of cities, regions and landscape.