RWH FOR CROP PRODUCTION IN KENYA

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Range Environment Improvement in Laikipia - Problems Encountered

The Maasai community in this area have been experiencing decline in grazing area due to continued sub-division of surrounding land followed by settlement of immigrants from high potential areas of Central and Eastern provinces. Land pressure has also resulted due to population increase within the community members and also their livestock. This has significantly raised pressure on pastures leading to overgrazing and decline in ground cover.

The impact of the frequent droughts that often affect the area has therefore been increasing over time. Huge livestock numbers have been dying every time there is drought and the community has since been looking for ways of sustaining the large numbers of animals within the available pasturelands.

Much of the pastureland has lost grass cover and is often bare. The area has also experienced a lot of soil erosion and the soil surface has with time formed hard crusts. This has led to large decline in infiltration of rainwater during the wet seasons.

The Techniques Used

The community has devised ways of overcoming this problem and is now reclaiming the land. In collaboration with the ministry of agriculture, techniques have been developed to break the surface crusts, apply quality grass seeds and improve soil fertility. Tine harrows are used to pierce the crusted surface as a way of reducing the sealing of the soil and pave way for improved infiltration. Draught animal technology is used to provide the much-needed power for the exercise.

Learning from range trials on reseeding from Mpala Research Centre on suitable types of seeds, fertility improvement, and different combinations of treatments for optimum productivity has helped the project. Over time the community has been able to sieve through the different technologies and establish the most suited techniques on fertility management and seed selection.

The Equipment

Pairs of donkeys are used as sources of energy in the exercise. Animal drawn tine harrows developed by KENDAT are used to break the crust in the soil surface. The pair of animals is fitted with shoulder harnesses, which are well padded for comfort. The harrows are then attached to the shingles with distances well set for optimum operation. The animals are trained on the job and within a short while, they can comfortably perform the tasks well. The community members are trained on simple servicing and maintenance operations for the equipment.

The Community Set–Up and Operating Rules

Different categories of people are involved in the exercise. The lead groups have been the catchment committees who have been organizing and coordinating the activities. Women group leaders have also been organizing activities such as draught animal training, harnessing and harrowing in some sites.

While a large part of the degraded areas still needs to be treated, this approach is commendable owing to the little cost of inputs involved. The fact that all the operations involved are done by farmers themselves with minimal external inputs makes the technology highly adaptable and easy to replicate. Despite the scarcity of pastures in the area, particularly during the dry seasons, it's well understood by the community members that the treated grounds need time to heal and have grass established well before the grazers can be allowed in. This gives good indication that the community understands the benefits of the project. They are also ready and willing to enforce any necessary by-laws to ensure that it succeeds.

The Grass Reseeding and Fertility Improvement

Additional certified grass seeds have been provided to the community by the programme to support the already existing seed bank. This is done to ensure faster establishment of pasture in the treated area particularly in the bare patches. Choices of types and application rates are guided by guidelines in the Soil and Water Conservation manual and research findings from the neighbouring Mpala Research Centre and practices from the adjacent commercial ranches. In order to improve the capacity of the soil to support growth, organic manure is added to the treated plots. This is mainly by using

farmyard manure available locally. The manure is spread on the ground together with the grass seeds.

The Results

The resulting improved grass cover is a good indication of the success in the project. Uniformity in pasture establishment in terms of size and species is a good indication of the potential of the project in improving the carrying capacity of the pasturelands. Improved net biomass production coupled with high quality grass pasture is contributing significantly to improving the potential of land in supporting the growing livestock numbers throughout the year.

Technological Replication

Research Findings and Recommendations

The technologies being used in the area are those that have been developed in the various research stations in the locality and in the country. Simplified forms of these technologies are being adopted by this community particularly on the area of improving range pastoral potential. Notable is the adoption of research findings from the neighbouring Mpala Research Centre where experiments of ground scratching followed by fertility addition and reseeding have been yielded positive results.

Between Different areas in the Locality

Information flow within the communities living in the area has been fast and progressive. Despite the technologies having started in only one remote site it has now spread to many other sites within the locality. Members have organized themselves in groups, animals have been trained and trial sites selected in three other group ranches. Treatments have been carried out on the sites and already positive results have been obtained in most of the areas.

Introduction of Cropped Agriculture amongst Pastoral Communities

The main objective of introducing crop husbandry to the community members is to provide an alternative source of food and body nutrients other than those that are livestock based. This has been intended to slowly bring about progressive change to the strongly held belief that food can only be derived from livestock or gathered from wild plants obtained from the forest reserve or from open range land.

Techniques being tried are for water conservation using pits for water collection and storage or artificial underground impervious layers developed by installing a layer of polythene sheet at the depth of one to two feet below the surface. This impedes vertical movement of water below the root zone.

A mixture of topsoil and manure is put on of the polythene top to provide the required media for vegetable growth. The main crops being grown using this technology include kales, spinach, tomato, onion, spider weed and eggplants. In the periphery of the enclosed areas other annual and perennial crops are grown mainly maize, fruits like oranges, lemons and trees.

Within one year of implementing the technology, the main achievements include training of 60 adult pastoralists (50 female, 10 male) and 200 school children (100 male, 100 female). The monitored yields obtained include 500 stems of kales, 600 of bulbs onions, 300 of spinach, 300 of tomatoes, 200 heads of cabbage and other assorted greens.

It's believed that if this technology works and has proved popular with the community, it will be a very useful weapon for the Maasai community as they face the hard fact that they have to make their lifestyles sedentary and shun pastoral lifestyles. Community members, mainly women groups are already adopting this by starting group plots where they learn and practice cropped agriculture.

Some Commonly Raised Issues in Water Harvesting

In discussing issues of runoff harvesting, ex- situ water storage, dams, pans, and water holes, a number of problems are normally raised. These issues include evaporation losses, mosquito menace, water-borne diseases, seepage losses, methods of drawing water and safety. With experience and continued observation of several case studies mainly in Rumuruti, Ngobit, and Central in Laikipia and also Lare division in Nakuru, the following explanations can be raised to address this issue.

EVAPORATION LOSSES

An estimation of evaporation losses using experimental pan evaporation E_p data for this Northern side of Mt. Kenya region available in the Environmental database in Nanyuki, show that on average the pan will loose 5- 6 mm per day. The water lost to evaporation per month is 180mm.

Three months would probably be the longest dry period in a normal year before some significant rainstorm can be received. Often, people tend to view water losses due to evaporation as much higher than in tanks and therefore prefer roofing as a necessary measure even before undertaking a cost – benefit analysis of the roof versus the use for little water that will be saved through roofing. Normally roofing is an expensive undertaking and unless one can justify it, it is normally much cheaper to put up another structure (unit) and harvest more water.

MOSQUITOES AND WATER BORNE DISEASES

The numbers of mosquitoes vary from place to place and would habituate in pools with still water. As such the water pans may offer a good breeding ground in warm areas where mosquitoes are prevalent. To prevent this, it is recommended that a few drops of kerosene be put in the pan every fortnight. This has been proven in Central Laikipia and it has been seen to work in Ngobit and Rumuruti areas where this mosquitoes have been controlled.

WATER QUALITY

The water harvested into the water pans is normally runoff from roads or tracks, home compound, farms etc. This water is normally soiled and generally "dirty". The main use for this water is normally agricultural with some going to domestic use. Where water is to be used for domestic purposes, treatment can be done. This is mainly by using Allum to initiate sedimentation and Chlorine to treat the microbial properties. This technology has been proved to work and is being promoted in Nakuru by **Mtakatifu Clara Farmers training center** in Lare division.

SEEPAGE LOSSES

Most of the water pans developed at the farm level are earthen. This means that their storage efficiency depends on the soil characteristics. For most of soils in this region which are formed from basement rock of the pre-Cambrian age which are properly weathered their transmissivity is not very high.

Observations in Laikipia and Nakuru, show that the pans are able to store water for a period of 1- 3 months if left idle. Some remote cases have been observed where the performance was poorer probably attributed to remote pockets of poorly weathered soils, or excess amounts of murram. Where seepage is a menace, several options are available to improve this. The best options include flooring with uv - resistant *PVC* polythene available in the market. To cover the standard water pan in Laikipia will cost about **Kshs. 12,000/-.** This is a much cheaper option than concreting which costs about **Ksh. 77,000/-** (Kihara, 1999).

DRAWING TECHNIQUES AND SAFETY

When the pan is full of water, drawing water by bucket may need caution particularly if the sides are wet and slippery. A combination of water pans with water drawing technological options like installation of *Money Maker I or II* pumps should be encouraged where possible. This can also be connected to a low head drip irrigation set of equipment.

As a safety measure for both human and wild life, a kind of fence should be installed to control traffic. Children should be warned about the dangers of playing near the units when they have water particularly because they can **never** mange to climb out if they slip in.

Rainwater Harvesting Activities in Kitui and Mwingi District

Introduction

Much of the district is semi arid. Rainfall is concentrated in two seasons; the short rains from November to December and the long rains from March to April. The rainfall received is unreliable in amount and distribution. There are long periods of drought separating the two seasons during which most of the vegetation dries up. During the rainy season, long dry spells are often experienced which causes severe water stress to growing crops.

Soils are easily eroded. They are low in nutrients and prone to surface sealing and capping. Animals kept include indigenous cattle, goats and donkeys. Crops grown include maize, beans, pigeon peas, and sisal among others.

Rainfall

60% probability 200 – 250mm March – April

60% Probability 350 – 400mm November- December

Problems Encountered

Food shortage resulting from repeated crop failures is the main problem. This has resulted to malnutrition and sometimes death of both man and his livestock. Children, especially girls are withdrawn from school to go and search for water for pasture and seek employment

opportunities in nearby urban centers. Limited sources of income mean living standards are low. Dependency on relief food and imports is high.

Rainwater Harvesting Activities

Many options to solve water and food problems have been sought and rainwater harvesting has been shown to yield good results. Methods used include:

- Sand dams and sub-surface dams. These are constructed along sand rivers, which are dry riverbeds that are flooded with water during the rainy seasons. They are constructed to prevent floodwater from draining downstream and instead impound it for future use.
- Runoff harvesting from roads, homesteads, hilly areas, pastures and footpaths. The runoff is directed to cropped areas or reservoirs.
- Retention ditches which hold runoff and allow it time for infiltration into the cropped land
- Use of organic manure and mulching. This increases the water holding capacity of the soil. There are also farming practices, which help in water infiltration and retention by the soil e.g. breaking hardpans, planting on furrows, terracing.
- Rock catchments, which feed water to tanks, have proved useful but they are not abundant.
- Earth dams have been used to impound runoff. They are less successful because of the highly erodable soils and high evaporation.
- Most of the boreholes in Kitui have low discharges. They are expensive to install and maintain.
- Others include; negarins, semi-circular buds, basins, stone and trash lines
- Water pans
- Protecting springs
- For domestic purposes, roof catchments rock catchments, wells and sub-surface dams are used.

Impact

- Clean water near homesteads both for domestic and livestock uses.
- Reduced walking distances to water collection points. This helps to save time for other social and economic activities.
- Significant reduction of cases of children with diarrhoea related diseases
- Improved nutrition status. Communities can now grow foodstuffs like vegetables and fruits
- Has facilitated reforestation nurseries

Future Challenges

The benefits of rainwater harvesting has reached only a few people. More training and community mobilization need to be done to facilitate more rainwater harvesting activities. Existing water harvesting technologies need to be evaluated in order to invest only where they will yield good results.

Community participation in RWH for Agriculture in Ol Moran, Laikipia District, Kenya. (Picture courtesy: J. Wanyonyi)