WATER HARVESTING & MANAGEMENT (WHM) FOR AG PRODUCTION IN KENYA

A presentation made Kenya delegation during the 3rd Africa-Asia Drought Adaptation Forum held at Urumqi, China from 13th to 21st August 2013

Presentation outline

- Background
- Soil and water harvesting and Conservation in Kenya
  - Micro-catchments
  - Floodwater Farming
  - Off-stream Rain water harvesting -Farm ponds
- Conclusion

Background

- Kenya's land area is about 582,646 sq.km, of which 2.2 per cent is surface water.
- Generally, Kenya's land use is largely pastoral in semi-humid and semi-arid zones and agricultural in the moist and humid zones.
- Arid and semi-arid lands, called ASALs, account for over 80 per cent of the total land mass (GoK 2004).
- About 37% of Kenyans are food insecure which is significant improvement from 46% in 2003.

Geographical Coverage of Arid and Semi-Arid Lands

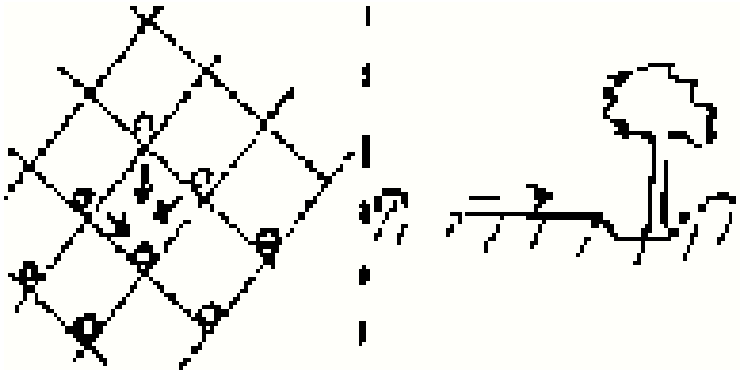
Soil and water harvesting and Conservation in Kenya

- Kenya has fairly long history of soil and water harvesting since its both a water deficit and erosion prone
- In late 1970's up to mid 80s the second president of Kenya spearheaded construction of soil conservation structures
- From Mid 1980's through the support of Swedish government a soil and water extension programme was implemented

Basic Categories of Water Harvesting Systems for Crop Production in Kenya

1. Micro-catchments (Within-Field catchment systems)
   - Negarim Microcatchments (for trees)
   - Contour Bunds (for trees)
   - Contour Ridges (for crops)
   - Semi-Circular Bunds (for range and fodder)
   - Zai Pits (for crops)
2. External Catchment Systems (Long Slope Catchments) – RWH
   - Trapezoidal Bunds (for crops)
   - Contour Stone Bunds (for crops)
3. **Floodwater Farming (Floodwater Harvesting)**
   - ✓ provision for overflow of excess water
   - ✓ Permeable Rock Dams (for crops)
   - ✓ Water Spreading Bunds (for crops)

Examples of main WH systems



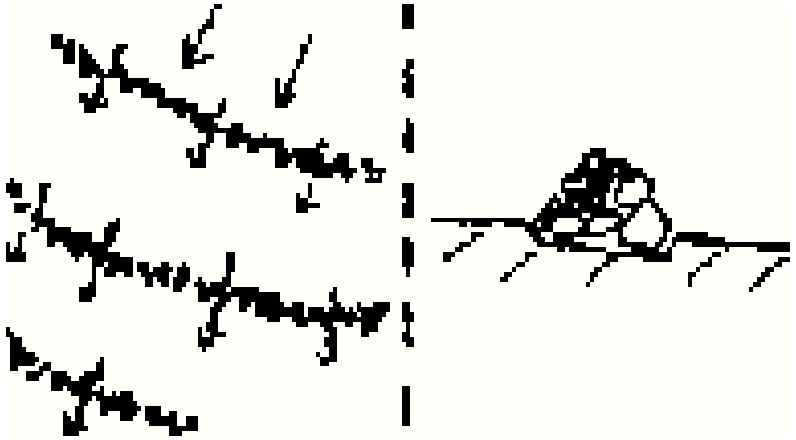
Negarims

Contour Bunds

Semi-Circular Bunds

Contour Ridges

Trapezoidal Bund



Contour stone bunds

Permeable rock dams

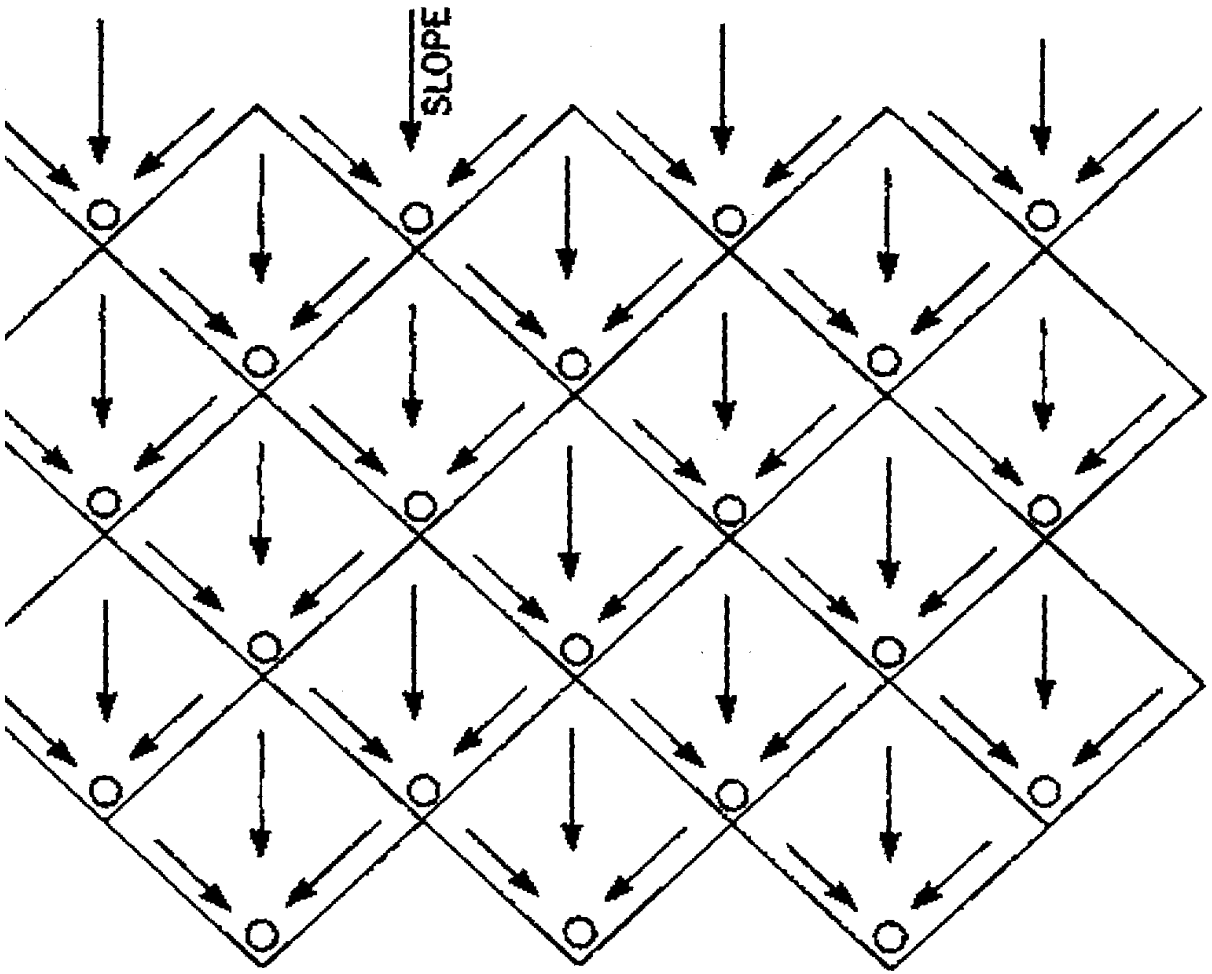
Water spreading bunds

Negarim microcatchments

- Negarims are derived from the Hebrew word “Negev” meaning runoff. It was popularized in Israel negev desert. Negarims are appropriate in arid conditions with as low as 100-150mm rainfall pa.
- Structure- negarims are diamond shaped basins surrounded by small earth bunds with an infiltration/retention ditch at the lowest corner.
- Suitability- negarims are with soil that have at depth of 1.5-2m for adequate water storage, uneven topography and a slope of 1%- 5%

Negarims under construction in different parts of Kenya

- Negarim *MC* typical ground appearance



Zai pits micro-catchments

- Zai pits are traditional land rehabilitation technologies originally practiced in Burkina Faso. These are small pits 60cm long by 60cm wide by 60cm deep dug in ASALs and where degraded soils are prevalent.
- Pits are dug during the dry season. Manure placed at the bottom of the pit and fast maturing dry land crops planted at the start of the rains. The pits collect and concentrate water at the root system guarantee conservation and availability.
- Zai pits are effective with small cultivated areas. Useful in ASAL zone with rainfall of 200-700mm and where soil hardpan and poor infiltration is common. Slope can be up to 2%on any uneven topography

Zai pits constructed in Kilifi district

CONTOUR BUNDS FOR TREES PRODN

- Contour bunds/ridges for trees establishment are simplified MC which can easily be mechanized, more like terraces but target to retain as much runoff as possible
- Suitable in ASAL with rainfall of 200-550 mm pa and soils- 1.5-2m depth for food crops. For fodder an even shallower depth is ok
- Slope is up to 5% with a even topography. For effective infiltration and retention for trees, it recommended that infiltration pits/retention ditches are dug at the base of the contour. Bunds are spaced at 5-10m on slopes of up to 2%, while bund height range between 25-60cm with a base of 50-75cm depending on the slope

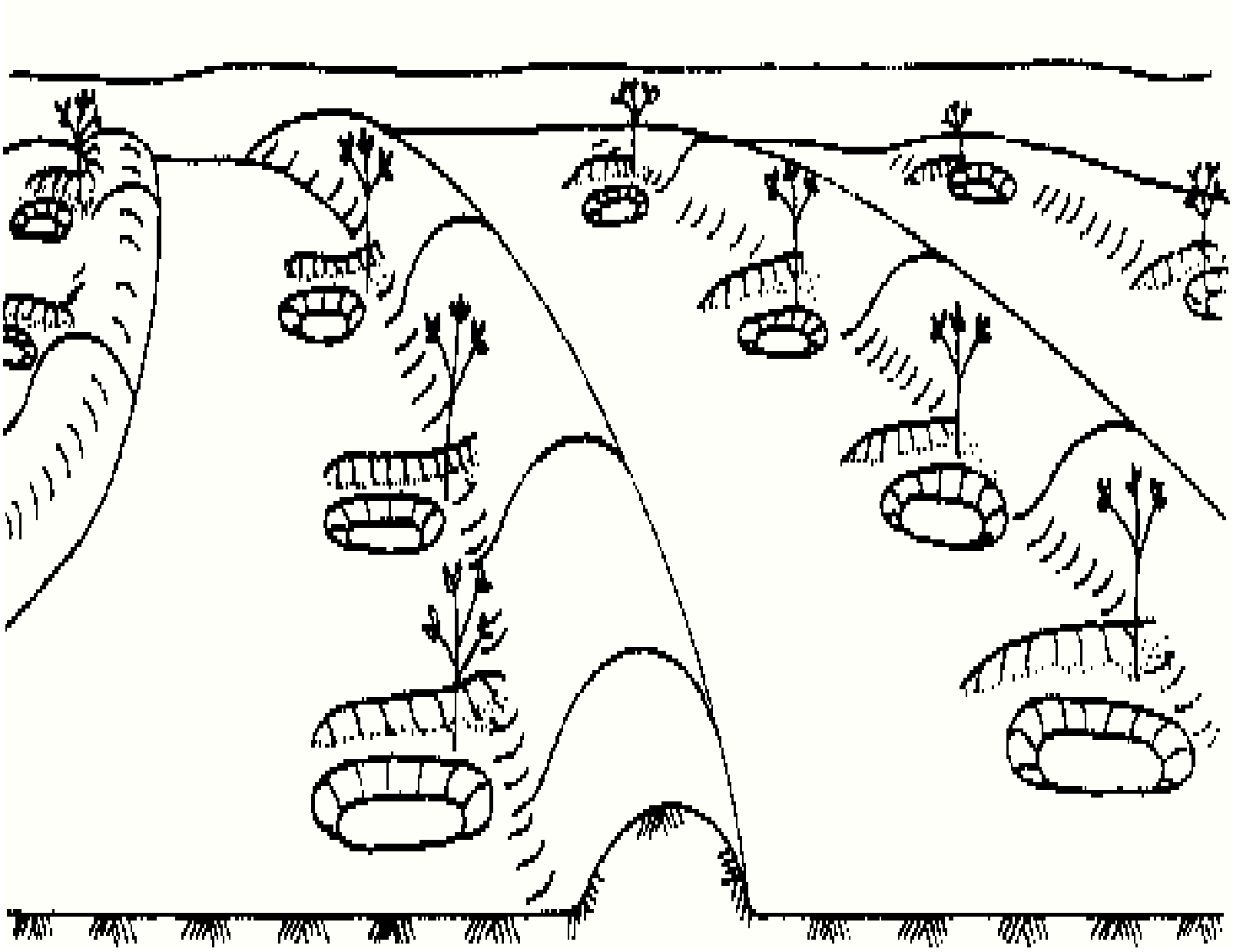


Illustration of contour bunds

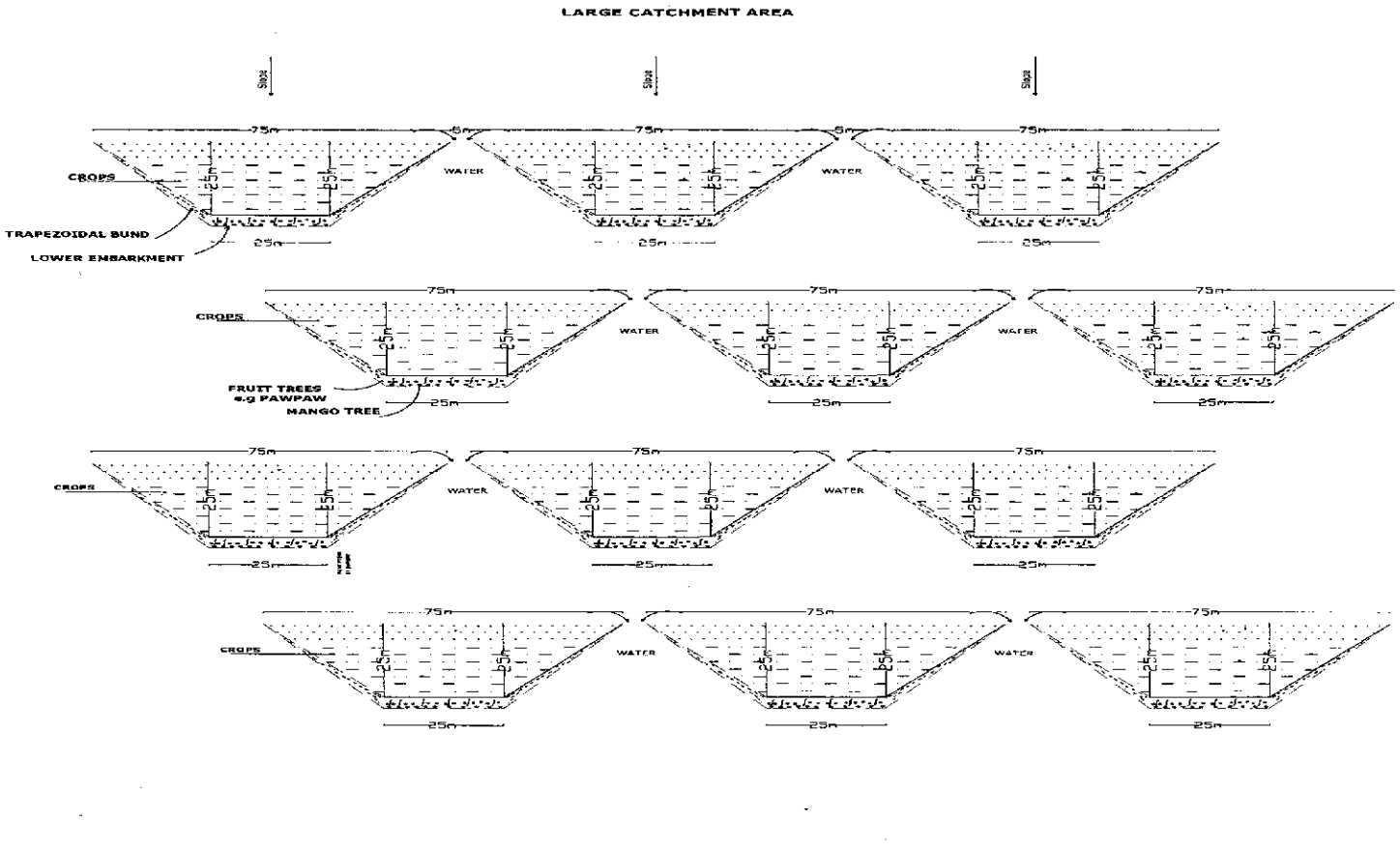
Contour Ridges

- Contour ridges, sometimes called contour furrows or micro-watersheds, are used for crop production.
- This is again a micro-catchment technique. Ridges follow the contour at a spacing of usually 1 to 2 metres.
- Runoff is collected from the uncultivated strip between ridges and stored in a furrow just above the ridges. Crops are planted on both sides of the furrow.
- The system is simple to construct - by hand or by machine - and can be even less labour intensive than the conventional tilling of a plot.

Contour ridges in Marigat, Baringo

Semi circular bunds

TRAPEZOIDAL BUNDS

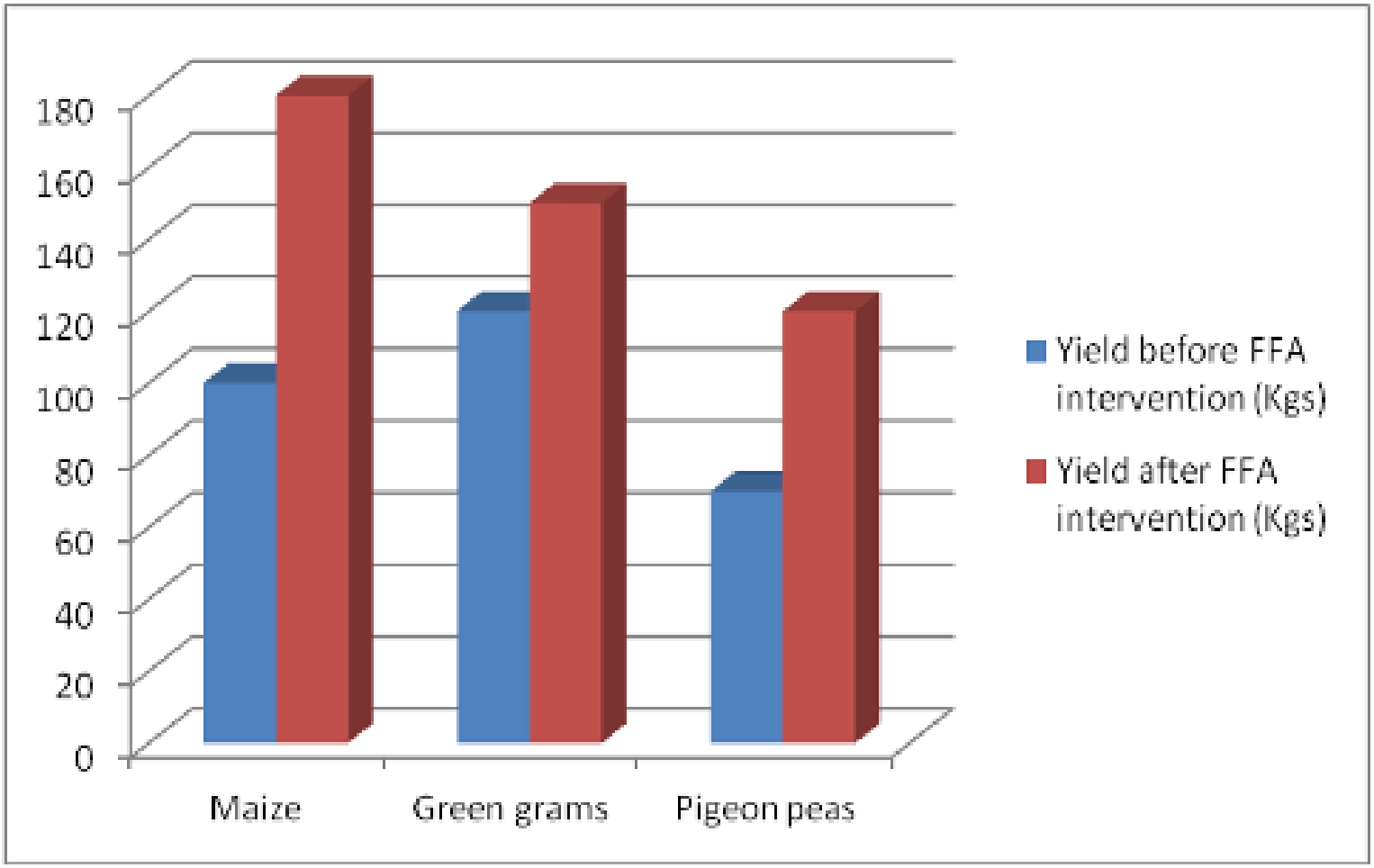


ONE TRAPEZOIDAL BUND IS ½ ACRE

TRAPEZOIDAL BUND

Permeable rock check dams for gully control and catchment conservation in a water project site, Makueni district

Off-stream Rain water harvesting - Farm ponds



Others:

Pumpkins sales Kshs. 20,000 in first season;

Sukama wiki & tomatoes for HH use and local market

Family appreciating tomatoes produced as a result of improved water harvesting

Before adopting SWC practices

After adopting Water harvesting technologies

ACCOMPANYING TECHNOLOGIES TO WH FOR CROP MGT

Soil & Water Conservation Structures

- Soil conservation structures are commonly used to manage erosion problems. Extensive investigations show that erosion is increased as water runs along steeper slopes over long distances

- The principal behind all soil conservation structures is to:

a) reduce length of slope

b) reduce steepness of slope

Fanya Juu Design and construction

Description

- This is the most common soil conservation method in both high and low rainfall areas of Kenya.
- It is mostly made manually.
- Made by digging a trench along the contour and heaping the soil uphill to form an embankment.
- Appropriate on slopes between 15-30%.
- Useful in semi-arid areas to harvest and conserve water.

General, slope-dependent dimensions of Fanya Juu terraces:

Slope, %	VI, m	HI, m	Width, m	Depth, m	Channel area, m
5	1.00	20	0.50	0.50	0.25
10	1.35	14	0.50	0.55	0.28
15	1.73	12	0.60	0.55	0.33
20	1.80	9	0.60	0.60	0.36

Measuring slopes and marking contours using line level

Stabilization

Ensure that constructed embankments are stable

- The stability and effectiveness of soil structures depends on the stability of the embankment.
- During construction, ensure the soil forming the embankment is compacted to reduce risks of breakage.

Soil embankment stabilized with napier grass. A grass adds value so that no part of the land is perceived as wasted.

- Establish vegetation from the first rainy season and ensure it is protected from livestock.

- Plant either single or a grass mixture in rows about 20 cm apart.

- Plants should be regularly trimmed and used either for animal feed or soil fertility enhancing through composting.

- All embanks should be planted with perennial grasses to stabilize the soil against erosion. Suitable stabilization material includes Napier grass, Signal grass , Donkey grass, Makarikari or Guinea grass.

- Root crops such as sweet potato and cassava SHOULD NEVER be planted on the embankment.

Fanya Juu soil & water conservation structure

Conclusion

- Water is the most important factor of agricultural productivity in the tropics.
- Investments in soil and water Conservation is therefore the key to sustainable agriculture productivity.
- This requires appropriate technologies supported by robust policy and legal frameworks

THANK YOU