Trends of Potash Levels in soils under Sisal, Maize Rice and Cassava based Production Systems in Tanzania

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Introduction

- Sustainable soil productivity depends on essential plant nutrients
- Potassium is a major nutrient required in large quantities.
- 9.5 t/ha maize grain yield absorb 99.6 kg K/ha
- 30 t/ha fresh cassava tuber absorb 116 -133 kg K / ha
- 5.0 t/ha rice removes 129kgK/ha
- 1.5 t/ha sisal remove 52kg/ha

► Replenishment of soil K by fertilizers necessary to sustain high yields

Introduction cont

- Crop production in Tanzania is usually without K fertilizers or Manure
- In some fields crops yield and residues are removed from fields
- This lead to continuous K mining and hence unsustainable soil productivity

►The paper reviews K trends under Sisal, Maize, Rice and Cassava fields in Tanzania in view of coming up with need for K fertilization

Materials and Methods

- Data was collected from following sources:

  -Gray literature: Field experiment conducted at ARI Mlingano

  -Data published in different sources

  -Data from Mlingano soil laboratory records

Field experiment

Soils under maize production systems

- Data on trial conducted between 1981 and 1988 to investigate maize response to N & P fertilizers

- Located at the crest (Rhodic ferralsol), mid slope (intergrade) and lower slope (Chomic Luvisol) on Mlingano catena.

- Soil (0 – 20cm) sampled from unfertilized plots before maize planting each season

Data published in different sources

▲*Soils under sisal production*

- Soil from sisal estates in Tanga (1959 – 1990).
  - Estates were under continuous cultivation without K fertilization.
  -Soil (0-20cm) sampled initially and re sampled from the same field after 21to 28 years of cultivation

▲*Soils under cassava-based production systems*

-Data from 29 fields sampled in 1999 (Coast region)
-Data from 21 fields sampled in 2010 (Coast region)

Soils Under rice based cropping system

- Soil data from 14 fields in Korogwe and Muheza districts in Tanga (2014)
  - **Villages in Korogwe**: Mnyuzi and Lusanga
  - **Villages in Muheza**: Masimba and Kwemsala

- In each village 3- 5 upland rice fields selected based on dominant soil types topography, cropping systems and crop management practices.

- Soil samples of the top 0 – 20 cm were taken mixed then sub sampled for laboratory analysis

Data from Mlingano soils laboratory records

- Analytical results of **319** samples between 2013 - 2015 randomly picked as follows:
  Bagamoyo district (40); Muheza district (11); Lushoto district (23); Kilombero district (32); Morogoro rural river basin (23)
  Ngara district (28); Karagwe district (4); Misenyi district (13); Bukoba (8); Kagera river Basin (13); Naliendele district(35); and Dodoma district (14)

- ► Data grouped based of potassium status (London 1991)

RESULTS & DISCUSSION

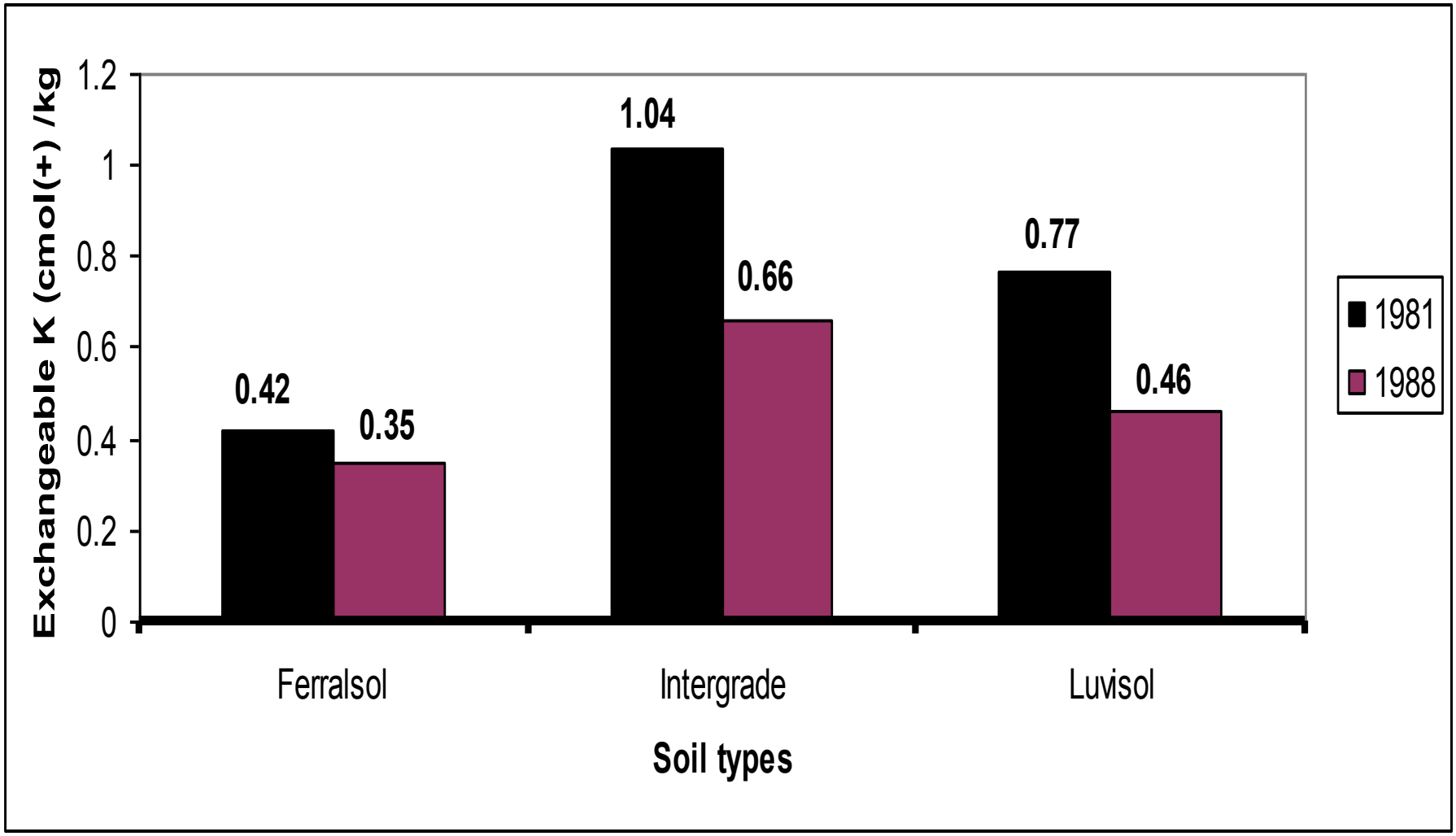

Figure 1: Effect of eight years of continuous maize cultivation on exchangeable K on Mlingano Catena.
Source: NSS 1989

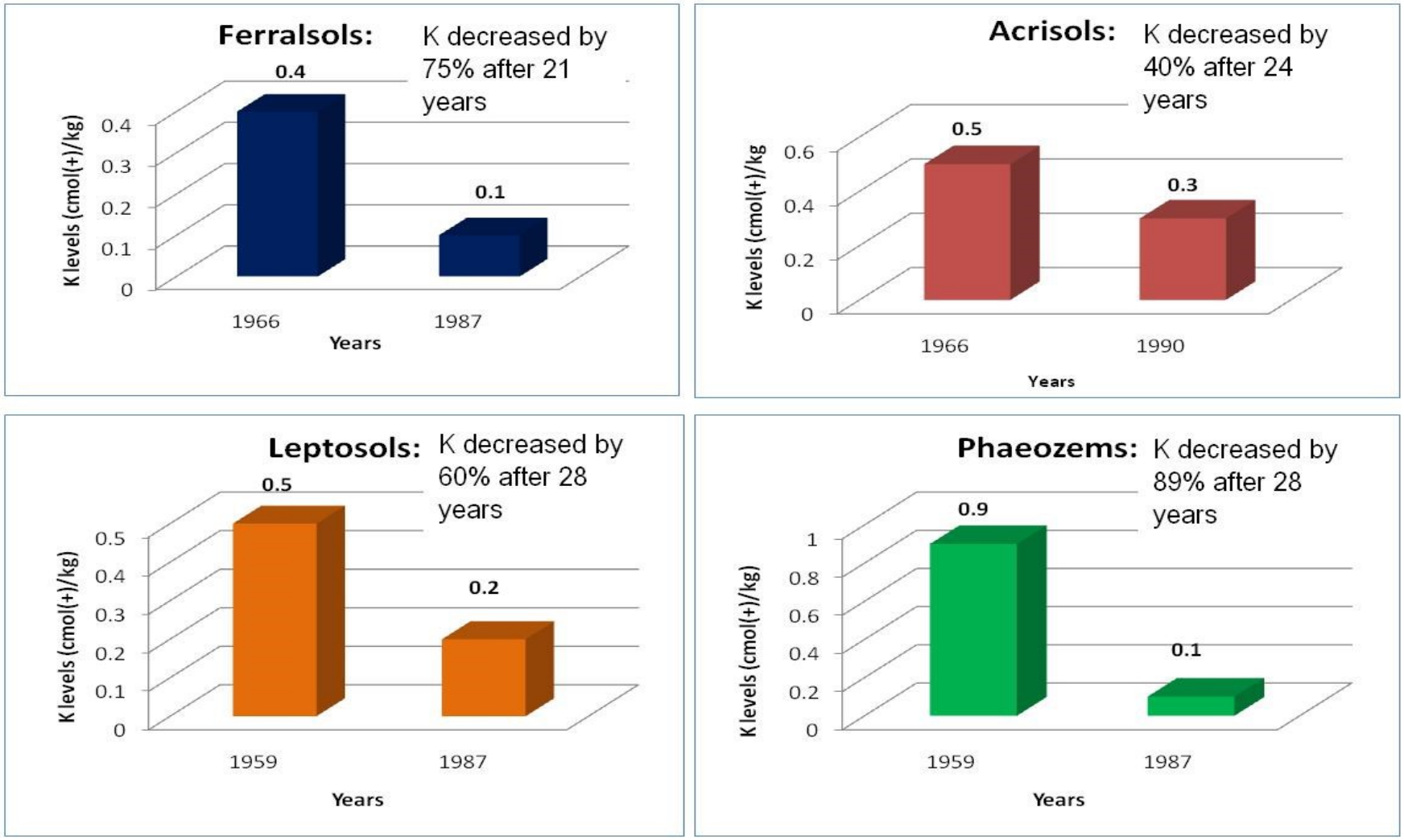

Figure 2: Trend of Potassium with years of sisal cultivation (without fertilization) in four soil types estates in Tanga Tanzania

Source: Hartemink,1997

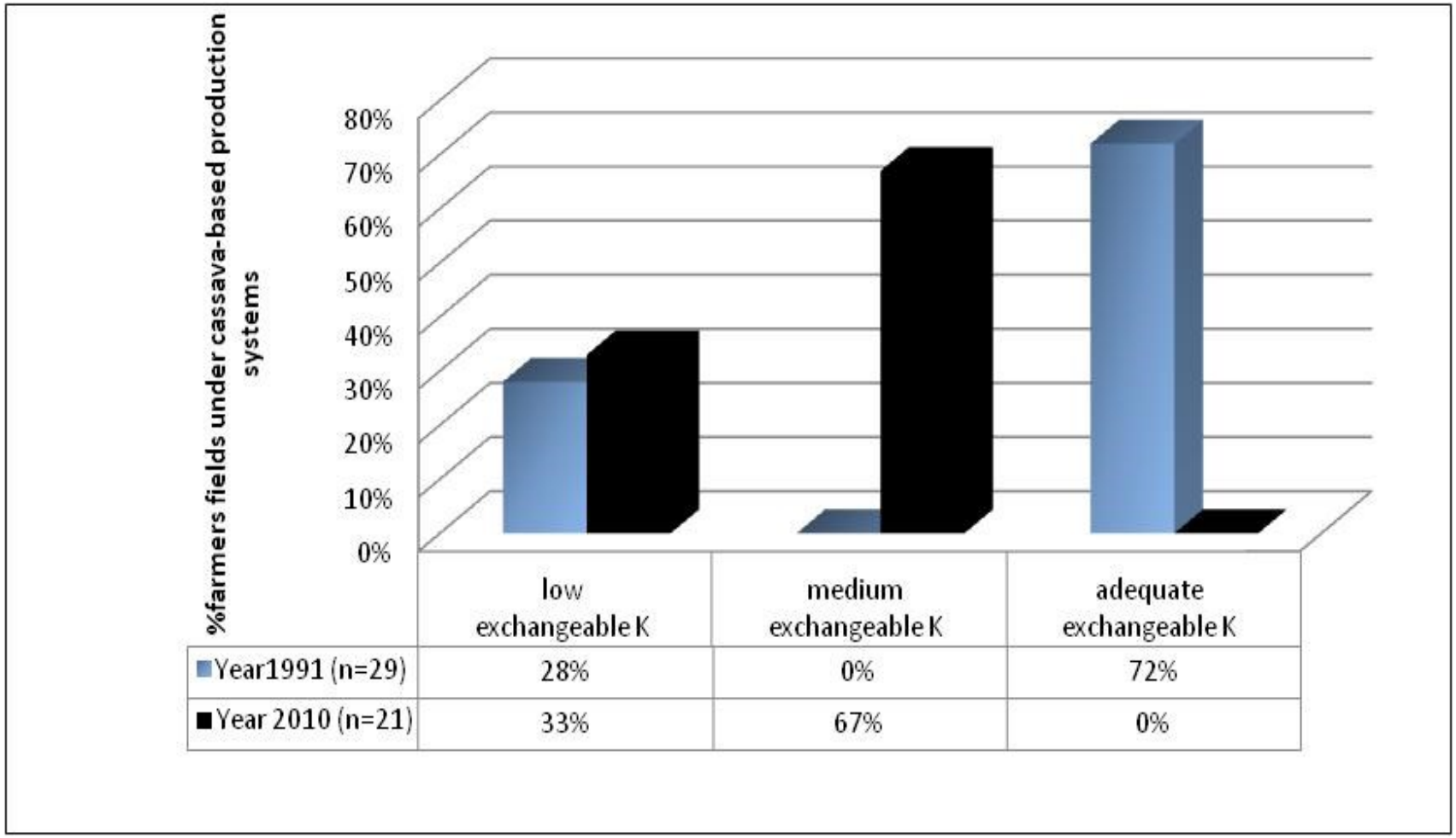

Figure 3: Trends of potassium fertility status in selected farmer's fields under cassava-based production systems in the Coast region Tanzania
Source: Shekiffu, 2011

Soils Under rice based cropping system

- Data showing potassium trends under rice cultivation in Tanzania not obtained

- Data from most rice irrigation schemes from Mlingano lab. analytical results show K level > 0.4cmol(+) /kg

- Levels of exchangeable potassium in upland rice production fields show potassium to be deficient in some fields

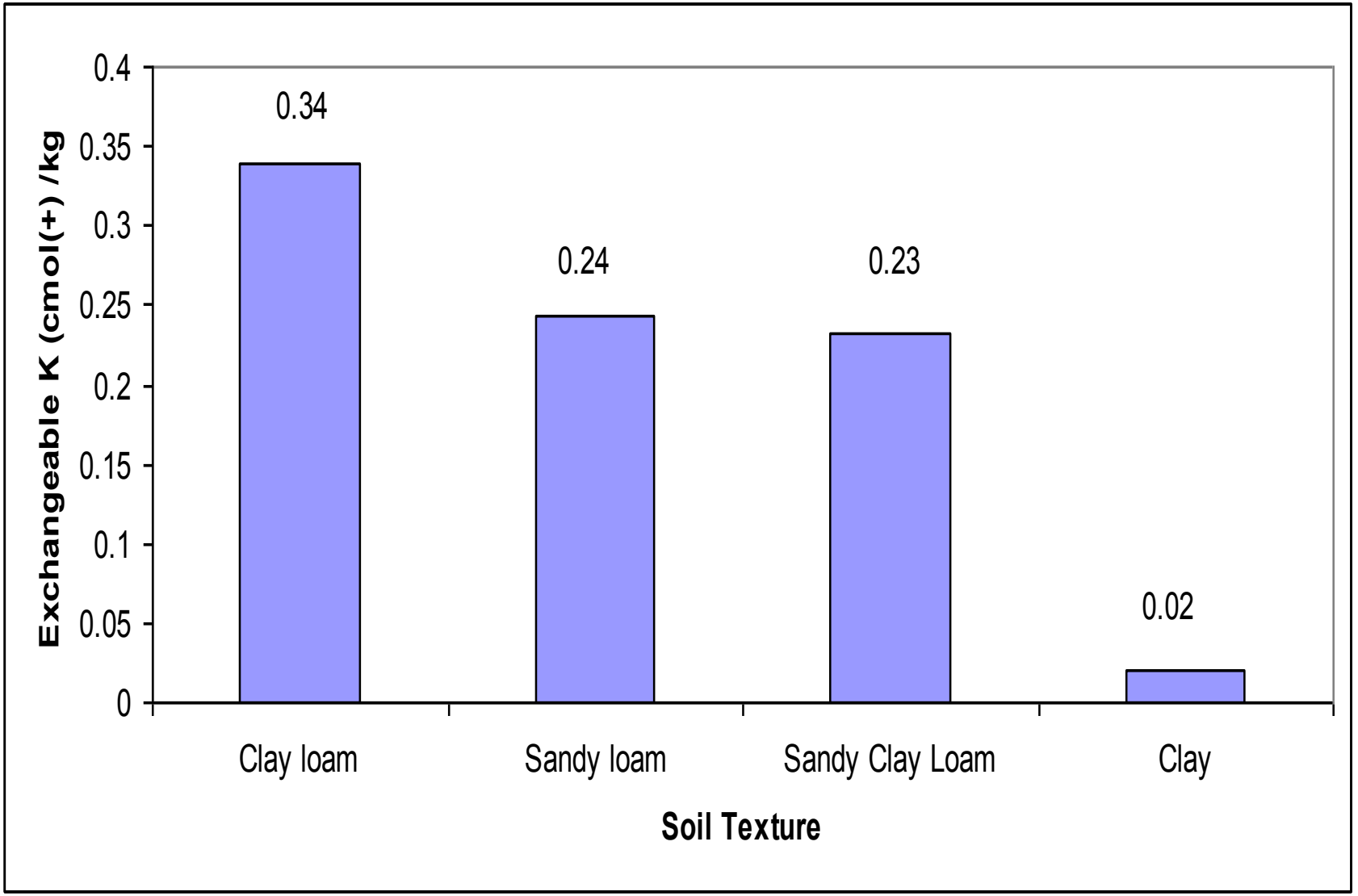

Fig 5. Exchangeable Potassium in upland rice fields of some villages in Tanga Region

Source: Senkoro et al; 2014

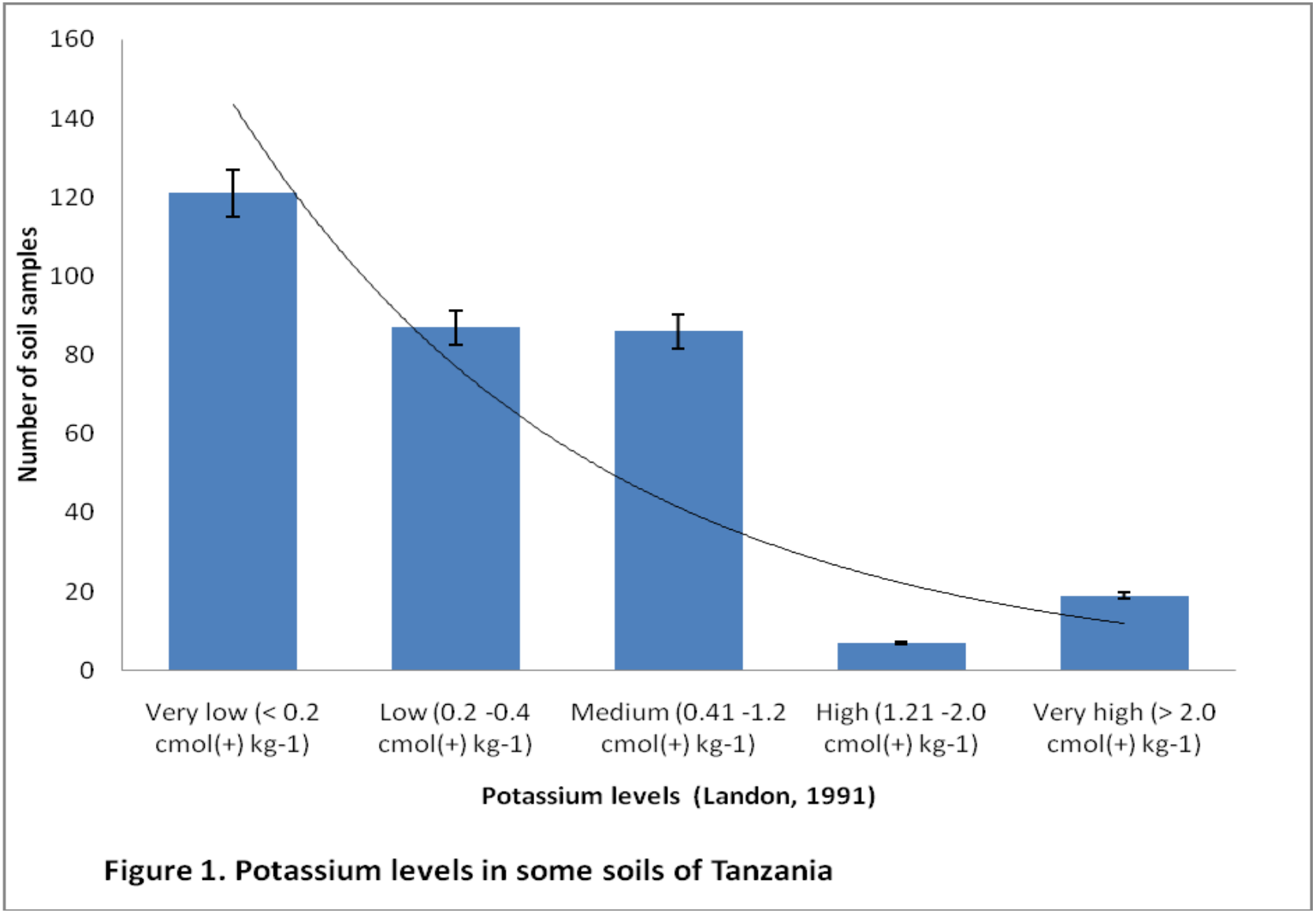

Figure 1. Potassium levels in some soils of Tanzania

Source: *National Soils Laboratory (2015)*

Conclusions and Recommendations

- Potassium fertilizers were not package of fertilizer recommendations in the past as soils had sufficient levels
- Continuous cultivation necessitate the element be considered for sustainable quantity and quality yields
  - ▲ Package of K fertilizers for deficient soils and maintenance for medium K level soils recommended
  - ▲ Monitoring potassium trends in cultivated fields recommended

THANK YOU