Agricultural Development and the role of legumes in Kenya

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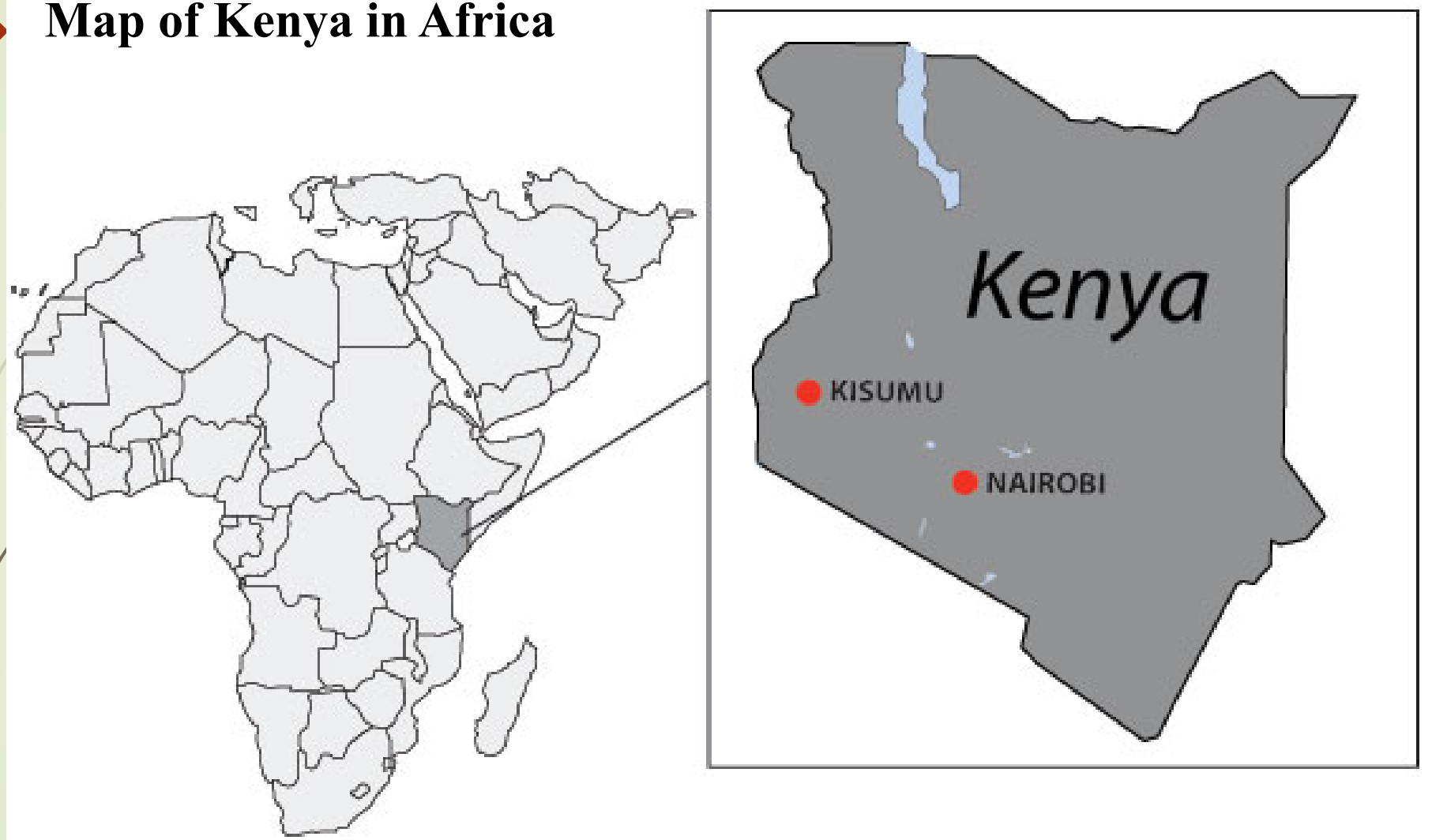
Map of Kenya in Africa



Agriculture sector contributes approx. 30 % GDP of Kenya.

The sector is pivotal in:

1. Enhancing food security
2. Reduction of poverty

The sector supports

- Sustainable Development Goals (1) No Poverty (2) Zero Hunger.
- Kenya's Vision 2030 (2008-2030) -Transforming the country to a newly industrializing middle-income country by the year 2030.
- Kenya's current administration's development agenda-Food security as top priority.

Challenges faced in agricultural sector:

- Low land productivity (due to poor soil fertility and low inputs),
- Land use (remains under-exploited for agricultural production),
- Supply chains, is constrained by some inefficiencies e.g limited storage capacity, lack of post-harvest services and poor access to markets,
- Value addition of agricultural products.

Smallholder farming systems account for:

- 75 % of the total agricultural output.
- 70 % of the marketed agricultural produce in Kenya.

Legumes are integral to the smallholder and silvo-pastoral systems

Provide nutrition to:

- Humans - pulses (common bean, cowpea & pigeon pea),
- Livestock- NFTs (*Calliandra* spp., *Sesbania* spp., *Acacia* spp.),
- Important source of organic soil inputs for improving crop yields- NFTs & shrubs (e.g. *Crotalaria* spp., *Tephrosia* spp.).

Most common legume-based cropping system in Kenya-Maize-bean intercrop.

Accounts for 31% of total caloric intake.

NFTs fix up to 300 kg N ha^{-1} yr^{-1} depending on species & soil fertility status.

Highlights of the importance of legumes in Kenya and opportunities for improvement in the framework of TRUE project

Maize- Beans intercrop (common cropping system in Kenya).

Calliandra calothyrsus a fodder MPTs.

Acacia senegal, the gum arabic tree, a vital NFT for people & economy in the drylands of Africa.

Acacia sp. (Fodder in ASALs)

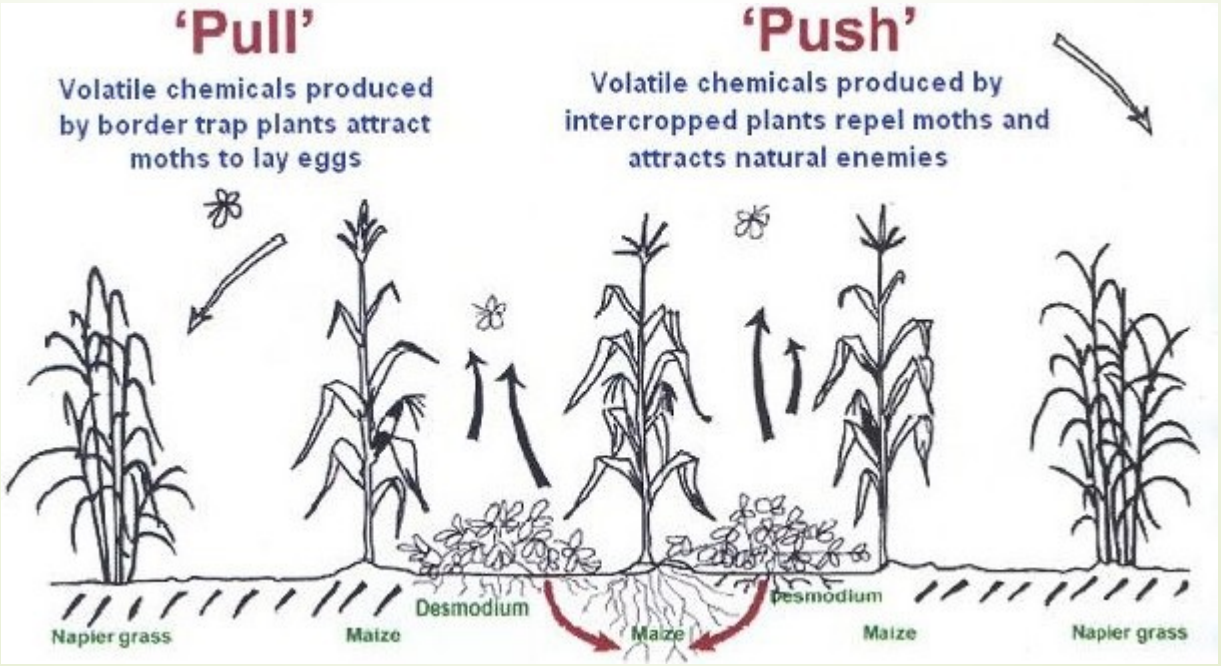
N_2-fixing legume fallow

N_2-fixing legume mulch & biomass transfer

Belowground biodiversity

Integrated agricultural pest management (IPM)

Push-Pull technology



Desmodium repel

- (E)-ß-ocimene
- *(E)-4,8-dimethyl-1,3,7-nonatriene*,

Combinations of cropping systems

- Maize- Beans
- Maize- Groundnuts
- Maize-Beans-Groundnuts
- Maize- Beans-*Sesbania* spp./ Acacia spp.
- Fallowing- Shrubs *(Crotalaria* spp., *Tephrosia* spp.)/ NPTs (*Sesbania* spp., *Calliandra calothyrsus*).

Challenges

1. Human population pressure
2. Crop pests and diseases
3. Climate change
4. Low acreage
5. High poverty

Legume improvement in infertile soils

Addition of NPK containing fertilizers-use averages 20-32 kg ha^{-1}. (Target is to achieve 50 kg ha^{-1})-Cost limitation.

Inoculation using superior genotypes of microbes.

- The N-fertilizer gap can be attained by the use of rhizobia inoculants (the use of NFTs-green manure, biomass transfer).
- Long history of inoculant use in Kenya & the region since 1970s

Selection involves

1. Nodule collection
2. Isolation & authentication
3. Characterization (Morpho-cultural & using molecular markers)
4. Field studies for evaluation.

Morpho-cultural characteristics of rhizobia from root nodules of *Sesbania* spp.

	Morpho-cultural characteristics
I	3mm Ɵ, pink, translucent, milky centre, dome, shinny and moderate gummy EPS
II	5mm Ɵ, milky, translucent, shiny, dome and copious friable EPS
III	4mm Ɵ, red, opaque, shiny, raised and moderate gummy EPS
IV	4 mm Ɵ, transparent, shiny, dome and copious viscous EPS
V	5mm Ɵ, purple suspensions, opaque, raised, dull and copious watery EPS
VI	2mm Ɵ, yellow centre, clear margin, raised, shiny and moderate gummy purple EPS
VII	2mm Ɵ, milky opaque, raised, shinny and gummy moderate EPS
VIII	1mm Ɵ, milky opaque, dome, shiny and no EPS
IX	< 1 mm Ɵ, pink, translucent, flat, dull, dry and no EPS

Legume tree and crop rhizobial inoculant

Conclusions

KEFRI has >4000 culture collection for NFTs and crop legumes.

More collection made under emerging Legume-based projects.


Thank You