

Invasive species and their impact on African Rangelands: The case of Prosopis Juliflora in the Greater Horn of Africa Region

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- Brief introduction the Greater Horn of Africa: Ecology, people and civilization;
- The genesis of and characterises of Prosopis;
- The coming of Prosopis to Africa: a curse, a blessing or both,
- The blessings and future opportunities,
- Concluding remarks,
- Potential collaboration with the RAU and TAA!

Part one: Greater Horn of Africa: Ecological and strategic setting



Map of the IGAD Sub-Region

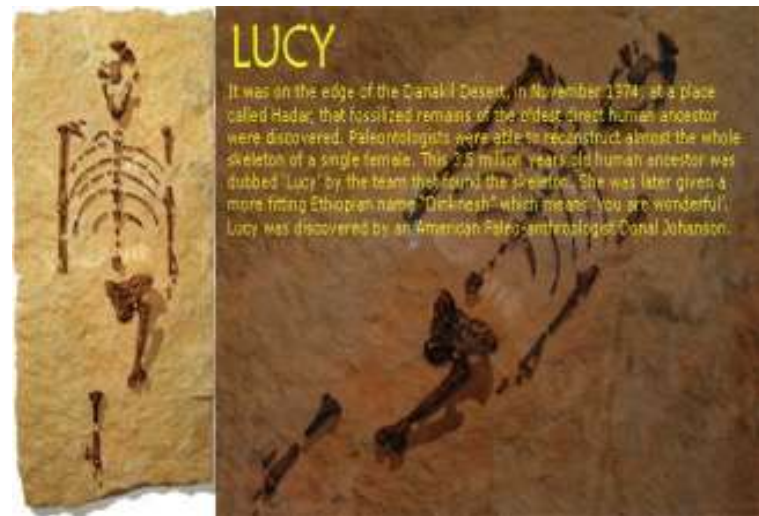
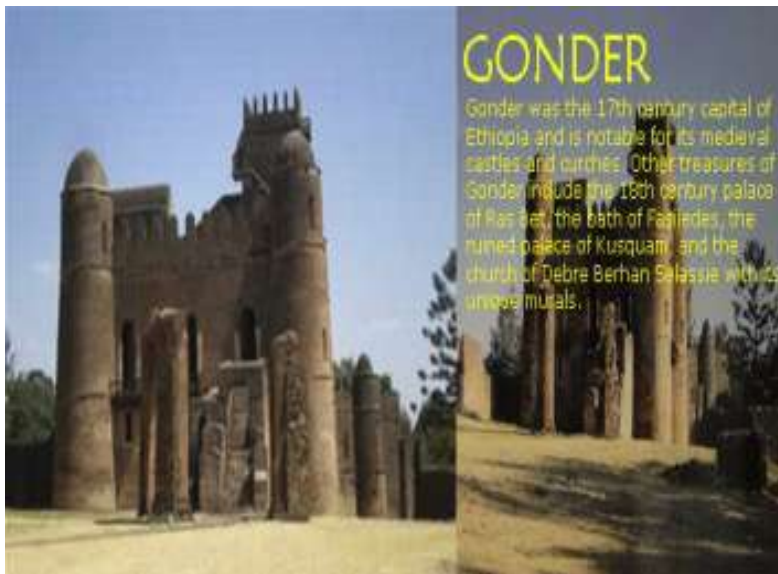
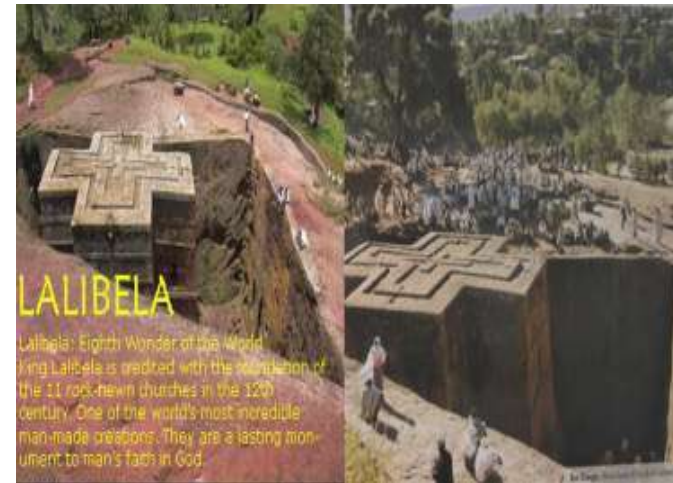
Greater Horn of Africa



Ethnic diversity



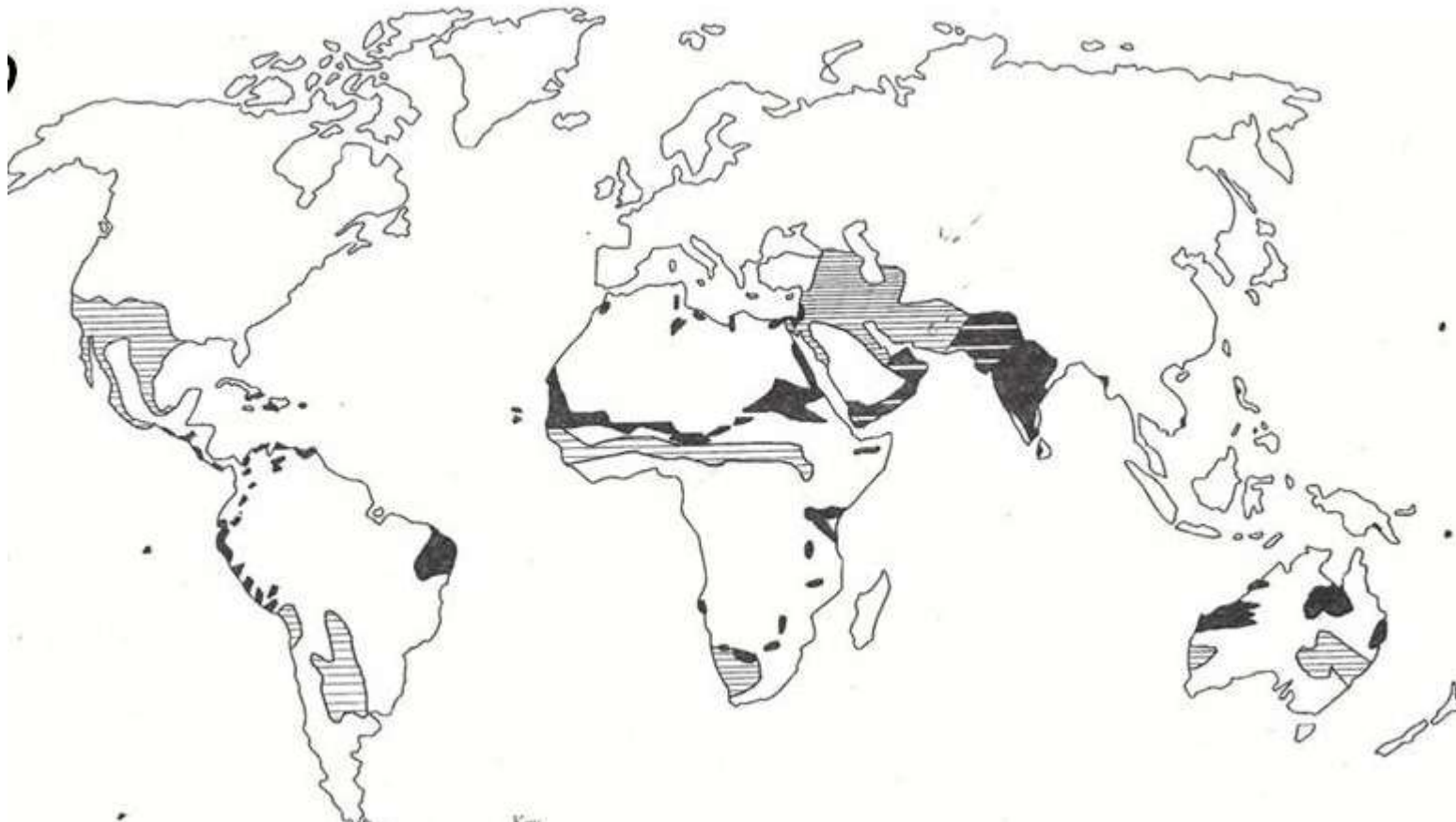
History and old civilizations



Part two: The genesis of and characteristics of *Prosopis*

- *Prosopis* spp. multi-purpose ever green trees or shrubs but has several local names;
- The genus comprises **45 species**;
- Only four, *P. africana*, *P. kodiziana*, *P. fracta* and *P. cineraria* are known in Africa but the rest are widely spread in South America where *Prosopis* originates from;
- *Prosopis Juliflora* is the one which is widely spread across the Greater Horn of Africa and across the Sahara belt of Africa.

Prosopis : Global distribution



Why was prosopis introduced to the Arid and semi-arid lands

Important environmental and social roles.

- Combats desertification;
- Facilitates biodiversity;
- Provides high-value mechanical wood, fencing stalks, firewood and charcoal, feed and food for human, Bee forage for honey, flour and syrup, water soluble gum, medicine, pesticides;
- Preserve indigenous trees;
- Ameliorates soil under canopy;
- Used as compost;
- Suitable for agro-forestry.

It was for the above reasons the plant was introduced to many arid and semi-arid parts of the world with great success.

Characteristics of *Prosopis juliflora*

- Multi-stemmed, spreading crown
pendulous branches
down to the ground stabilizes sand dunes
and curtails sand movement;
- Tetraploid variants, incompatibility
Hybridization, genetic variability;
- Nitrogen fixer, drought high temperature
(48 °C) and salinity tolerance;
High water use efficiency;
- Opportunistic and grows any where;
- Copious seed production



Characteristics

- Coat imposed dormancy;
- Goats, sheep, cows and feral animals water long distant transport;
- Germinates in flushes a huge persistent seed bank;
- Germination seedlings vigorous growth;
- Coppicing, competitive and lacks natural enemies;
- Deep tap roots + laterals + un-palatability of leaves , Preferential survival heavy grazed drought stricken areas and/or on uncultivated fallows.
- Adaptability to arid and semi-arid conditions;
- Confers plasticity, ease of spread and allows colonization of a wide range of habitats.

Part three: The coming of Prosopis to Africa: a curse, a blessing or both(Sudan case)

- Introduced to Sudan from Egypt in 1917(Shambat arboretum);
- Drought 1960s to the early 1970s;
- Need to protect residential and cultivated areas from sand dunes ;
- Increased animal population, shortage of fodder and firewood,
- Desert encroachment (5 kilometer yr⁻¹) and land degradation;
- Introduced as shelterbelts to protect Irrigated schemes;
- In 1980 the plant was re-introduced through the Finland forest Programme in central and northern Sudan;
- Introduced to Eastern Sudan during the droughts years of the eighties.

Part three(negative impacts)....

- In most of the countries, has spread outside where not desired;
- Invades overgrazed, abandoned lands, replaced indigenous vegetation and develops into non-productive thickets;
- Deplete underground water ;
- Pollens are allergic reactions;
- Thorns poisonous and/or promote secondary infections on prickling



Negative impacts..

The plant, recognized, a potential problem late in the 1970s., spread into various ecological niches

**Invaded natural and managed habitats
highways, railway lines; irrigation canals**



Negative impacts...

Floodplains, forests, watercourses, and degraded abandoned land and irrigated areas
Mesquite has become a problem, Central, Northern and Eastern Sudan
In the sandy soils of Western Sudan, apart from localized foci; no problems of weedy invasions



Negative impacts..



- **In most of the infected sites mesquite impenetrable thickets, smothered and excludes native vegetation changed community structure**
- **Into jeopardy animals and human health**

Prosopis appreciated for:

- Plasticity, qualities of survival,
- Sand dunes fixing potential
- Take-off, comprising fuel wood, charcoal, construction timber
- Livestock feed, availed to local communities.



Blessings: PENHA research in Sudan in collaboration with the Ministry of Science and Technology (2016)



Community training on effective utilization of prosopis ration for animal feed in Sudan and Eritrea(2017)



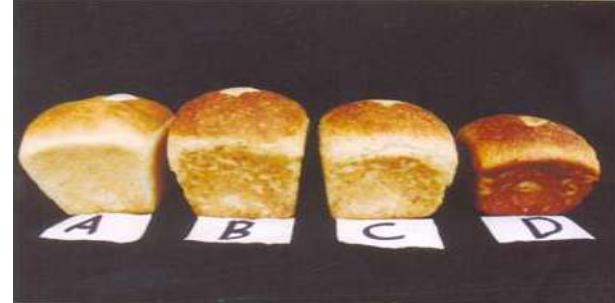
Training of trainers in Sudan and Eritrea (2017)



Blessings..

Human food(**Still wishful in the Horn!** :

- Prosopis a component of the Ameri- indians since time immemorial;
- Pods proximate and essential amino acids analyses revealed suitability for food and feed;
- Prosopis flour , blends with cereals, could be used in breads, biscuits, jam and concentrates (m In Sudan *P. Juliflora* In Sudan Pods sugar content ranged 13-20%, South and North America 35-59%
- Help fight malnutrition



Blessing continued.. **Animal feed:**

- In Sudan animal wealth major contributor to the national income (25-30%).
- Pastoralists, agro-pastoralists and sedentary animal's (60% of the populace) and posses about 90% of the total livestock population.
- Feed has become a major item of cost in animal production. Identify and evaluate underutilized resources, legumes, as alternative protein source for livestock. Mesquite, a unique resource In Sudan *P. Juliflora*
- In Sudan Pods sugar content ranged 13-20%, South and North America 35-59%
- Analyses showed suitability of mesquite leaves and pods as feed for ruminants and poultry

Animal feed...

Leaves:

- Fresh leaves, un-palatable, consumed under hunger stress
- Locals claimed milk of goats browsing mesquite leaves tastes bitter, animals facial paralysis.
- Drying improves palatability and abolishes toxicity. Silaging improved digestibility (not more than 5% in feed)

Pods:

- Controversial reports on anti-nutritional factors and toxicity. Less on ruminants than poultry.
- Fattening goats lambs, increased milk production and reproduction in goats
- Need to be crushed and be part of the ration and not the whole ration.
- In poultry (Broilers chickens) enzymes preparations have to be added.
- Effects on layers controversial

Blessings ..Fuel:

- In Sudan mesquite under utilized (firewood charcoal, sand dune fixation)
- Good quality fuel of high calorific value (4216-4800 kcal/kg).
- Firewood and charcoal, income generation and satisfies, in part, household energy requirements
- Records charcoal and firewood in 1996/97 (Gash and Atbara rivers) were 600,000 sacks and 135,500 m³, respectively
- Storage and transport, woodborers, charcoal viable option (3-6 kg = 1 kg of charcoal)



Concluding remarks

- National Governments in the Region do not have a coordinated plans for prosopis management;
- Complete eradication of prosopis is neither desirable nor tenable;
- Most control measures are confined to hand clearance or mechanical uprooting;
- Felling burning stumps, and biomass , Stumping at 15-30 cm uprooting of seedlings;
- Slow, expensive and constrained by area occupied, rapid spread labour shortage coppicing, attendant soil disturbance and mesquite seed bank;



Concluding remarks....

- Adequate planning and investment for an integrated management strategy based on international experience on management of invasive plants.
- Management resides on prevention, containment, utilization eradication, replacement monitoring and rapid response aided by legislations
- The strategy should take into account the stage of invasion,
- Effective community participation and capacity building for communities on alternative utilization of prosopis as demonstrated by PENHA.

Potential collaboration with the RAU and TAA!

- Prosopis is an **underutilized resource** with huge potential for development in the arid and semiarid lands(ASALs);
- Seeking possibilities for **joint funding and research** partnerships for expanding the Prosopis programme within the Horn and across the other African countries;
- Great potential for **South-South cooperation** by exchanging knowledge and innovative initiatives with PENHA and other organizations globally but particularly South America ,India and Australia .
- Based on PENHA experience , develop **proper training package** for training of trainers at community level using the outcomes of the PENHA research as well as capitalizing on research outcomes from other like minded institutions in Africa and elsewhere.

- **Acknowledgment** : To the Pastoral and Environmental Network in the Horn of Africa(PENHA)
www.penhanetwork.orgwww.penhanetwork.org
- **To professor Abdel Gabar Babiker**, from the Sudan University for Science and Technology Sudan for his contribution to prosopis research in the Sudan but also this particular presentation.

A photograph of a river flowing through a lush green landscape. The river is in the foreground, and the background is filled with dense green vegetation and trees. The sky is overcast.

Thank You