Management, control and utilization of Prosopis: Global experiences that informed approaches for Kenya

By

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International conference on management of *Prosopis juliflora* in the Horn of Africa

1st-2nd May 2014
DESALEGN HOTEL, ETHIOPIA

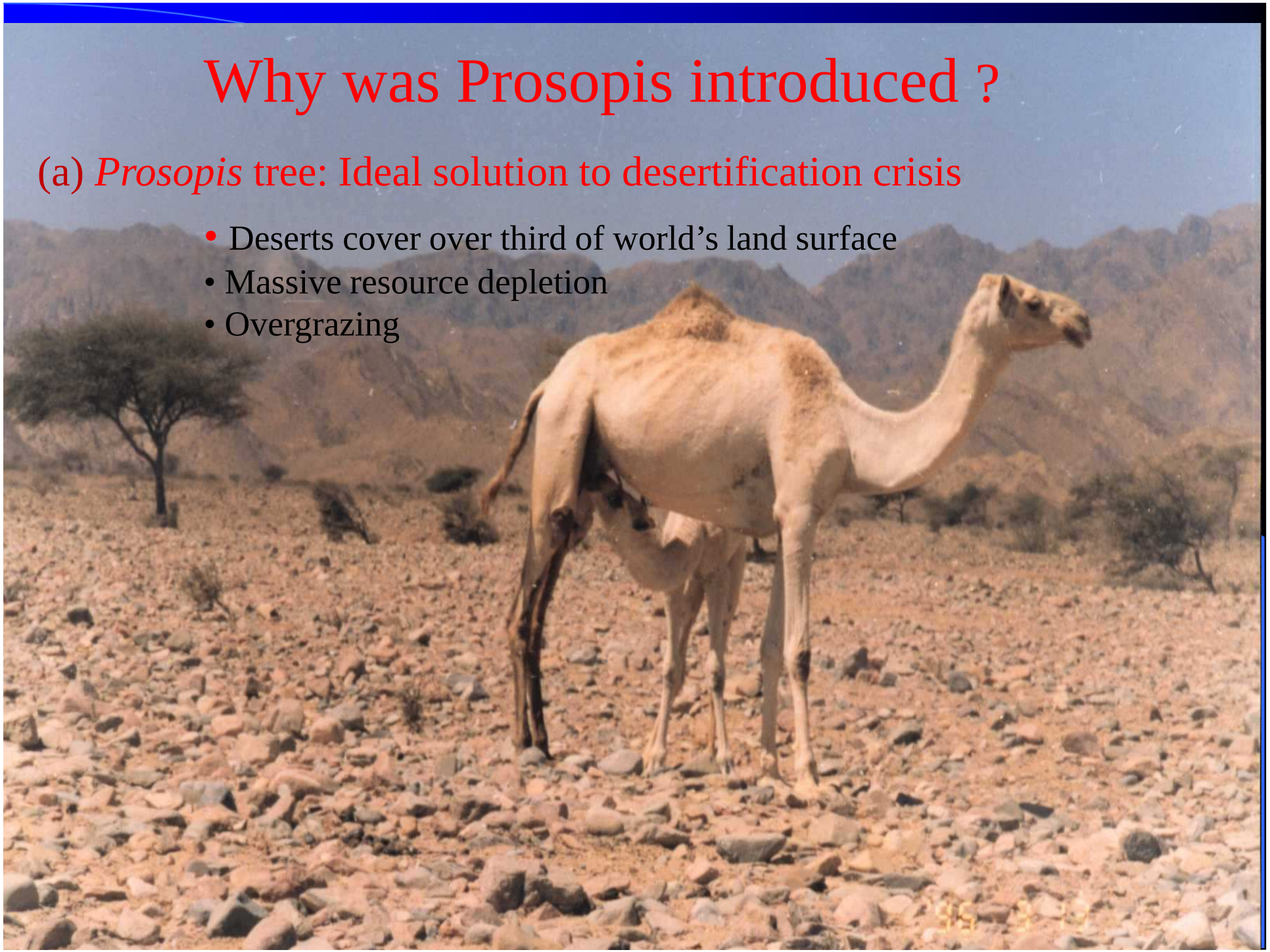
Presentation outline

1. Global introductions of Prosopis
2. Global examples on management and utilization
3. Selective approaches used in Kenya
4. What works and what does not
5. Revisions of management and control strategy
6. Way forward

Why was Prosopis introduced ?

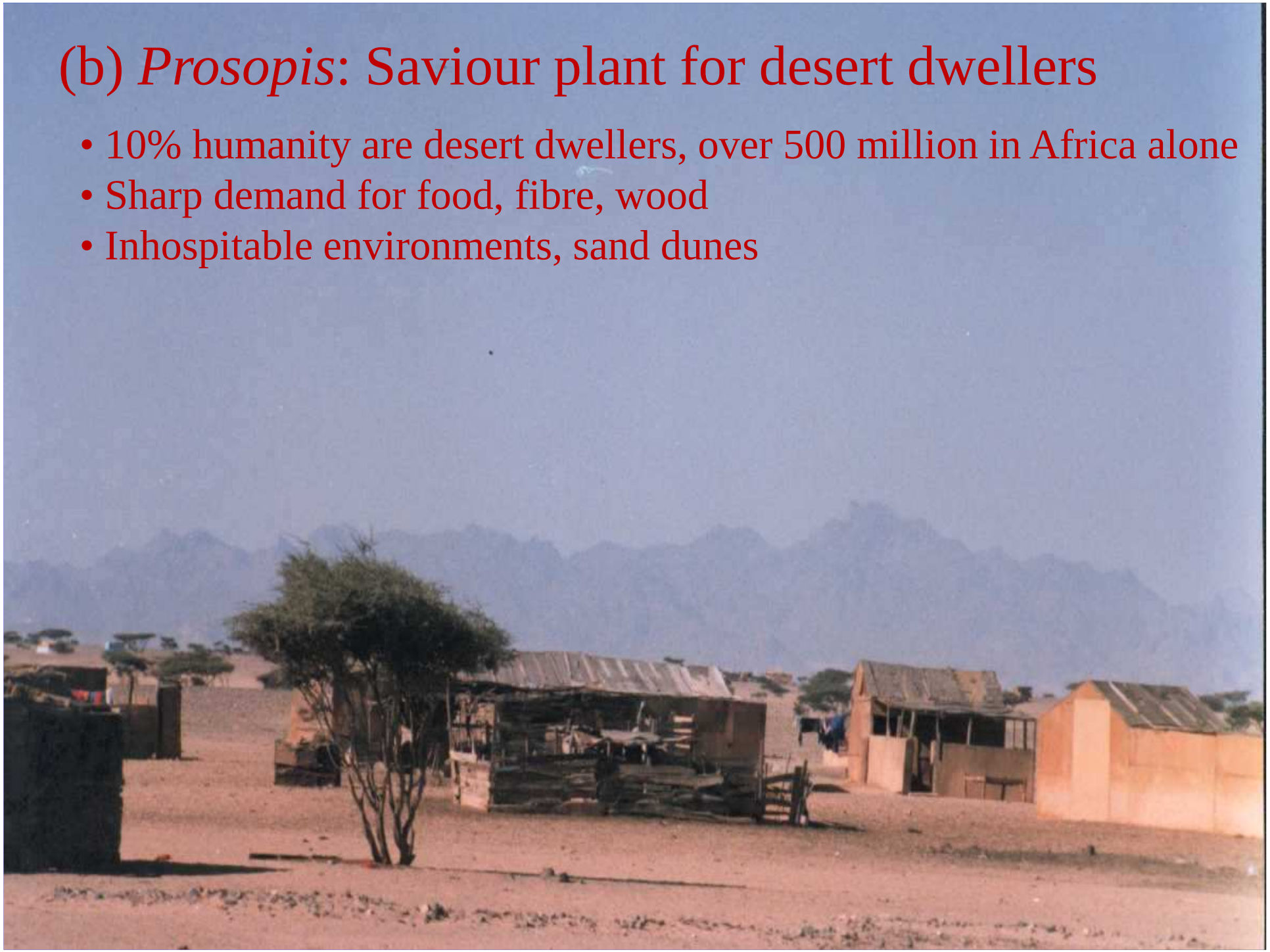
(a) *Prosopis* tree: Ideal solution to desertification crisis

- Deserts cover over third of world's land surface
- Massive resource depletion
- Overgrazing

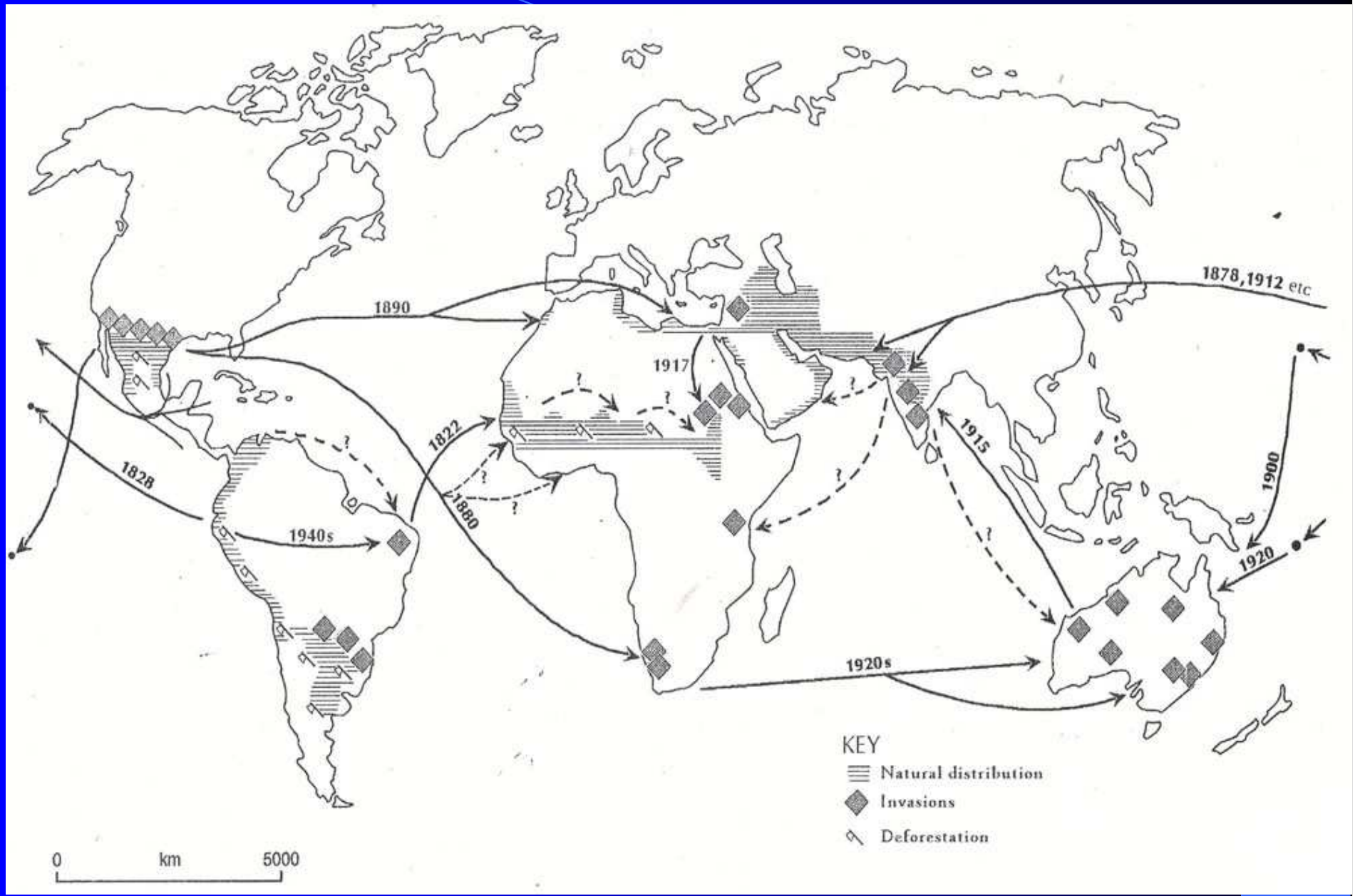


(b) *Prosopis*: Saviour plant for desert dwellers

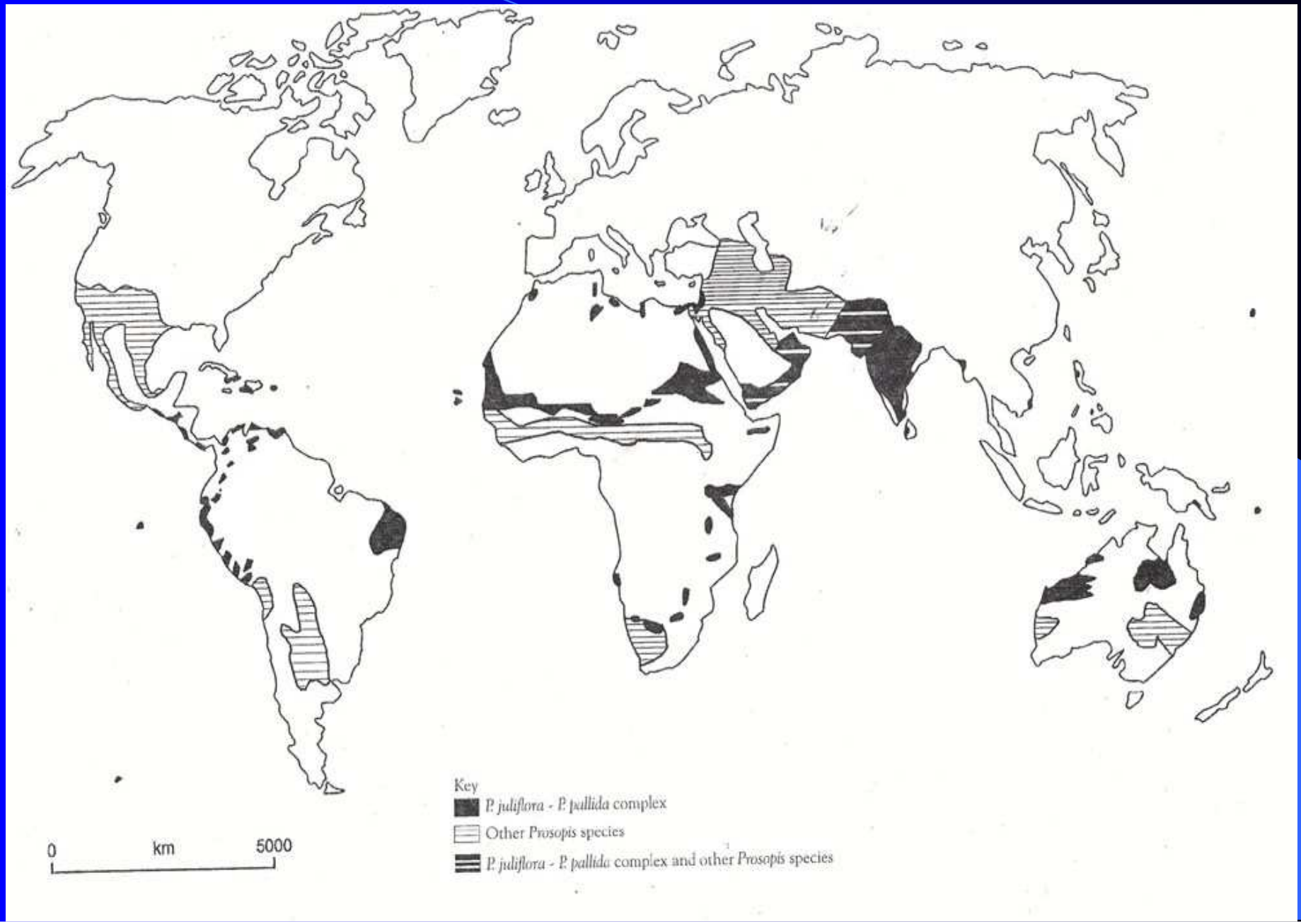
- 10% humanity are desert dwellers, over 500 million in Africa alone
- Sharp demand for food, fibre, wood
- Inhospitable environments, sand dunes



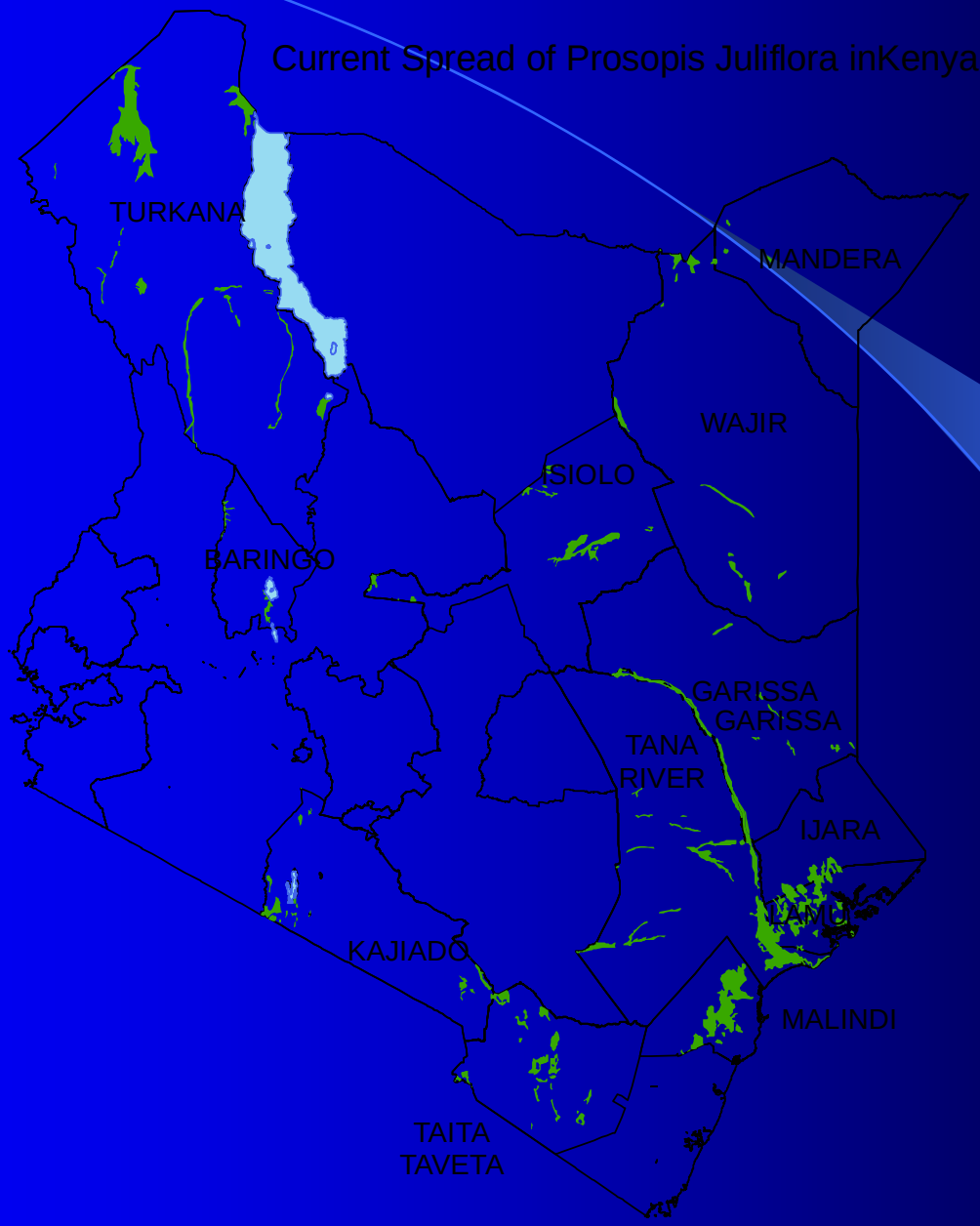
Introduction of *Prosopis* from Americas to the world



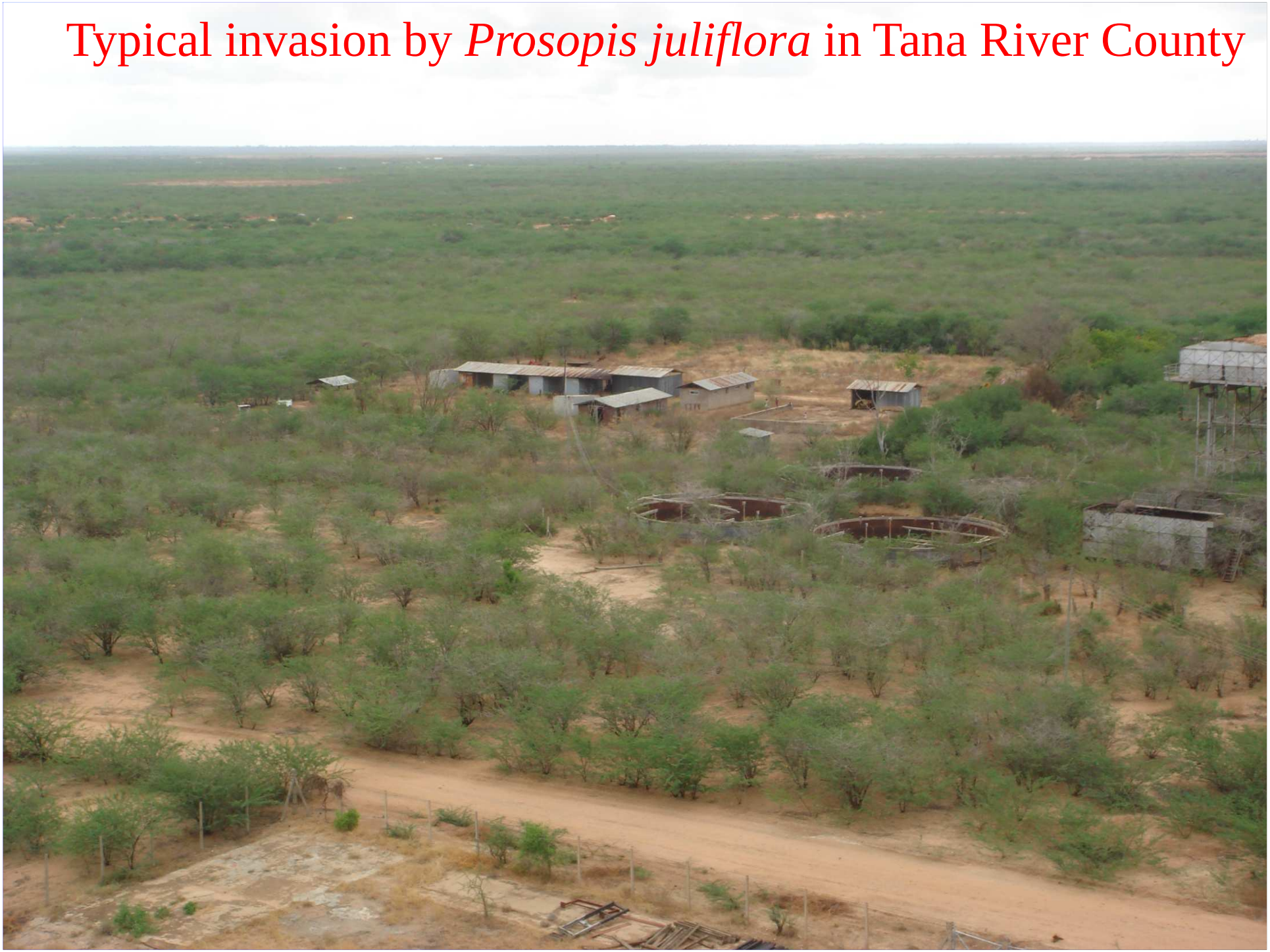
Current distribution of *Prosopis* spp in the world (2000)



Currently estimated at 2% of Kenya’s land cover



Typical invasion by *Prosopis juliflora* in Tana River County



Approaches used in Kenya

(a) Awareness creation and defining the problem (1999- 2004)

(b) Participatory development of technologies on management and control (silvicultural, biological, etc) (2005- 2008)

(c) Strengthening of capabilities of communities to manage the invasions (2009 to date)

(d) Focus on management of invasions through processing and utilization as a resource (on-going)

(e) Formation of community structures for effective management and linking industies to the Prosopis resource (on-going)

(e) Commercialization and refining processing and marketing structures, developing Research and Development (R&D) blueprint (on-going)

(f) Seeking other alternative sources of income from Prosopis resources (carbon trading) and improving marketing (pilot certification of charcoal)

Peru

- Population of 25 million
- 72 ethnic communities, 76% live in urban areas
- Rich in biodiversity, top 15 globally
- Ranked 4th globally in total tropical forest area
- Ranked 9th globally in total forest area, 72 million ha
- Forest resources valued at US $ 83 billion
- Forests under threat by encroachment
- Government spending US $ 70 million annually on conservation programme
- *Prosopis pallida* main species found in Peru
- Originally about 1.7 million ha, now only 200,000 ha
- Planting programme has been initiated

Peru: Where *Prosopis pallida* is a big asset

Silvi-pastoral activities within Prosopis forests in rural areas

Prosopis sustains livestock health and wood for construction

Honey production at village level from Prosopis forests

Commercialization of honey

Commercialization of pods through cottage industries

Products for export market

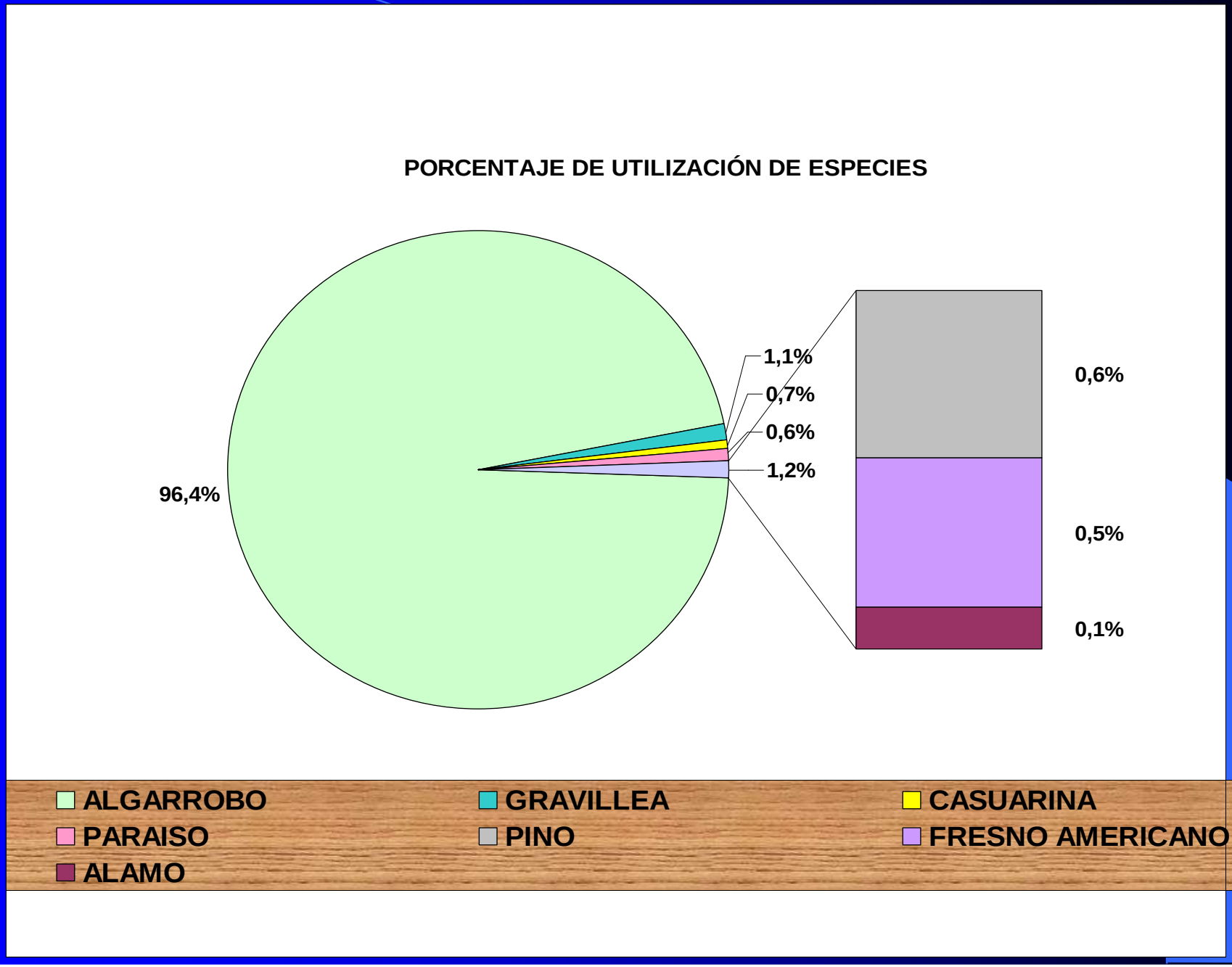
Research programmes on Prosopis in Peru

- Led by the University of Piura in northern Peru
- Prosopis research programme started in 1984
- National selection of superior germpasm have been done
- Criteria include good form, yields and taste of pods
- 80 ha seed orchard has been established
- Seed source for many international requests for planting

Argentina

- Population of 40 million
- Believed as centre of origin of Prosopis species
- Mexico as secondary origin
- Has the highest diversity of the species, 32 species found
- Use of Prosopis as forage species began in 16th century
- Industrial use in late 16th century until today
- Wood industries (railway, firewood) are major causes of massive degradation of germplasm
- Prosopis is a major species in northern Argentina (ASALs) both for domestic and industrial utilization

The high utilization of Prosopis in Argentina



Prosopis kuntzei: Mollasses plant

Prosopis alba: The wood and forage source

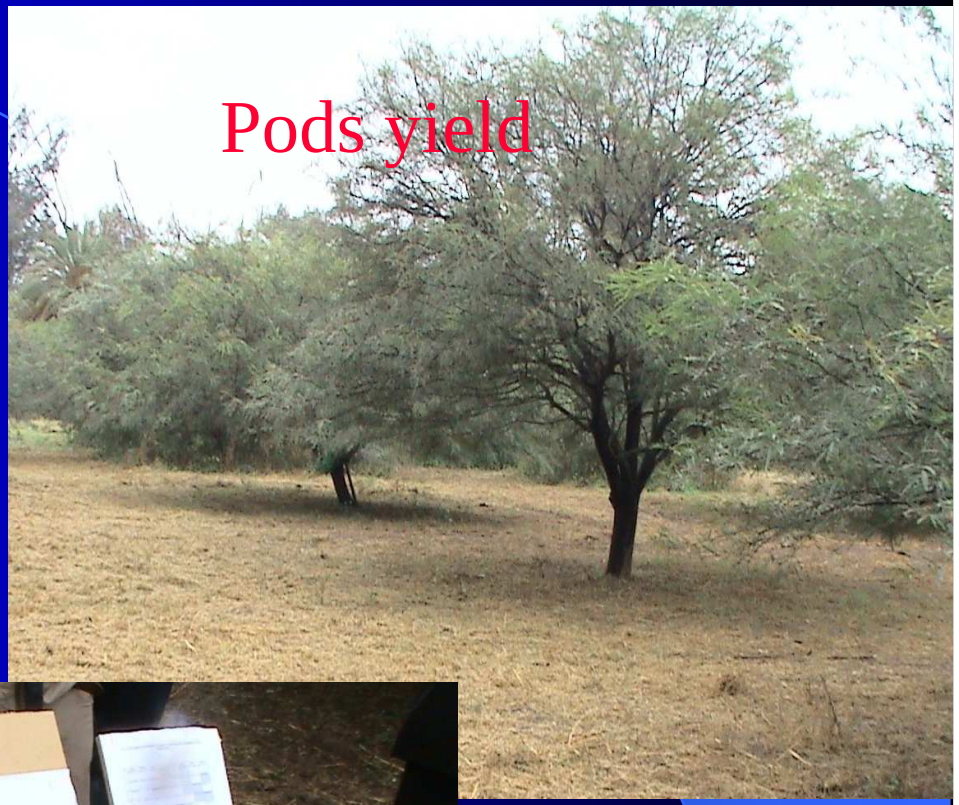
Prosopis ruscifolia: The invasive nuisance

Prosopis research in Argentina

Clonal production of superior germplasm

Breeding for specific product/wood qualities

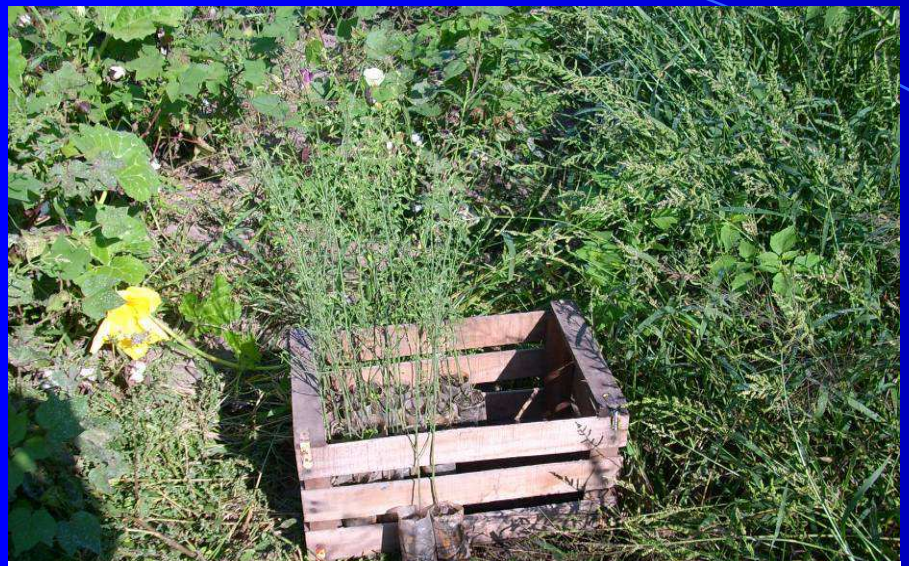
Timber



Pods yield

Sweetness

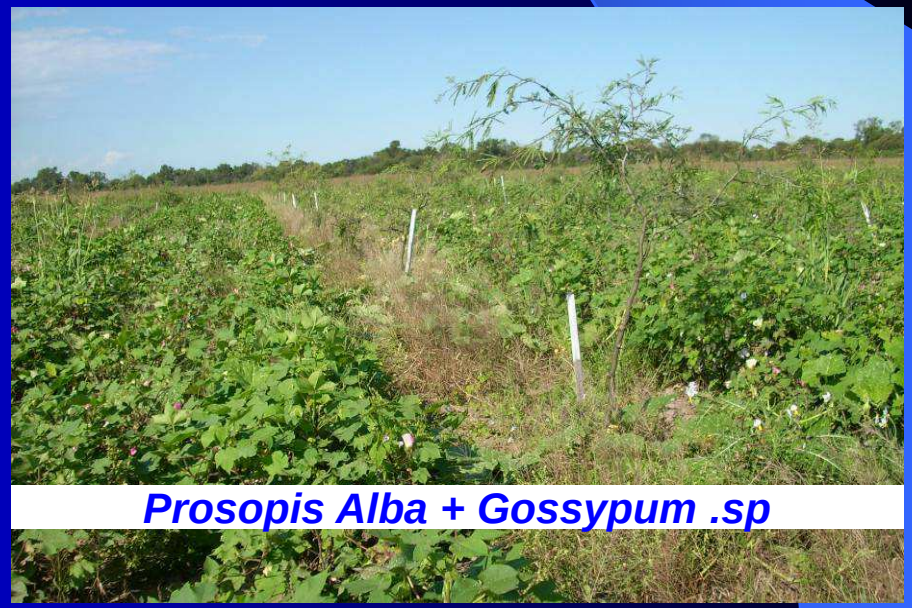
Agroforestry



Prosopis Kuntzei + Cucurbita .sp

Prosopis Kuntzei + Cucurbita .sp

Prosopis Kuntzei + Citrullus Lanatus



Prosopis Alba + Gossypum .sp

Intercropping

Prosopis Alba + Allium Fistulosum

Prosopis Alba + Zea Mays

Prosopis Alba + Medicago Sativa

Prosopis Alba + Zea Mays

Prosopis and livestock production

Prosopis livestock feeds and shelterbelts on pasturelands

Sustained annual planting programme using selected germplasm

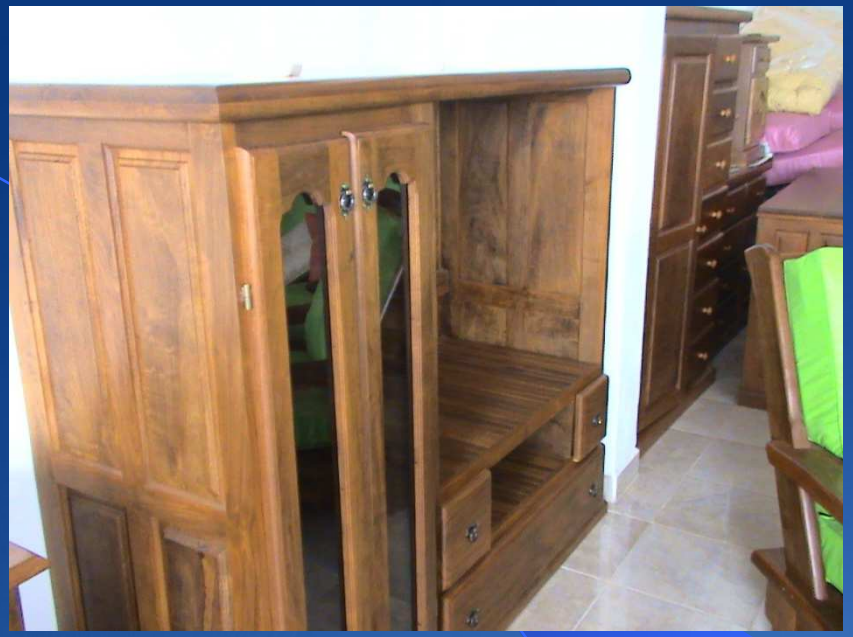
Field management

Tools of trade

Thinning and pruning on private farms

The Prosopis wood industry

Various wood products



Innovations and diversity of products

India

- Considered a poor man’s tree
- No clear cut policy for management by Government until 2010 when cultivation is now promoted for green energy production
- Management by utilization most preferred and encouraged
- Most industries supported by Prosopis products

Charcoal and timber production industries

Livestock feeds industry

Pods storage

Mobile blocking machine

Livestock feeds

Prosopis Research Programme

Emerging frontiers on utilization of Prosopis


Vermeer
BC1000

Policy re-orientation to support large scale cultivation (2010) !

Australia

- Introduced in late 1800s
- Recognized as weed of national importance
- Over 1 million ha covered by 2001
- National strategy launched in 2001 with vision of confining Prosopis and hybrids and eventually eradicated from Australia
- Led by National Prickle Bush Management Group (NPBMG) composed of government agencies, private sector and communities
- All arsenal have been used, including any imaginable mechanical, chemical and biological control methods
- Part of government policy is restriction on use of its products

South Africa

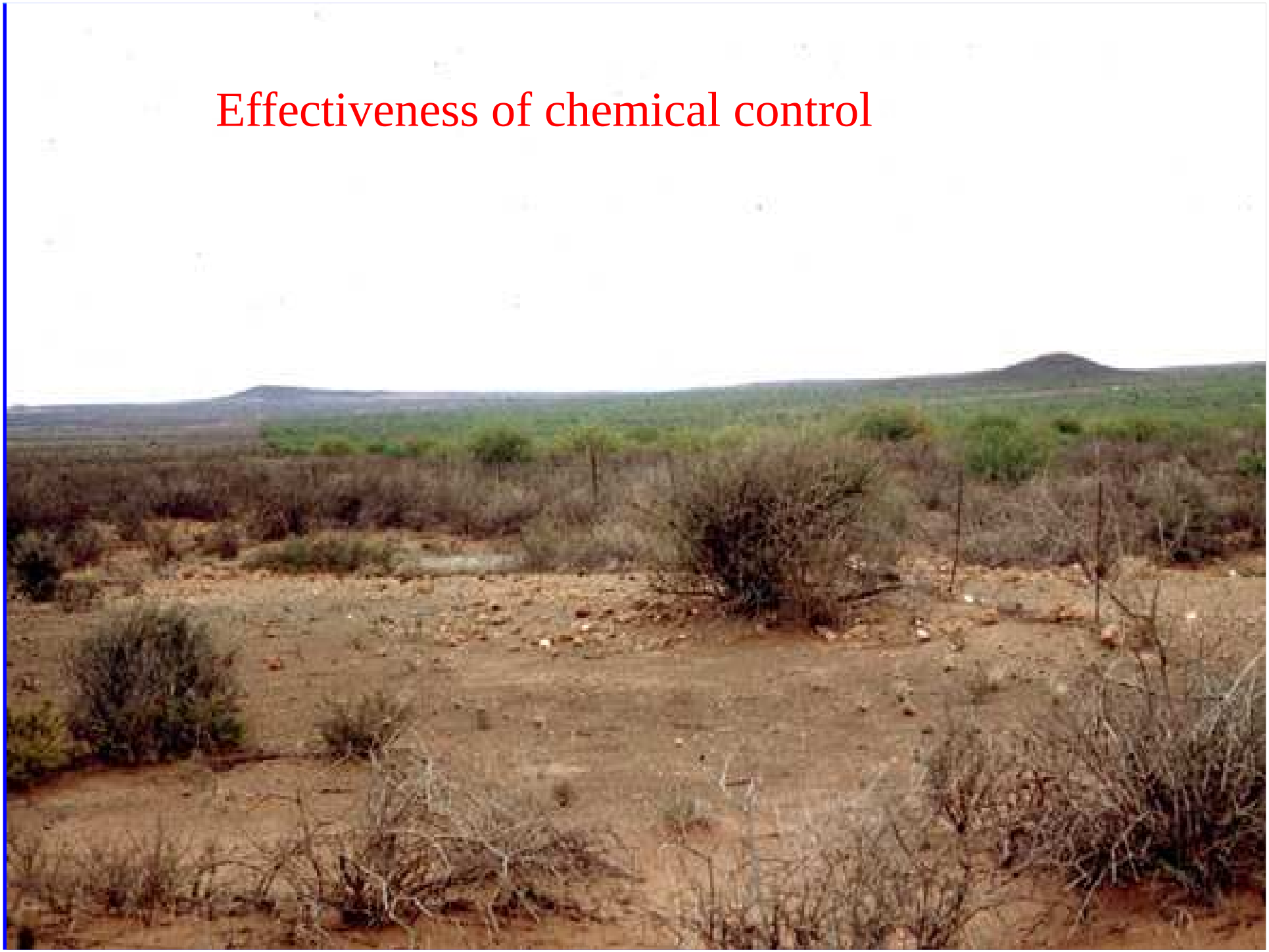
- Has the worst problem on invasives globally with over 160 plants, over 7% of runoff water wasted
- Prosopis introduced in 1800s mainly in Northern Cape
- 1.8 million ha coverage by 1995
- Management programme for invasives launched in 1995, Working for Water Programme (WfP).
- Use of human labour to clear invasives in an organized public works and job creation programme, the best in Africa
- Over 20,000 jobs created annually, funding over US$ 50 million/year (Ksh 4 billion/yr)
- The largest environmental conservation programme in Africa
- Cleared biomass used to support industries under PPP

(a) Using brush cutters


(b) Herbicide application on stumps


(c) Hand spraying

Effectiveness of chemical control



Aerial spraying

Use of biomass by Secondary Industries Programme (SIP)

Secondary wood industries

(d) Biological control

(i) *Algarobius prosopis*

Adult

Ovipositor sites on pods

Damaged and undamaged pods

Emerging larvae

(ii) *Neltumius arizonensis*

(iv) *Evippe spp* (leave tying defoliator moth)

Evippe adult

Evippe minor damage

Evippe major damage

(iii) *Apion spp*

Adult *Apion spp*

Oviposition sites on pods

Apion damaged pods

Sudan

- Introduced in 1917 by colonial government
- Spread by use of airplanes across desert areas
- Differences in approach by politicians and technocrats, technocrats advocate management, politicians for eradication
- Clear felling in selected schemes started in 2004 using oil revenue, over 50,000 ha cleared by 2006, and on-going
- Cleared areas allocated to squatter farmers and have to keep Prosopis away or risk being jailed
- Biological control agents already in the country from Yemen

Clearing of Prosopis at New Halfa Scheme, Sudan

The Kenyan experiences on procedures

(a) Awareness creation on Prosopis invasion

(b) Participatory formation of community groups

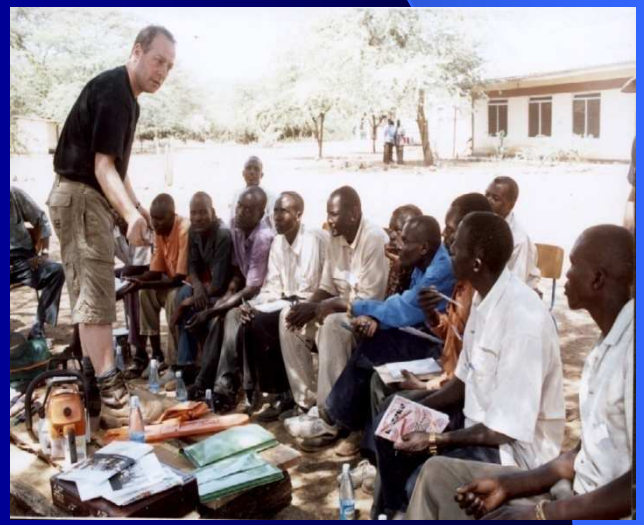
(c) Targeted regular intensive training of key facilitators (Theory and practice)

Field days

Facilitators

Local stakeholders

Special groups



Lectures on technical issues

(d) Field practical training

Public gatherings

Tree felling techniques

A stitch in time saves nine

Setting logs for sawing

Sawing techniques

Seasoning of timber

(e) Select high priority invasions and sites

(f) Open up by removing branches and selective thinning

(g) Extract stumps or kill by burning with manure

(h) Make sawn timber as first line of profitable use

(i) Produce poles and charcoal as 2nd and 3rd options

Charcoal production in Baringo County

	Period of production (in 25-30kg standard charcoal bags)					
	2007	**2008**	**2009**	**2010**	**2011**	**2012**
Annual Totals (Bags)	41,090	75,845	358,425	265,855	128,855	179,590
Total revenue (Ksh) (GOK)	821,800	1,516,900	7,168,500	5,317,100	2,577,100	3,511,800
Total annual income (Ksh)	10,272,500	18,961,250	107,527,500	79,756,500	45,099,250	61,456,500
US Dollars/YR	**120,000**	**217,000**	**1,250,000**	**900,000**	**500,000**	**700,000**
Monthly income (Ksh)	1,467,500	1,580,104	8,960,625	6,646,375	5,011,028	5,121,375
US Dollars/ MONTH	**17,000**	**18,000**	**105,000**	**78,000**	**58,000**	**58,000**

(j) Carry out active land use to prevent re-invasion

(k) Collect pods, dry, process them for feeds and food

Link community producers to feeds industry

200 tonnes Prosopis based feeds have been made in the first industrial pilot production. Several others underway

Observations already made

1. There is a serious lack of knowledge and technologies to manage Prosopis but the knowledge gap is gradually being filled.
2. Successful management of Prosopis requires serious commitment and political will by Governments
3. Initial capital expenditure is required to make an impact of core invasions and these efforts must be sustained for long term impact on control and management
4. While land privatization makes it easy to manage the invasions, the communal set ups common in most African cultures remains a challenge that must be overcome

What has worked and what has not

1. Clearing and replacing *Prosopis spp* with grass and crops. This has succeeded *only* on private land, *rarely* on communal areas. Best results noted in Baringo County where an NGO provide *subsidized* cultivation costs and *grass seed*. 145 households actively engaged on about 500 ha managed over a total invaded area of 300 square kilometres.
2. Utilization: Charcoal production has worked extremely well driven by *supportive Government policy* to open Prosopis charcoal and limited charcoal from other species. Constrained by lack of proper supervision and coordination to allow systematic clearing/management regimes of invaded areas
3. Processing of pods has worked well. Limited by lack of raw materials (crop residues) to make local mixtures of feeds. Long distances and poor roads to major markets also limits large scale use of pods

CNT: What works and what does not

4. Formation of groups and their sustainability. Groups are best as entry points by agents and partners to work with communities, for training and passing technology to larger communities, for bargaining and setting product prices and providing organized labour. However, they are only sustained by how much each member gains at the end of the day.
5. Control through utilization approach is working but not as desired. Invasions have not been significantly reduced at the levels and densities that are considered manageable.

Government of Kenya now making revisions on the approach

6. Many development partners engaged on Prosopis management efforts but there is poor coordination of these efforts. This encourages duplication of activities and wastage of resources. Government now coordinating these efforts

Revised approaches underway

1. Participatory developing management plans for invaded areas. This will help to introduce systematic clearing cycles and management of intervention areas.
2. Linking issuance of product licenses to ethical harvesting and long term management of intervention areas
3. Legislation, rules and regulations governing management of areas invaded by Prosopis trees are being formulated following the example of South Africa's working for water programme.
4. Introduction of certification programme for Prosopis charcoal
5. Establishment of a National Centre of Excellence on Prosopis management, control and utilization in Kenya
5. Promotion and support for industrial utilization of biomass to achieve desired impact of manageable densities while mitigating against climate change (green energy)

Startle Company to introduce mobile kilns

9. What next?

- Regional approach towards management and utilization within ECA building from the experiences of Kenya, Ethiopia, Djibouti & Sudan
- Establishment of Regional Centres of Excellence in Ethiopia, Kenya Sudan, Djibouti and other IGAD member countries to share technologies and approaches in pastoral areas.
- Areas of focus are refinement of the activities and governance structures of the existing groups for profit maximization while ensuring environmental integrity without losing the primary objective on control and management of the Prosopis invasions
- Regular monitoring of new invasions and timely initiation of management and control programmes to desired densities
- Increased role of Prosopis resources for mitigation on climate change, improved livelihoods and consolidation of its status as a miracle tree for 21st century and beyond
- Continuation of Research and Development programmes at all levels (such as improvement/breeding, new industrial uses, etc)

Bold research steps?

- Identification, marking and breeding/cloning of existing superior genotypes for specific qualities of wood and pod yields
- Improving the existing inferior populations using materials of known high quality and certified non invasive stocks
- Controlled trials of high quality non invasive Prosopis species for human food (*Prosopis alba*, *P. pallida*) and livestock feeds (*P. kuntzei)*
- Serious investments in research and innovations and exchange of scientific discovery and knowledge globally

Acknowledgements

- FAO
- Ministry of Agriculture (KARI/KAPP and NALEP
- Ministry of Livestock Development (ALLPRO)
- University of Nairobi
- Communities (Baringo, Tana River, others)
- RAE
- ASARECA

THANK YOU!