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BAMBOO: THE OPPORTUNITIES FOR FOREST AND LANDSCAPE RESTORATION

*Kathleen Buckingham, World Resources Institute
World Bamboo Congress. 20th September 2015
Damyang, South Korea*

CONTENTS

- The global restoration movement
- The potential for bamboo restoration
- The Global Restoration Initiative & bamboo

WHY RESTORATION?

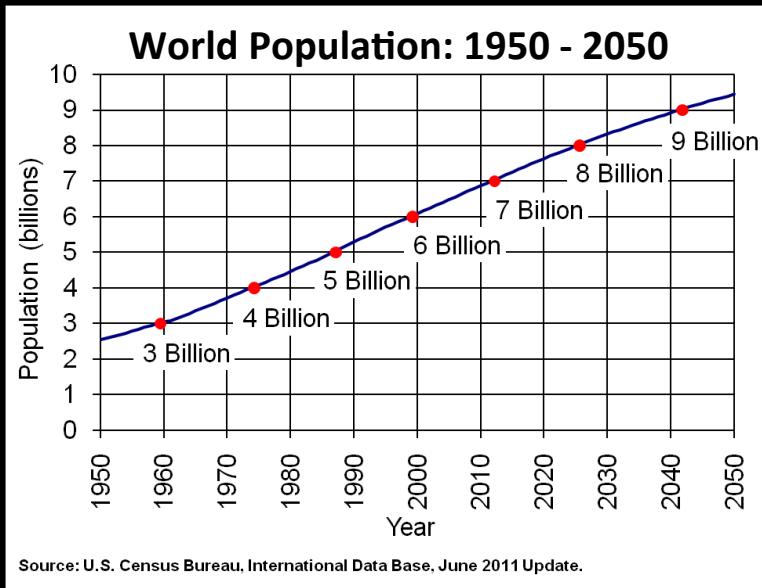
1. Increasing pressures on land
2. Decreasing utilization of land
3. The poor are disproportionately affected



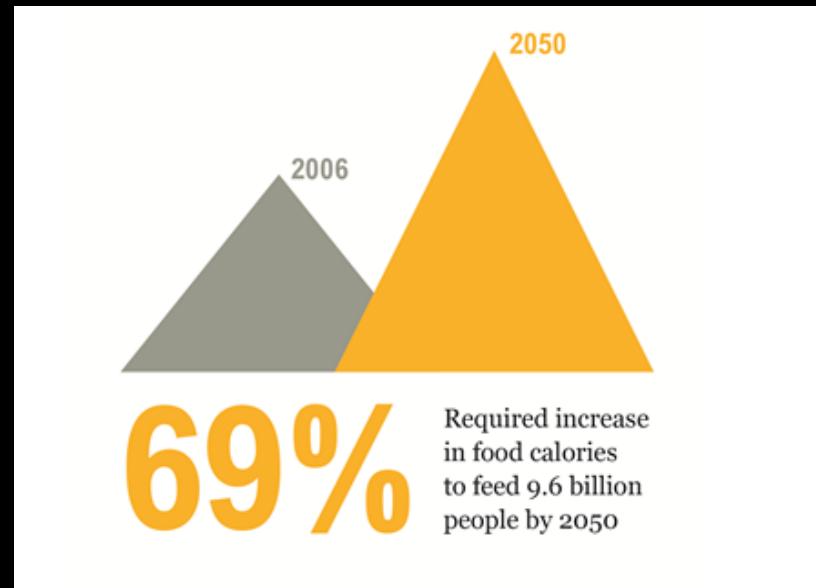
CHALLENGES

1. Increasing pressures on land
2. Decreasing utilization of land
3. The poor are disproportionately affected

Population increase to 9.6B by 2050



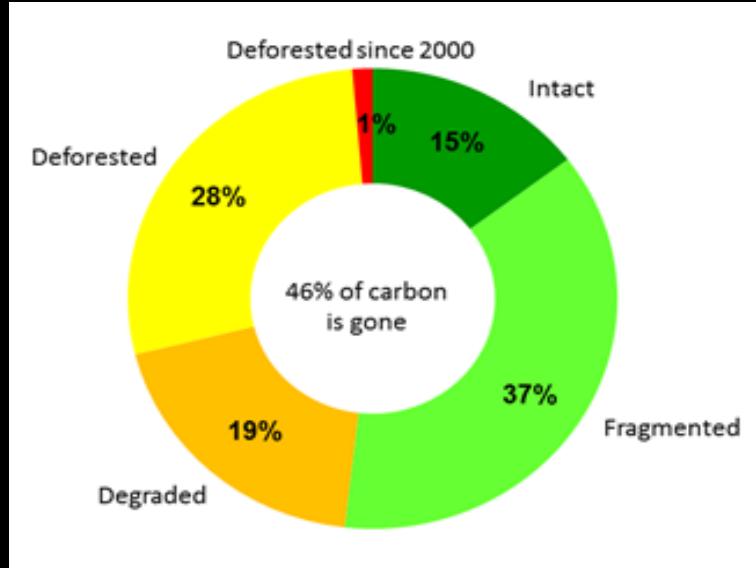
Expected consumption increase to 69%



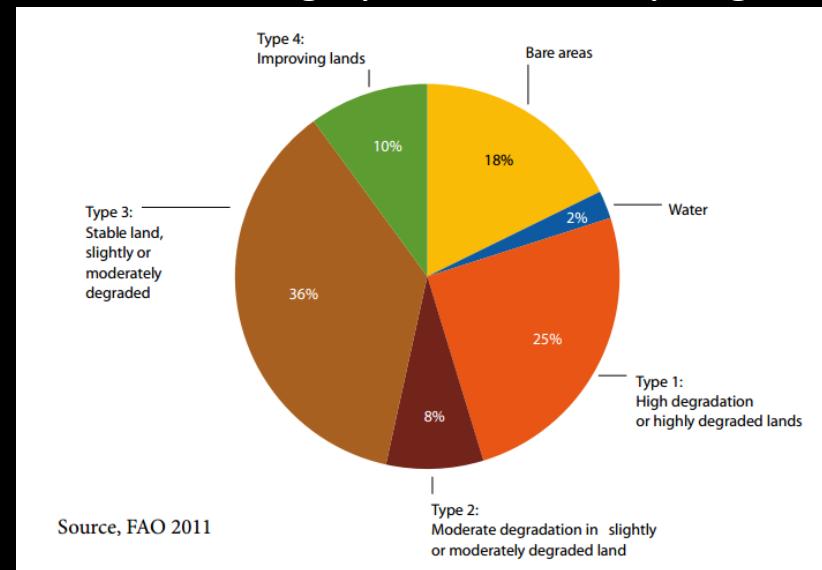
CHALLENGES

1. Increasing pressures on land
2. Decreasing utilization of land
3. The poor are disproportionately affected

47% of forests degraded or deforested



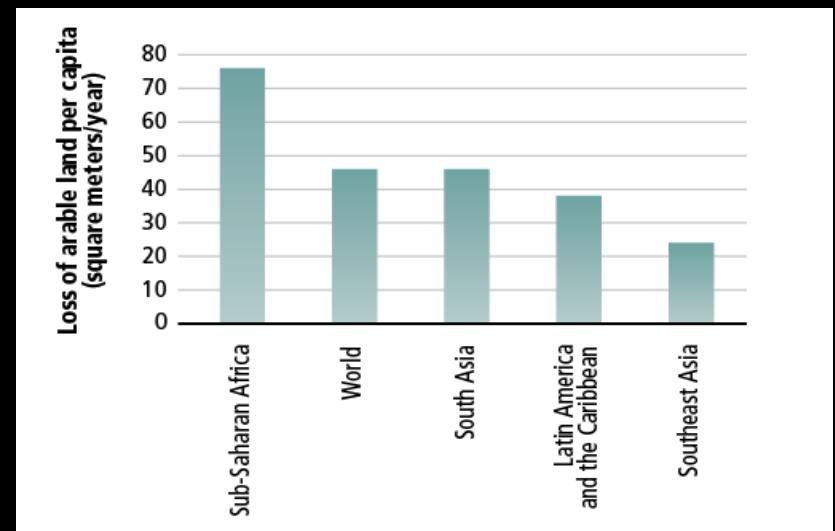
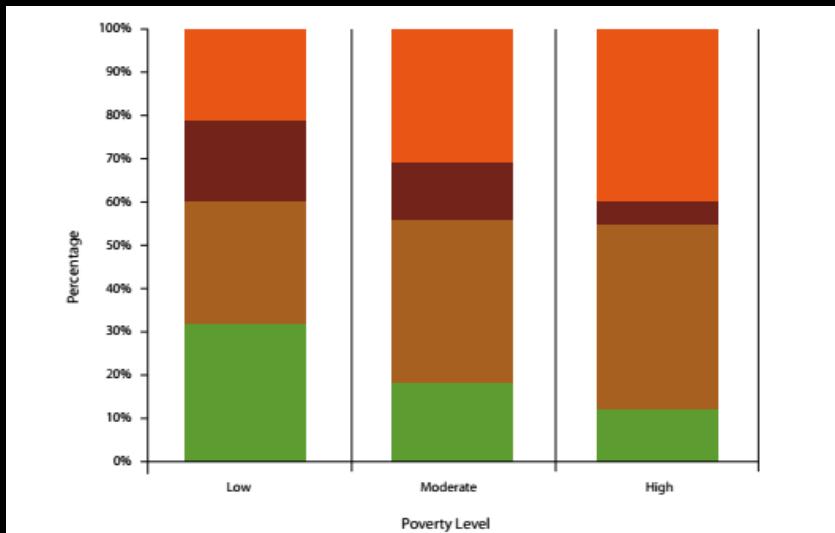
1/3 of land is highly or moderately degraded



CHALLENGES

1. Increasing pressures on land
2. Decreasing utilization of land
3. **The poor are disproportionately affected**

The poor face more severe degradation (FAO) 46m² of arable land lost /capita / year (IFPRI)





THERE IS HOPE

2bn

hectares with
opportunities for
restoration



AMBITIOUS TARGETS EXIST

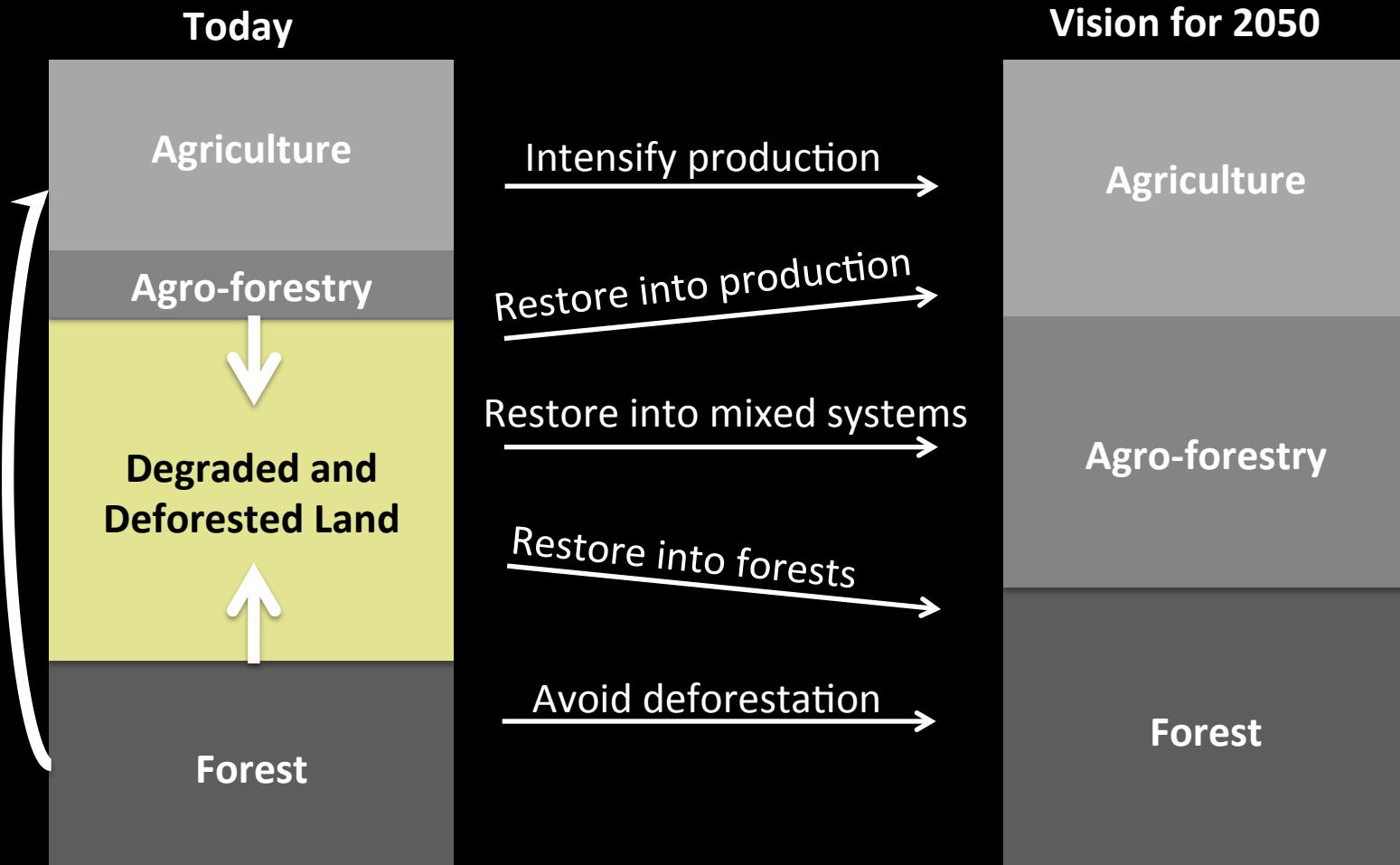
The Bonn Challenge

150m
hectares under
restoration by 2020

New York Declaration

350m
hectares under
restoration by 2030

GLOBAL RESTORATION INITIATIVE : RESTORE PRODUCTIVITY AND FUNCTION



THE LANDSCAPE APPROACH



IT'S BEEN DONE BEFORE...

South Korea, 1960

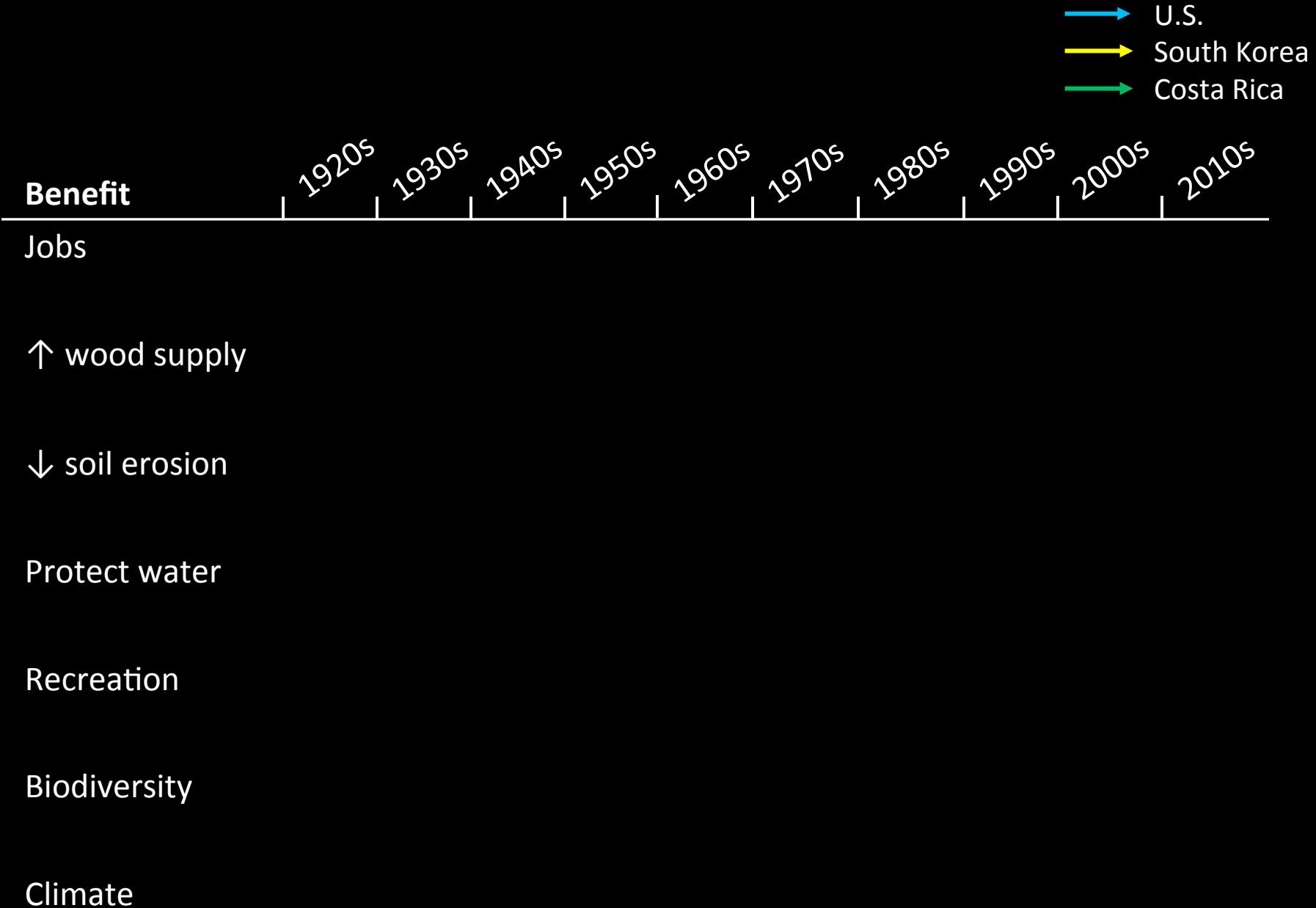


South Korea, 2000

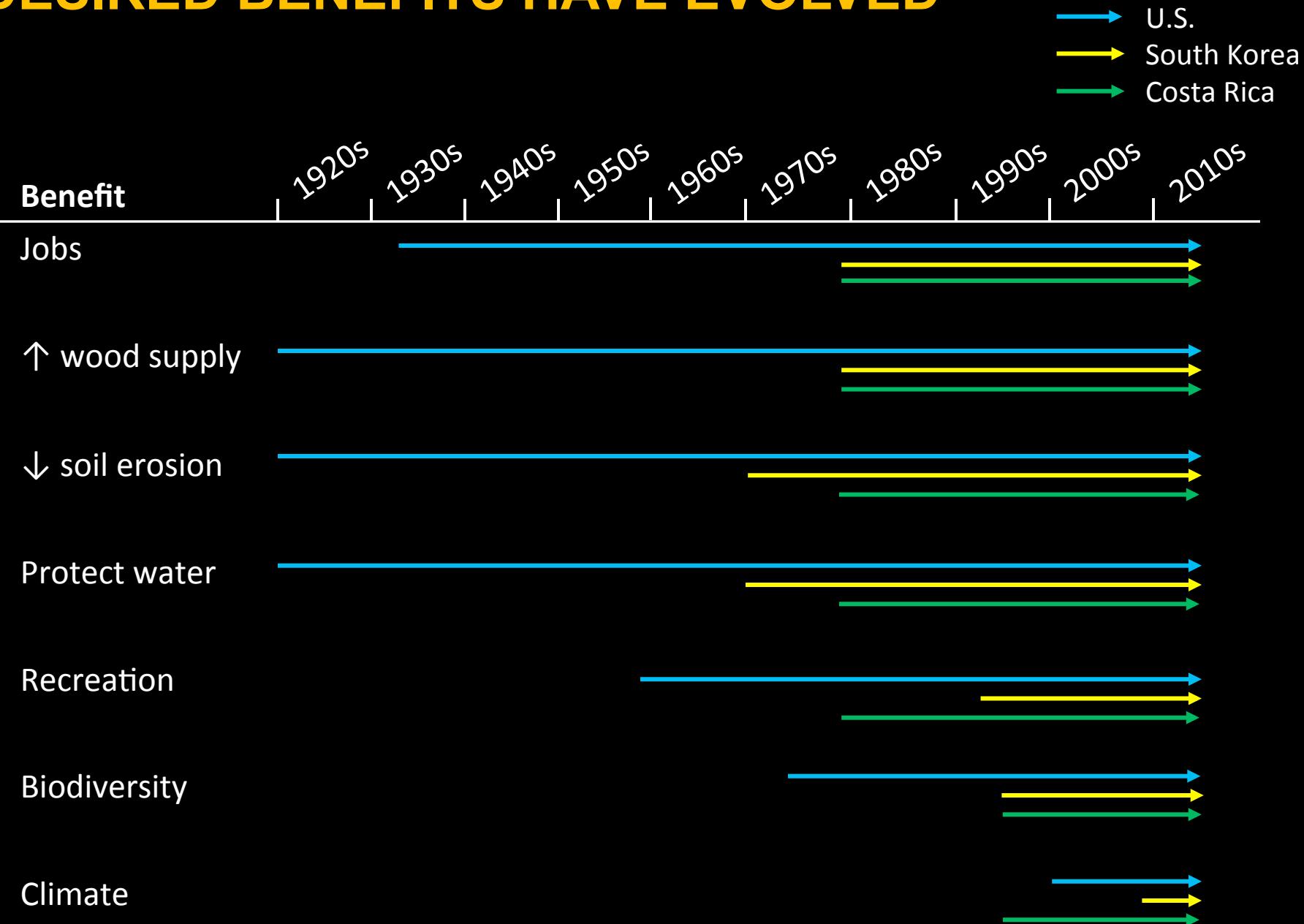


- Forest cover from 35% to 64%
- Forest density increased 14x, population 2x, economy 25x

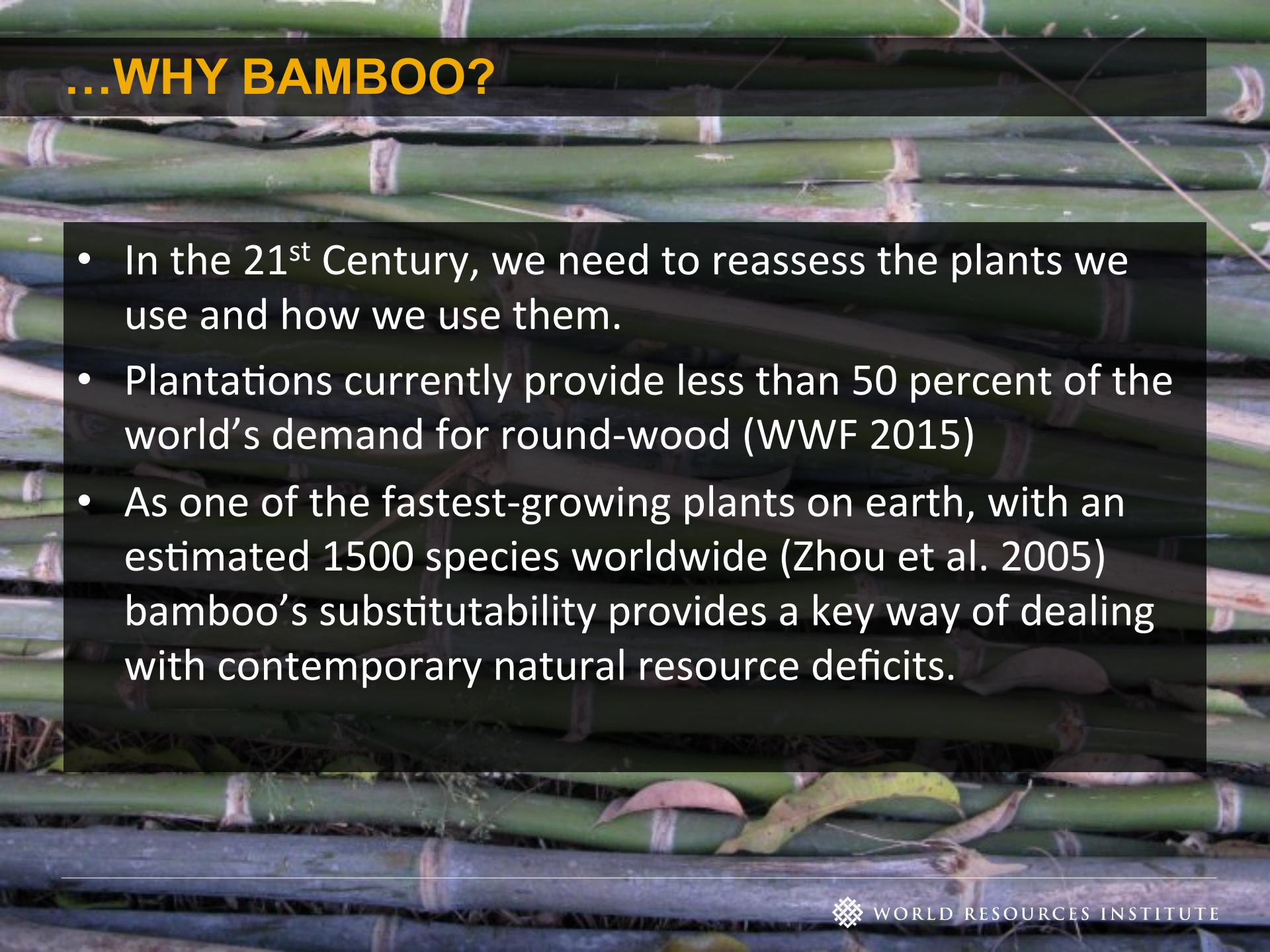
MULTIPLE BENEFITS



DESIRED BENEFITS HAVE EVOLVED



...WHY BAMBOO?



- In the 21st Century, we need to reassess the plants we use and how we use them.
- Plantations currently provide less than 50 percent of the world's demand for round-wood (WWF 2015)
- As one of the fastest-growing plants on earth, with an estimated 1500 species worldwide (Zhou et al. 2005) bamboo's substitutability provides a key way of dealing with contemporary natural resource deficits.





Food and Agriculture
Organization of the
United Nations

243/244
ISSN 0041-6038

unasylva

An International journal of forestry and forest industries

Vol. 66 2015/1-2



FORESTS, TREES
AND DISASTERS



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FORESTS, TREES
AND DISASTERS

Rebelo, C., and Buckingham, K. 2015. Bamboo: The Opportunities for Forest and Landscape Restoration; Forest and Landscape Restoration: Approaches, experiences and opportunities for scaling-up; Unasylva; FAO

WHAT ARE THE OPPORTUNITIES?

- **Rapid maturity** – e.g. 7 years for fiber, annually thereafter - high productivity, quick returns
- **Marginal degraded land utilization** – can grow on low fertility soils, sloping land e.g. will not compete with food
- **Reduced inputs** – e.g. less chemical, fertilizer, water input than other fiber sources, no replanting required – continuous yields
- **Soil regeneration** – Rhizomes bind soil, protect against erosion, landslides, rhizomes reduce soil compactability – break up soil particles – rhizomes (0-30cm) protects top layer of soil (clumping bamboos do not spread extensively)
- **Ecological benefits** – permanent canopy - creates thick layer litter to fertilize soil
- **Water benefits** – e.g. ‘Greening Red Earth’ water table rose from 40 – 33.7m – transformation within 6 years – evergreen water inception and moisture retention
- **Carbon sequestration** – Managed stands provide constant sequestration in durable products – annual regrowth after harvesting
- **Livelihood development** – Selective harvesting requires continual labor e.g. ‘Greening Red Earth’ witnessed 70% of migrant labor force return to bamboo agroforestry labor

05/05/2015

Ecological functions of bamboo forest: Research and Application

ZHOU Ben-zhi, FU Mao-yi, XIE Jin-zhong, YANG Xiao-sheng, LI Zheng-cai

Research Institute of Subtropical Forestry, Chinese Academy of Forestry, Fuyang, Zhejiang 311400, P. R. China

Abstract: Bamboo forest is an important forest type in subtropical and tropical areas. Due to its biological characteristic and growth habits, bamboo is not only an ideal economic investment that can be utilized in many different manners but also has enormous potential for alleviating many environmental problems facing the world today. This review describes ecological functions of the bamboo forest on soil erosion control, water conservation, land rehabilitation, and carbon sequestration.

Keywords: Bamboo forest; Ecological function; Environment; Review

CLC number: S795; S756

Document code: A

Article ID: 1007-662X(2005)02-0143-05



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WHAT ARE THE CHALLENGES?



- Management requirements – high cost of labor e.g. Chishui government supported pulp mill faced closure
- Ecological constraints – propagation, availability of quality planting material, tissue culture, flowering cycles
- Institutional constraints – outdated policy frames



Can't See the (Bamboo) Forest for the Trees: Examining Bamboo's Fit Within International Forestry Institutions

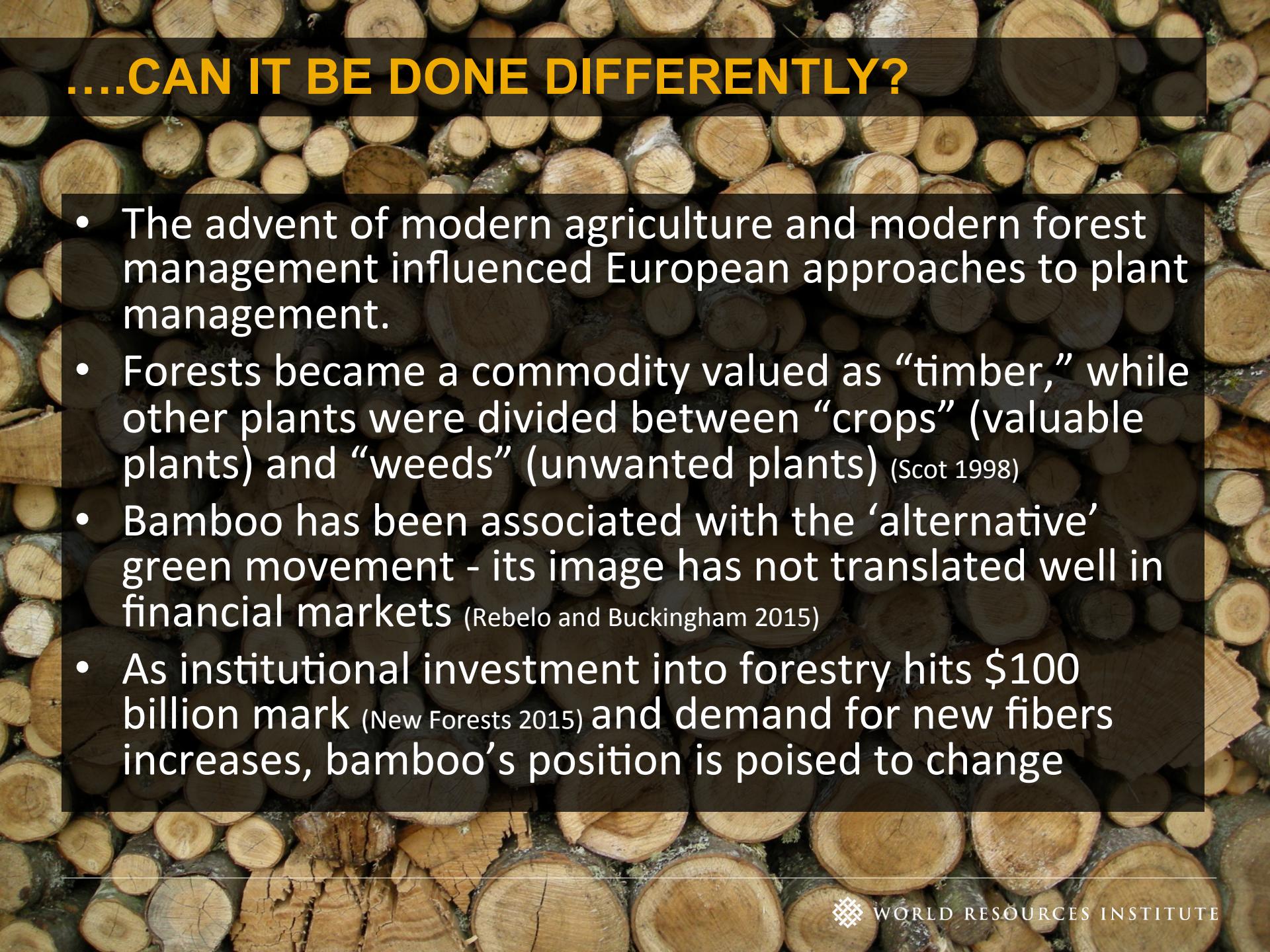
Kathleen Carmel Buckingham, Liangru Wu,
Yiping Lou

Received: 11 March 2013 / Revised: 28 August 2013 / Accepted: 15 October 2013

Abstract Over the centuries, governments and international agencies have developed a wide range of institutions to manage timber resources and conserve values provided by treed lands. Concerns regarding the sustainable supply of timber have provided opportunities for the development of substitute resources; however, bamboo and other non-timber forest resources have not been a part of the development of these institutions. Bamboo is a unique Non-Timber Forest Product, as it is often classified

resources coming from China and India leading to increasing pressure on natural resources and institutions (FAO 2011). Although not a panacea, bamboo is already contributing to (Lobovikov et al. 2012), and has significant potential to further contribute to global forestry resource deficits (Hunter 2002). Bamboo is emerging as an important substitute for wood and fiber. The world bamboo market is estimated at $\$10 \times 10^9$ and is expected to double in 5 years (Woodridge 2012). This is a consequence of new



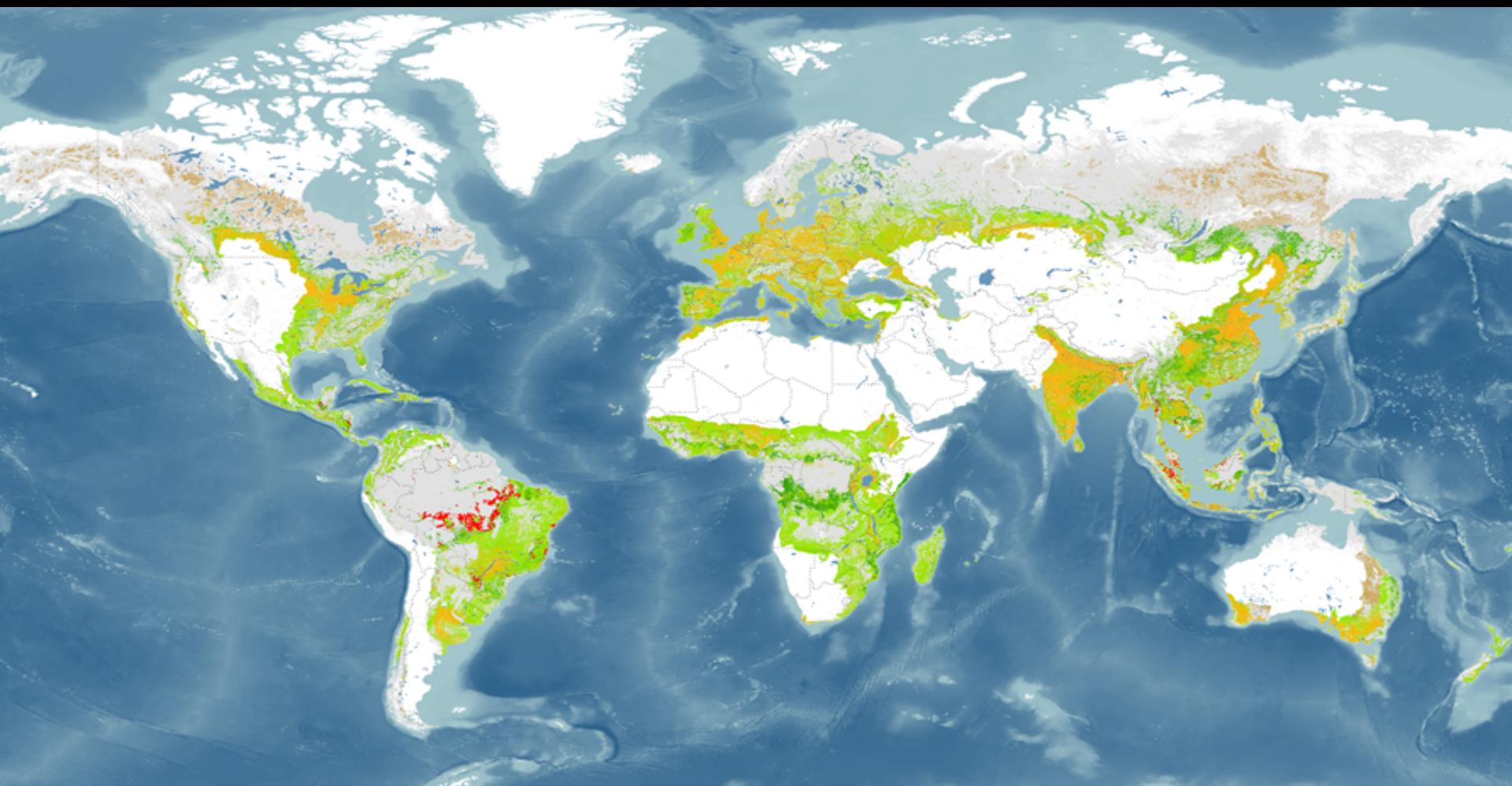


....CAN IT BE DONE DIFFERENTLY?

- The advent of modern agriculture and modern forest management influenced European approaches to plant management.
- Forests became a commodity valued as “timber,” while other plants were divided between “crops” (valuable plants) and “weeds” (unwanted plants) (Scot 1998)
- Bamboo has been associated with the ‘alternative’ green movement - its image has not translated well in financial markets (Rebelo and Buckingham 2015)
- As institutional investment into forestry hits \$100 billion mark (New Forests 2015) and demand for new fibers increases, bamboo’s position is poised to change



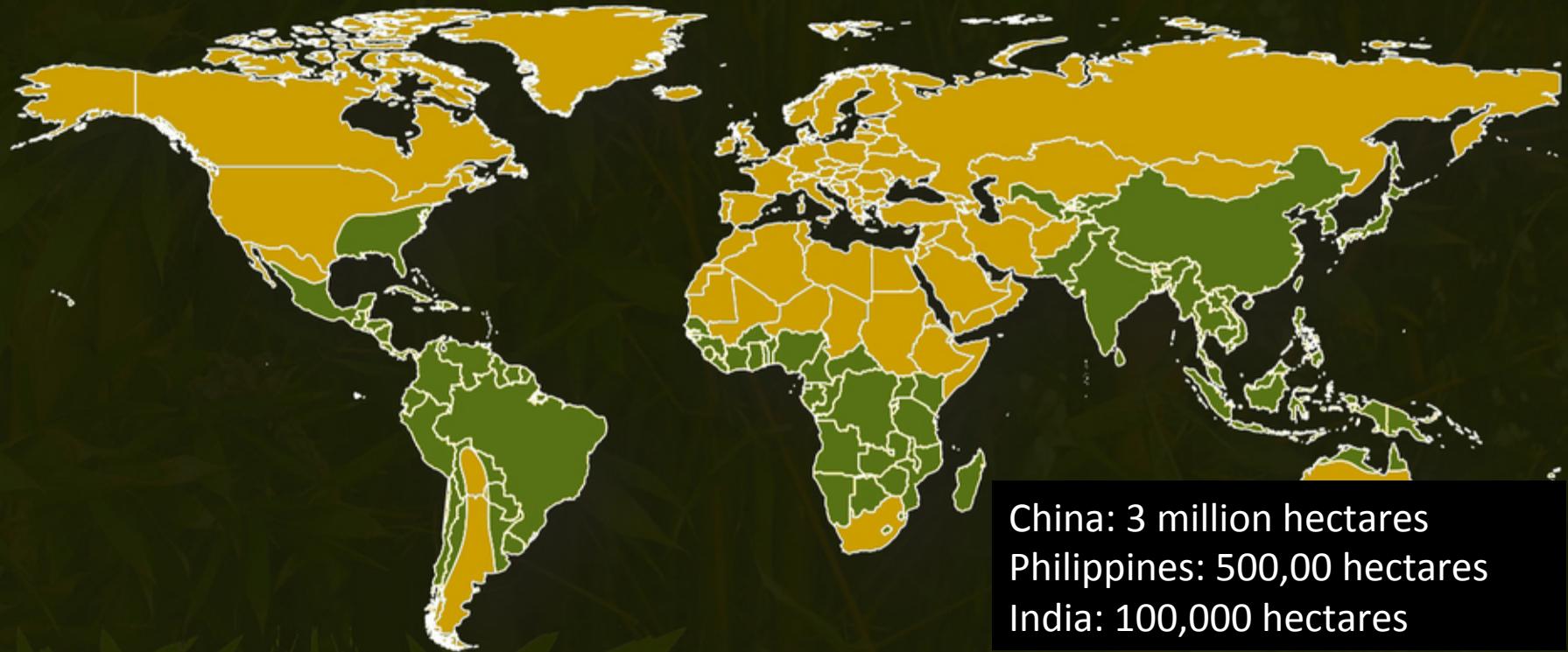
BAMBOO & BONN



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5 million hectare pledge from 40 member states



Need to create baselines and avoid double counting of forestry resources



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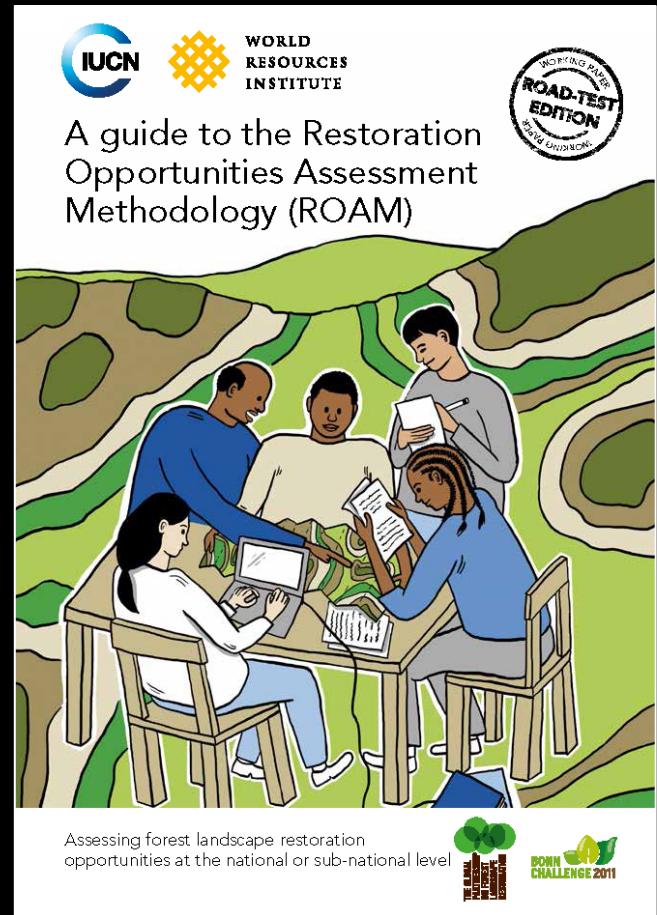
GEOGRAPHIES: WRI AND IUCN (AS GPFLR) SUPPORTING RESTORATION IN 23 COUNTRIES



Brazil	Costa Rica	Ghana	Indonesia	Niger	Uganda
Chile	Ecuador	Guatemala	Kenya	Panama	U.S.A.
China	El Salvador	Honduras	Malawi	Peru	Vietnam
Colombia	Ethiopia	India	Mexico	Rwanda	

HOW? OPPORTUNITY ASSESSMENT

- How to “package” opportunities
 - Restoration Opportunities Assessment Methodology (ROAM)
 1. *Stakeholder input*
 2. *Geospatial mapping*
 3. *Economic analysis*
 4. *Carbon analysis*
 5. *Enabling conditions*
 6. *Financial analysis*



Theme	Feature	Key success factor	Response
Motivate	Benefits	• Restoration generates economic benefits	
		• Restoration generates social benefits	
		• Restoration generates environmental benefits	
	Awareness	• Benefits of restoration are publicly communicated	
		• Opportunities for restoration are identified	
	Crisis events	• Crisis events are leveraged	
Enable	Legal requirements	• Law requiring restoration exists	
		• Law requiring restoration is broadly understood and enforced	
		• Soil, water, climate, and fire conditions are suitable for restoration	
	Market conditions	• Plants and animals that can impede restoration are absent	
		• Native seeds, seedlings, or source populations are readily available	
	Policy conditions	• Competing demands (e.g., food, fuel) for degraded forestlands are declining	
		• Value chains for products from restored area exists	
		• Land and natural resource tenure are secure	
		• Policies affecting restoration are aligned and streamlined	
Implement	Social conditions	• Restrictions on clearing remaining natural forests exist	
		• Forest clearing restrictions are enforced	
	Institutional conditions	• Local people are empowered to make decisions about restoration	
		• Local people are able to benefit from restoration	
	Leadership	• Roles and responsibilities for restoration are clearly defined	
		• Effective institutional coordination is in place	
Monitor	Knowledge	• National and/or local restoration champions exist	
		• Sustained political commitment exists	
	Technical design	• Restoration “know how” relevant to candidate landscapes exists	
		• Restoration “know how” transferred via peers or extension services	
	Finance and incentives	• Restoration design is technically grounded and climate resilient	
	Feedback	• Positive incentives and funds for restoration outweigh negative incentives	
		• Incentives and funds are readily accessible	
Evaluate	Feedback	• Effective performance monitoring and evaluation system is in place	
		• Early wins are communicated	

AFRICA



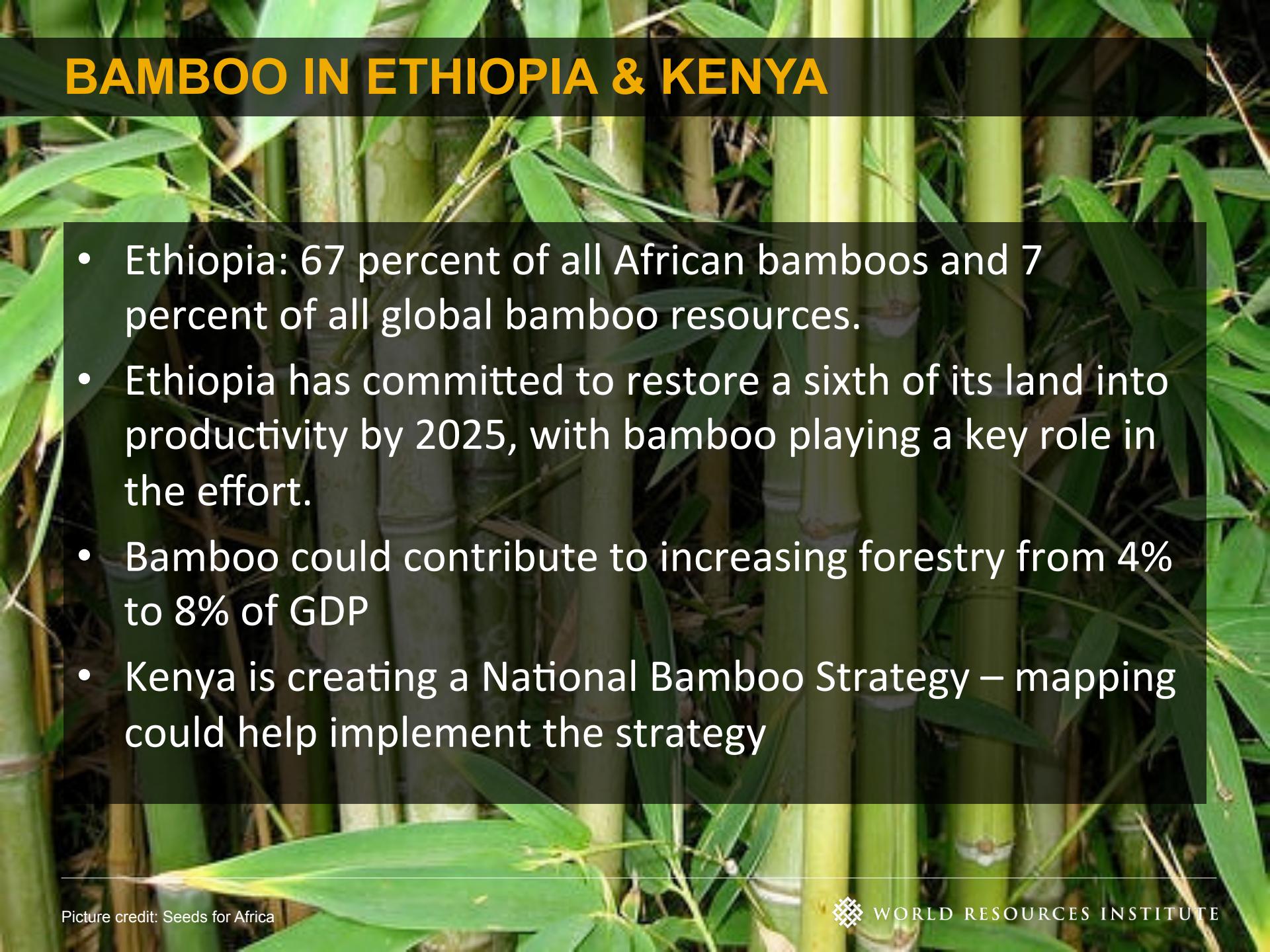
Ethiopia
Kenya

Malawi
Niger

Rwanda
Uganda

- **Vision 25x25:** 25 million small holder farmers restore land by 2025
- Have helped facilitate national strategy process for Rwanda
- R100 – mobilizing finance for restoration in Africa
- Limited native bamboo species but potential due to need for fuelwood alternative

BAMBOO IN ETHIOPIA & KENYA

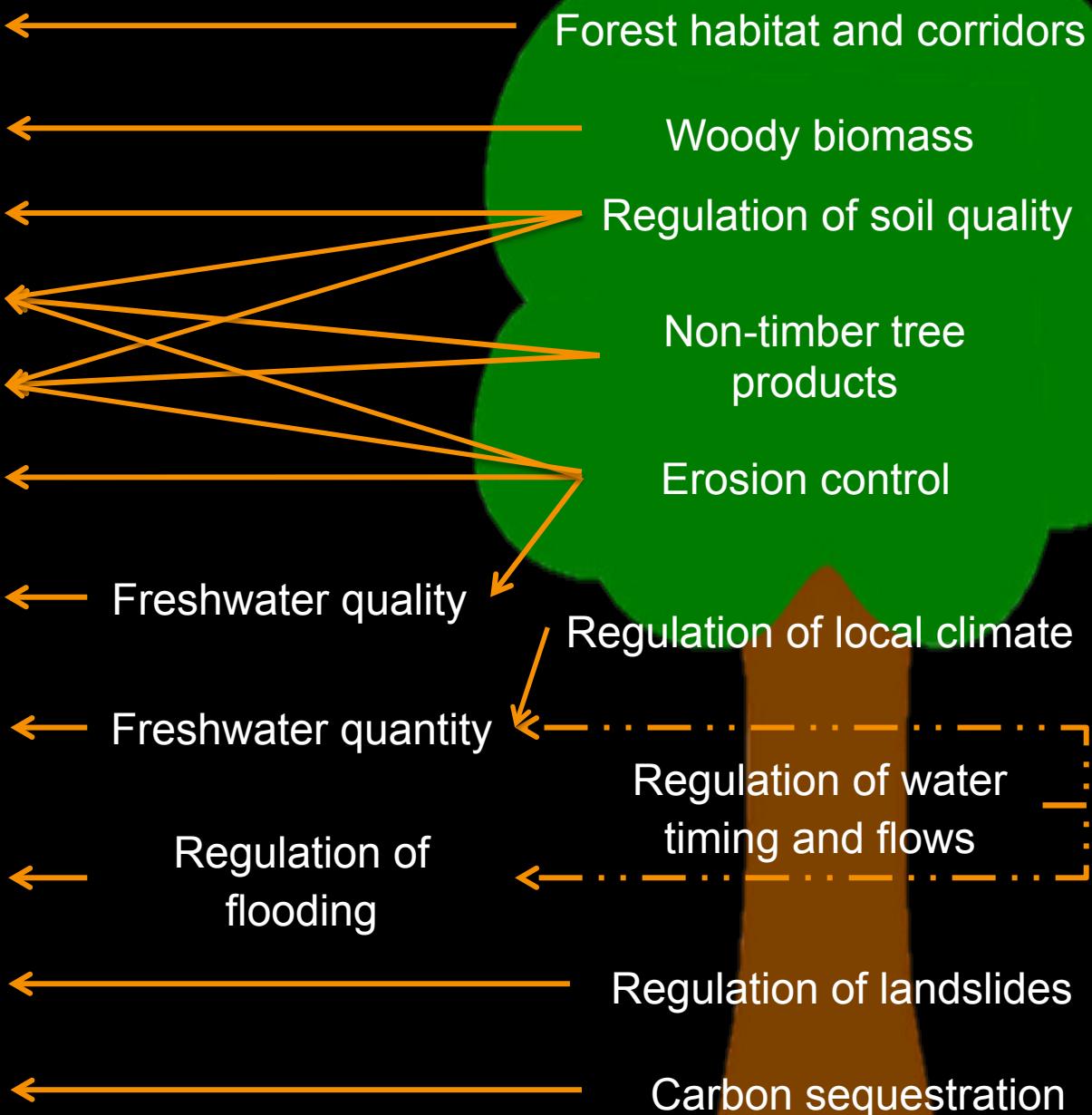
A close-up photograph of a bamboo forest. The image shows numerous green bamboo stalks of varying heights and thicknesses, some with nodes and some with small leaves. The background is filled with more bamboo, creating a dense, textured pattern.

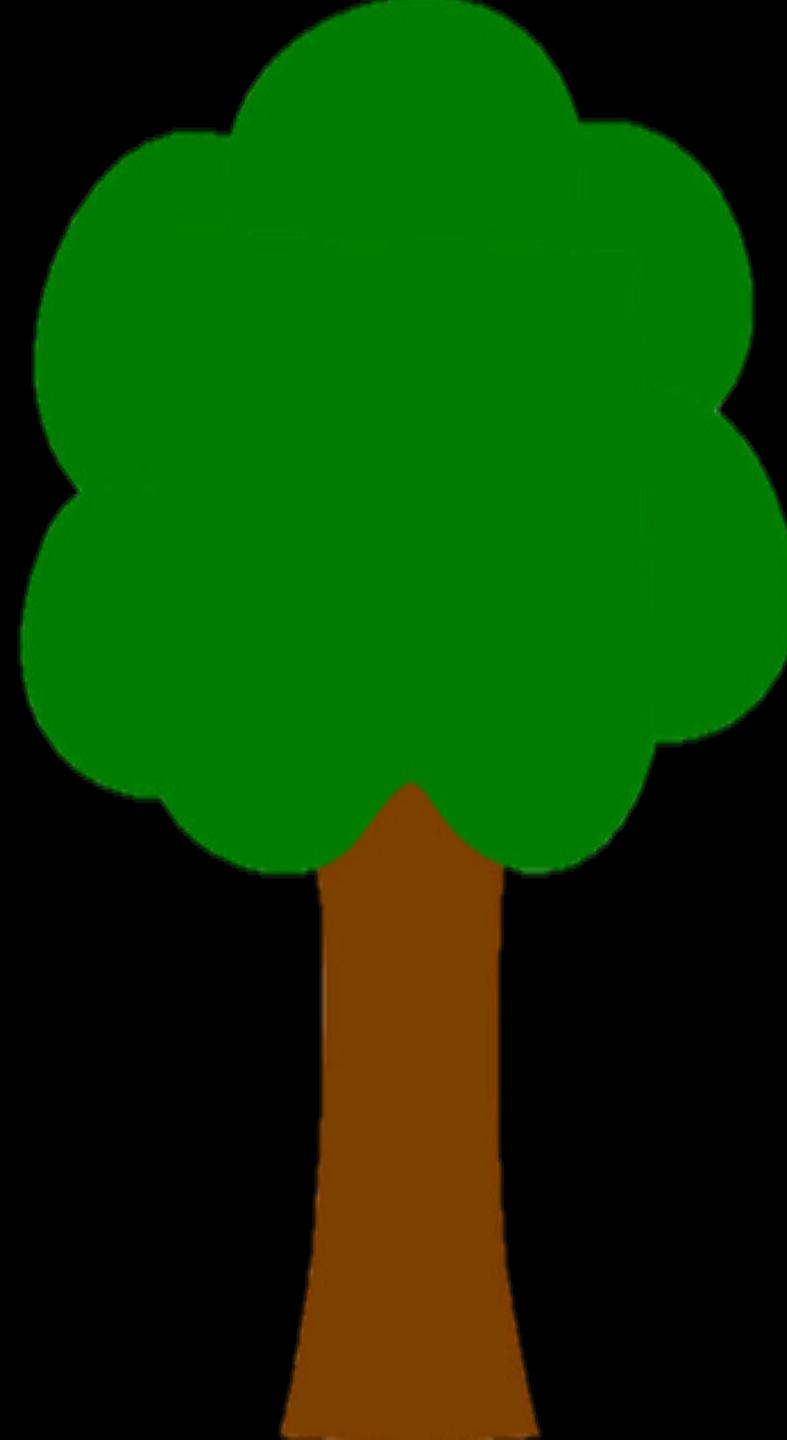
- Ethiopia: 67 percent of all African bamboos and 7 percent of all global bamboo resources.
- Ethiopia has committed to restore a sixth of its land into productivity by 2025, with bamboo playing a key role in the effort.
- Bamboo could contribute to increasing forestry from 4% to 8% of GDP
- Kenya is creating a National Bamboo Strategy – mapping could help implement the strategy

COMMON LAND USE CHALLENGES

ECOSYSTEM SERVICES TO BE RESTORED

1. Habitat fragmentation/ loss of biodiversity
2. Forest degradation
3. Loss of soil fertility
4. Overgrazing
5. Deforestation
6. Soil erosion
7. Sedimentation of waterbodies
8. Water stress
9. Flooding
10. Landslides
11. Climate change





LANDSCAPE RESTORATION OPTIONS

1. Afforestation of natural forest
2. Rehabilitation of degraded natural forest
3. Farm forestry in cropland
4. Silvo-pastoralism
5. Commercial timber plantation
6. Commercial bamboo plantation
7. Woodlots
8. Tree-based corridors between biodiversity hotspots
9. Tree-based buffer zone along waterbodies and wetlands

ECOSYSTEM SERVICES TO BE RESTORED

LANDSCAPE RESTORATION OPTIONS

Forest degradation

Forest habitat and corridors

Woody biomass

Regulation of soil quality

Non-timber tree products

Erosion control

Regulation of local climate

Regulation of water timing and flows

Regulation of landslides

Carbon sequestration

Farm forestry in cropland

Silvo-pastoralism

Commercial timber plantation

Commercial bamboo plantation

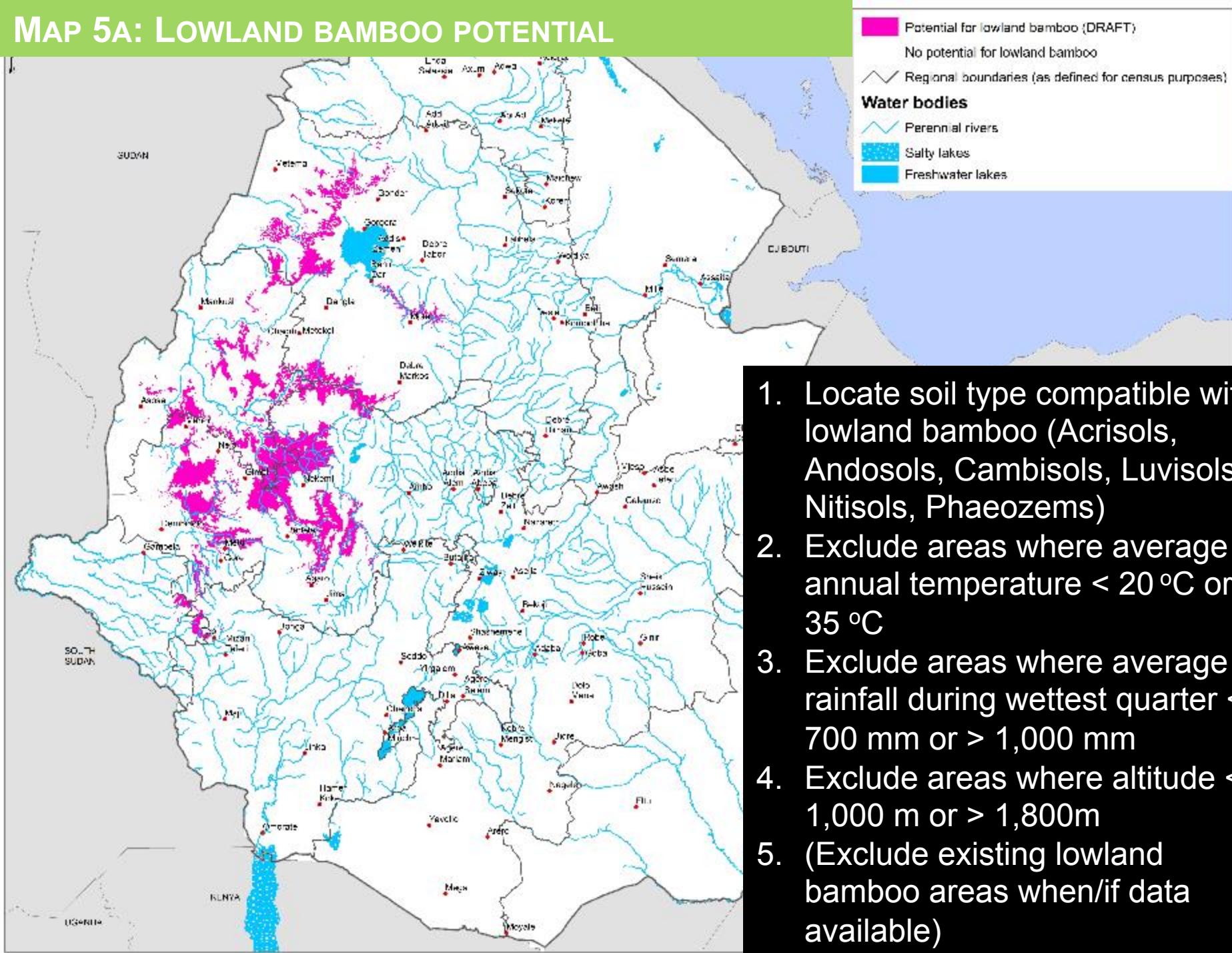
Woodlots

Priority bamboo landscape restoration options for mapping

1. Afforestation of natural forest
2. Rehabilitation of degraded natural forest
3. Farm forestry in cropland + Woodlots
4. Commercial bamboo plantation
5. Tree-based corridors between biodiversity hotspots

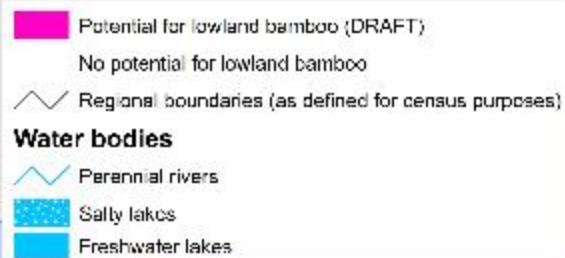
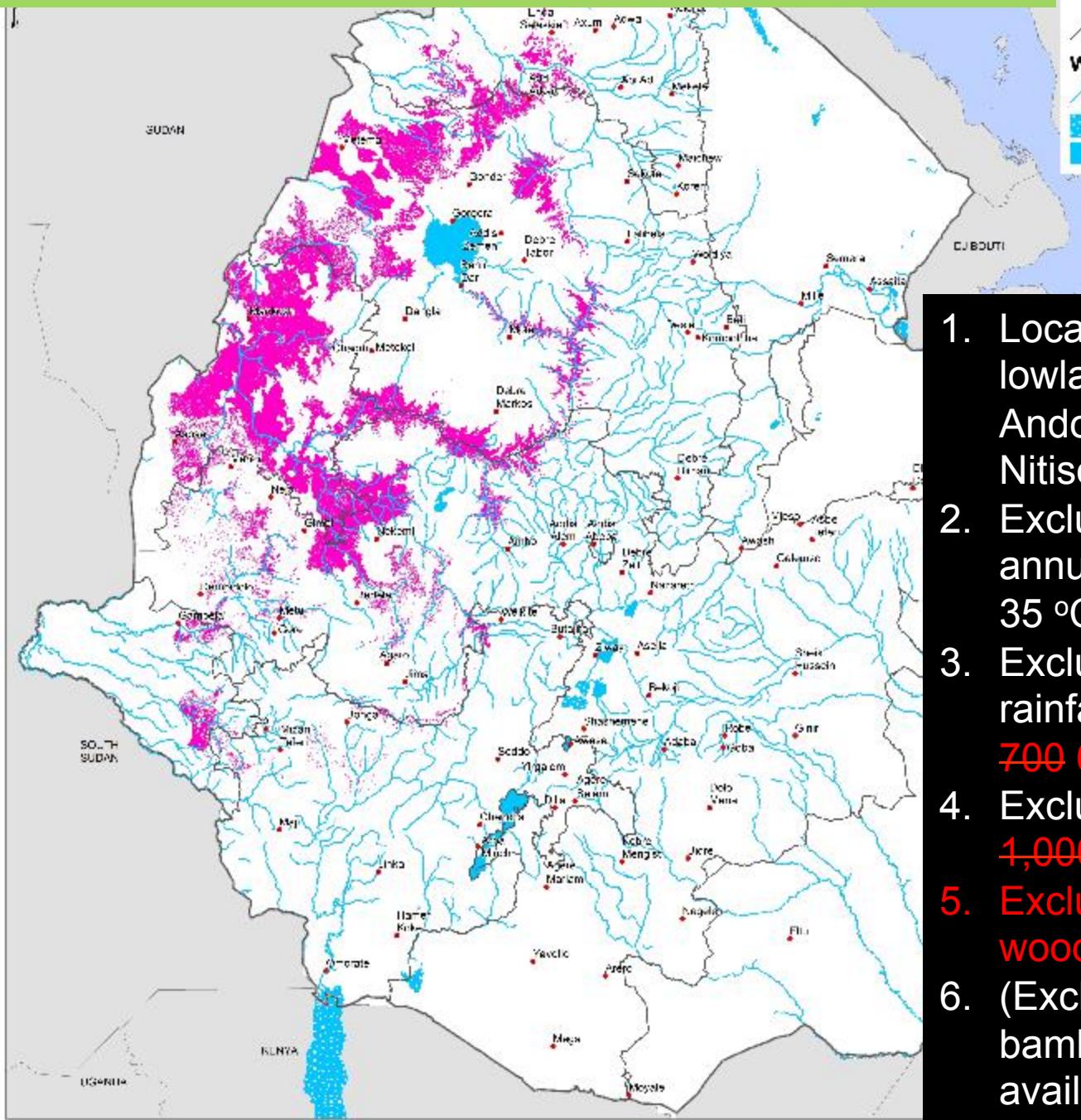


MAP 5A: LOWLAND BAMBOO POTENTIAL



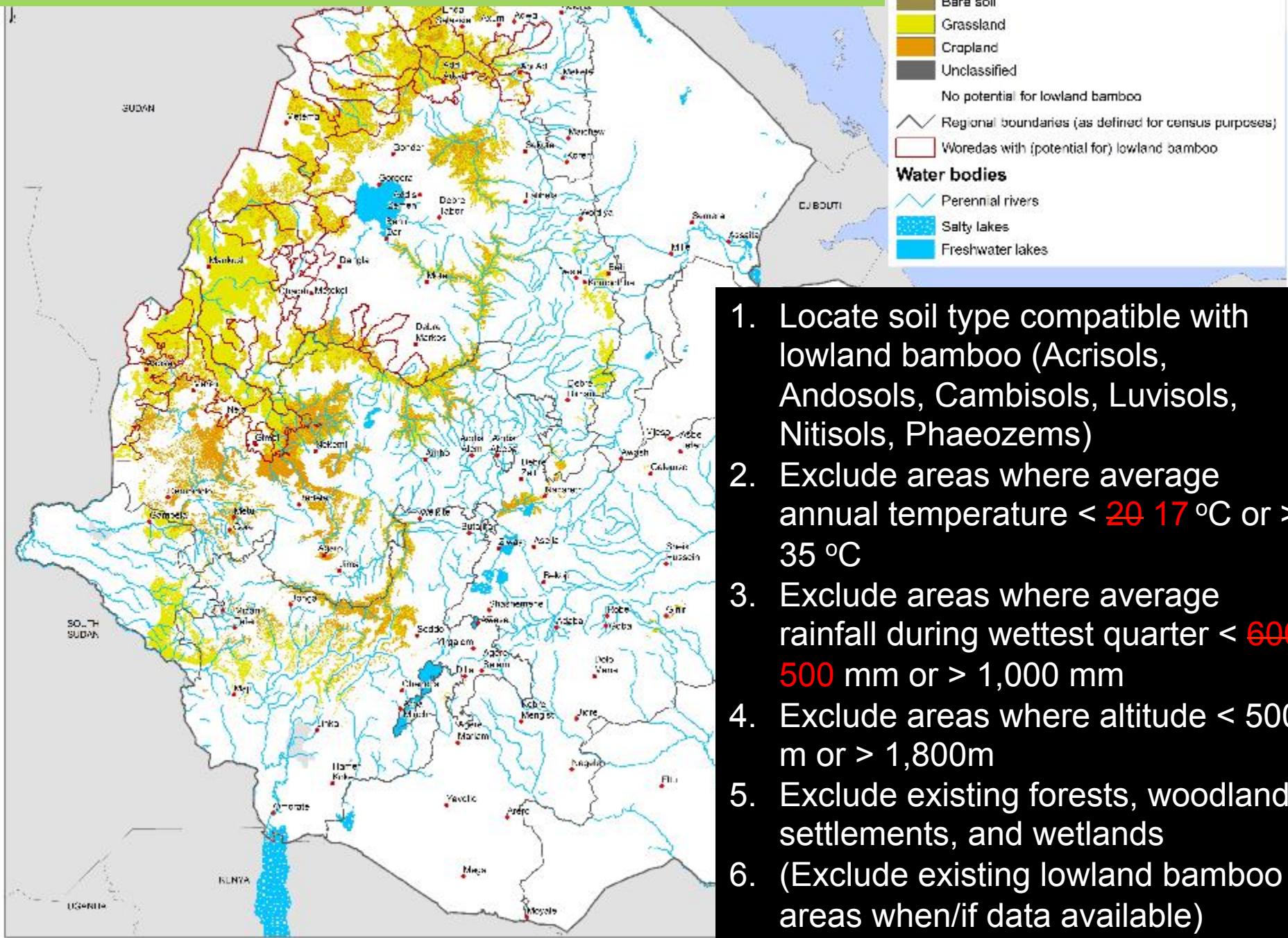
1. Locate soil type compatible with lowland bamboo (Acrisols, Andosols, Cambisols, Luvisols, Nitisols, Phaeozems)
2. Exclude areas where average annual temperature $< 20^{\circ}\text{C}$ or $> 35^{\circ}\text{C}$
3. Exclude areas where average rainfall during wettest quarter $< 700 \text{ mm}$ or $> 1,000 \text{ mm}$
4. Exclude areas where altitude $< 1,000 \text{ m}$ or $> 1,800 \text{ m}$
5. (Exclude existing lowland bamboo areas when/if data available)

MAP 5A: LOWLAND BAMBOO POTENTIAL - REVISED

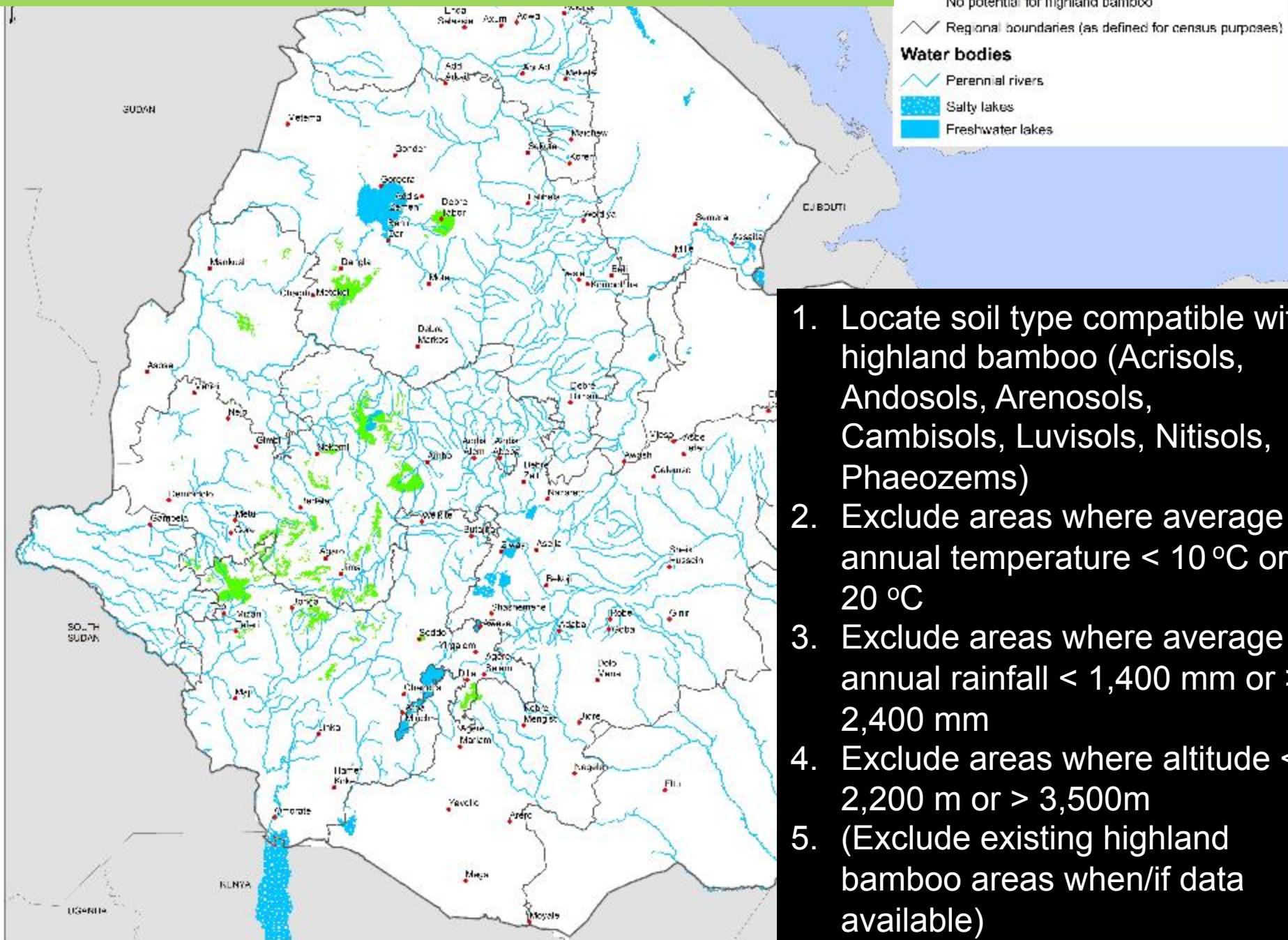


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2. Exclude areas where average annual temperature $< 20^{\circ}\text{C}$ or $> 35^{\circ}\text{C}$
3. Exclude areas where average rainfall during wettest quarter $< 700\text{ }600\text{ mm}$ or $> 1,000\text{ mm}$
4. Exclude areas where altitude $< 1,000\text{ }500\text{ m}$ or $> 1,800\text{m}$
5. **Exclude existing forests, woodland, and wetlands**
6. (Exclude existing lowland bamboo areas when/if data available)

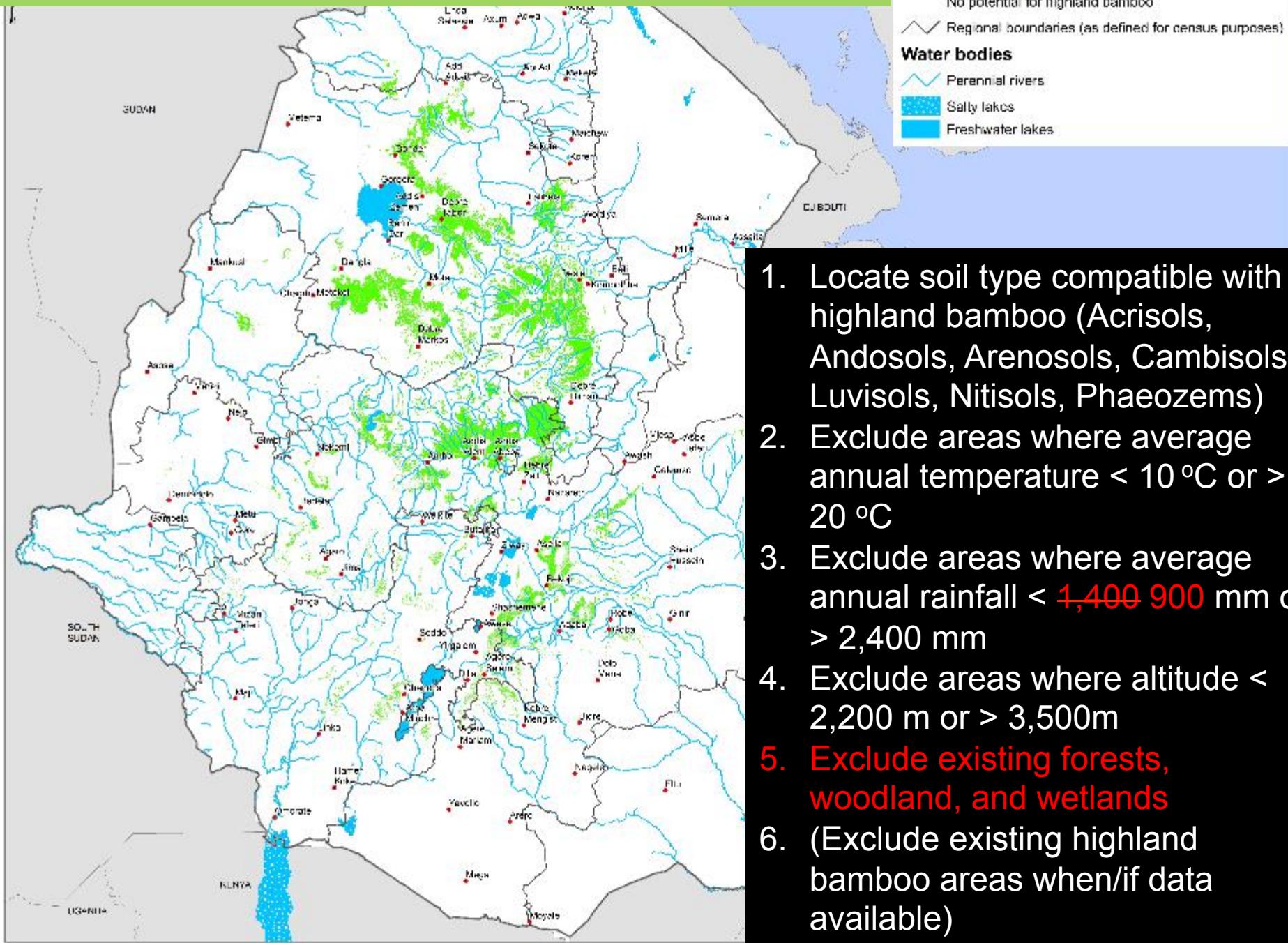
MAP 5A: LOWLAND BAMBOO POTENTIAL – REVISED 2



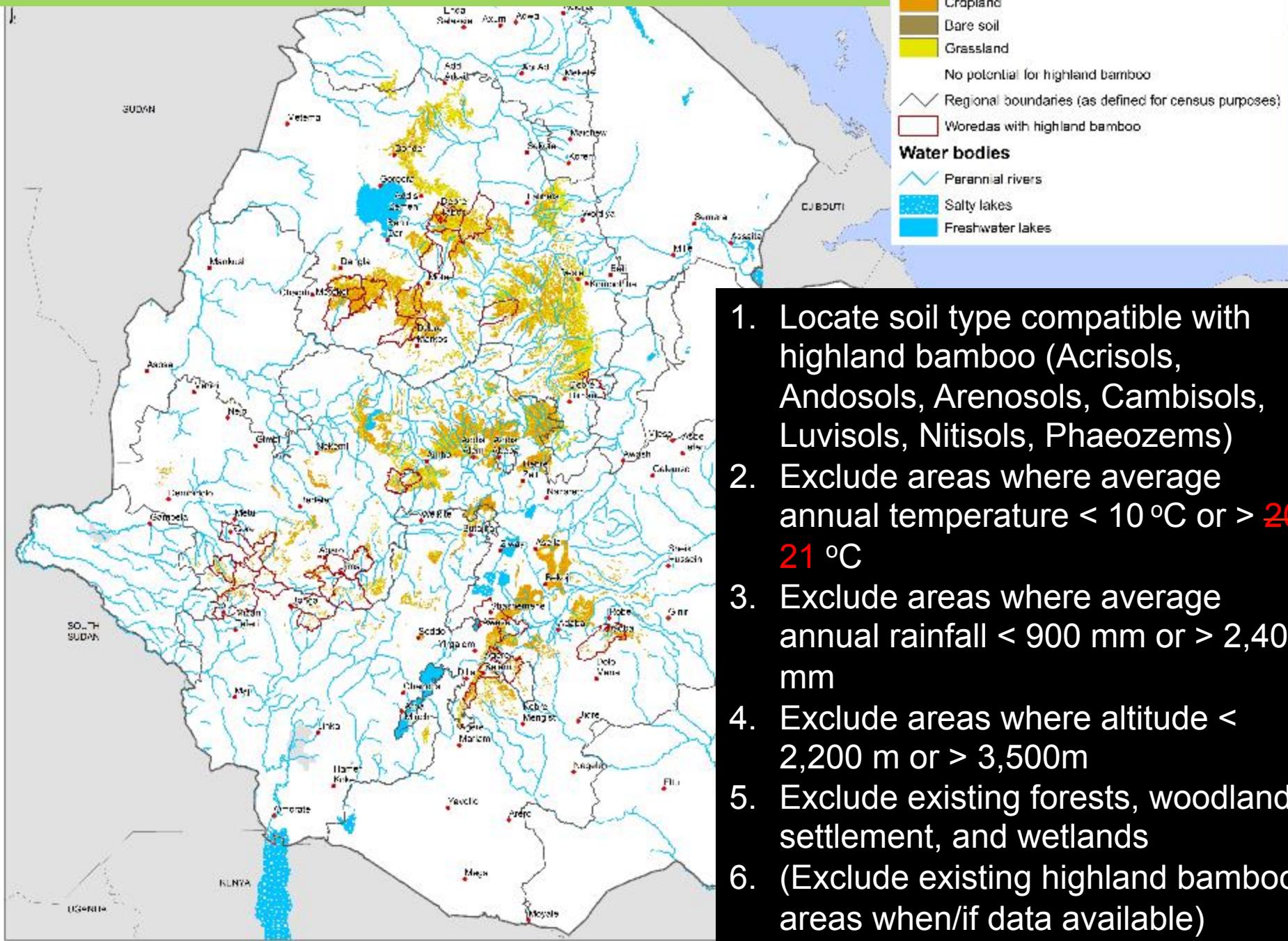
MAP 5B: HIGHLAND BAMBOO POTENTIAL



MAP 5B: HIGHLAND BAMBOO POTENTIAL - REVISED



MAP 5B: HIGHLAND BAMBOO POTENTIAL – REVISED 2



SPECIES IDENTIFIED FOR INDUSTRIAL PRODUCTION IN KENYA

	Ranking	Comments
<i>Yushania alpina basinia</i> (Highland bamboo)		
<i>Dendrocalamus asper</i>		
<i>Dendrocalamus membranaceus</i> cv. <i>Grandis</i>		
<i>Bambusa vulgaris</i>		
<i>Oxytenanthera abyssinica</i> (lowland bamboo)		
<i>Dendrocalamus Giganteus</i>		
<i>Dendrocalamus Brandisii</i>		
<i>Dendrocalamus Latiflorius</i>		
<i>Bambusa Tulda</i>		
<i>Bambusa Textilis</i>		
Include another bamboo species for industrial production		
Include another bamboo species for industrial production		
Include another bamboo species for industrial production		



SPECIES IDENTIFIED FOR SMALL-HOLDER PRODUCTION IN KENYA

	Ranking	Comments
<i>Yushania basinia</i> (Highland bamboo)		
<i>Oxytenanthera abyssinica</i> (lowland bamboo)		
<i>Dendrocalamus membranaceus</i> cv. <i>Grandis</i>		
<i>Dendrocalamus Barbatus</i>		
<i>Dendrocalamus asper</i>		
<i>Bambusa vulgaris</i> (2 varieties)		
<i>Phyllostachys Aurea</i>		
<i>Phyllostachys Aureosulcata</i>		
Include another bamboo species for small-holders		
Include another bamboo species for small-holders		
Include another bamboo species for small-holders		



Initiative 20x20

Bringing **20 million** hectares of degraded land in Latin America & the Caribbean into restoration by **2020**



1. Political Commitments

Aggregate firm restoration commitments in the region.

2. Economic Case

“The Economic Argument for the Restoration of Degraded Lands in Latin America and the Caribbean”

3. Financial instruments

Coalition of private investors who will lead private projects (i.e. risk mitigating instrument or guarantee, capitalization fund, and partners who offer loans). Investment philosophies are aligned with practices that deliver conservative financial flows

SUPPORT GLOBAL AMBITION



New York
Declaration on
Forests

FOCUS SUPPORT



Initiative
20x20

Argentina
Brazil (ES)
Chile
Colombia

Costa Rica
Ecuador
El Salvador
Guatemala

Mexico
Nicaragua
Peru

MOBILIZE FINANCE



Forestry and Climate
Change Sub-Fund

ACHIEVE COUNTRY AMBITIONS



- EcoPlanet Bamboo has joined **Initiative 20x20** as a private developer of sustainably managed and certified commercial bamboo plantations
- The projects are a good example of **landscape scale restoration**
 - No trees are cut in the planting
 - Each farm is a mosaic of standing native vegetation, remnant forest patches with bamboo planted in-between
 - Reduces pressure of deforestation and degradation through the provision of a sustainable source of fiber

- In **Nicaragua**, the project connects remnant forest patches with native species of giant timber bamboo (*Guadua aculeata*) at the landscape scale
 - 3 farms within the El Rama area of Nicaragua's Atlantic Coast – an area that underwent severe deforestation during the 1970s and 1980s for agriculture
 - Yield of 280,000 tons
 - Has FSC, VCS, CCBA certifications
- There are plans for additional investments in the LAC region (\$100 million), particularly in **Mexico and Brazil**
 - The Initiative may assist the search with pre investment analyses

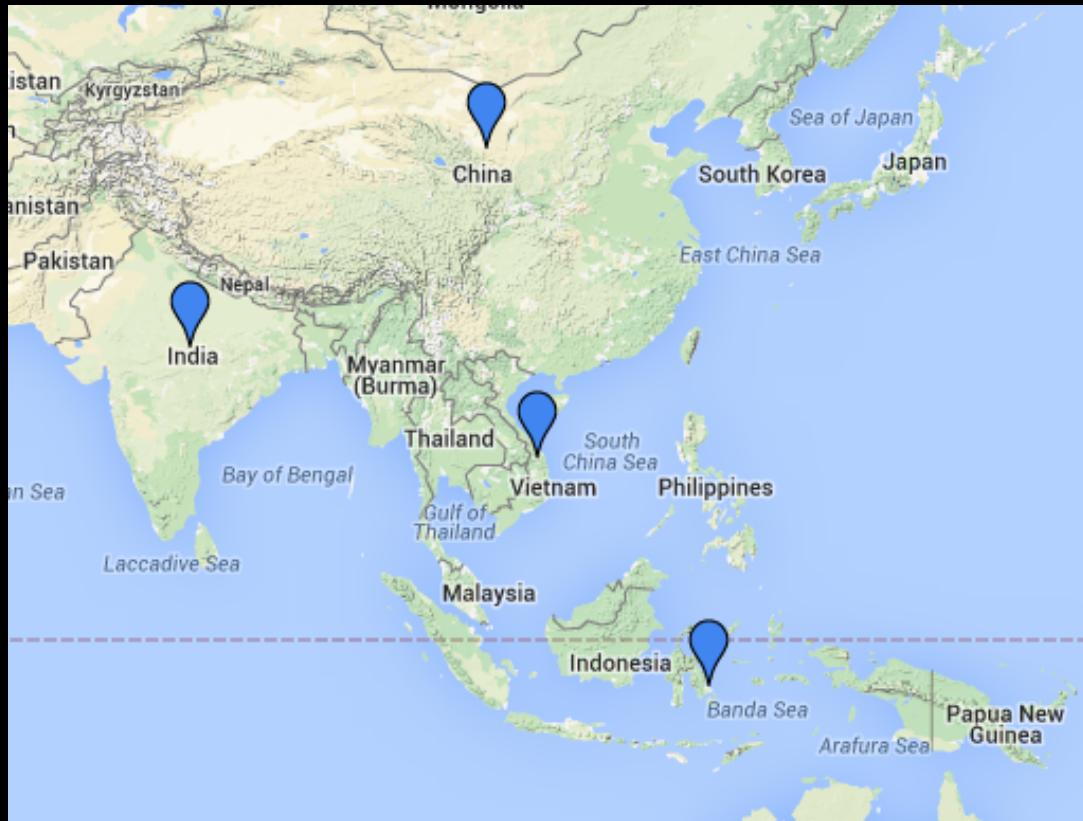
LATIN AMERICA & THE CARIBBEAN: NATIONAL PLAN IN BRAZIL



Pathway to the National Plan:

- WRI office in Brazil
- Assessed enabling conditions in all six biomes
- Convened 100+ stakeholders from 50+ entities from government, civil society and the private sector
- Developed plan of action with Ministry of Environment
- Bamboo is a controversial subject even though 137 native species – often put in same category as invasive grasses

ASIA: INDIA AND INDONESIA



China
India

Indonesia
Vietnam

- WRI offices in China, Indonesia and India
- New governments in India and Indonesia
- Window of opportunity exists to influence the path of green growth
- Initial funding secured to provide support
- Early stages of restoration assessment process

WHY HAS BAMBOO RESTORATION BEEN INCREMENTAL?

- 6 key needs:
 1. **Challenge assumptions and myths:** Bamboo is not a silver bullet - need research and development
 2. **Create partnerships:** Pool resources, create coordinated efforts
 3. **Conduct thorough stakeholder led assessments:** e.g. ROAM
 4. **Channel investment:** e.g. new technologies and reaching scale
 5. **Create economies of scale:** Supply needs to match demand
 6. **Change mindsets and institutions:** Advocate for bamboo within landscape restoration and commercial markets as part of a suite of options



CONCLUSION

- Globally there is increasing pressure on lands due to need for food, fuel and fiber
- Bamboo can act as one of a suite of options to rapidly regenerate degraded lands, reduce soil erosion and provide livelihood benefits
- The aims of restoration need to be clarified, opportunity mapping conducted and management plans identified to ensure sustainability





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THANK YOU

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