



**PHYLA**  
earth

The Transformative Tree

Elite Pongamia Agroforestry Systems

Gender-Responsive Climate Finance, Creating Wealth, Jobs, Food and Fuel

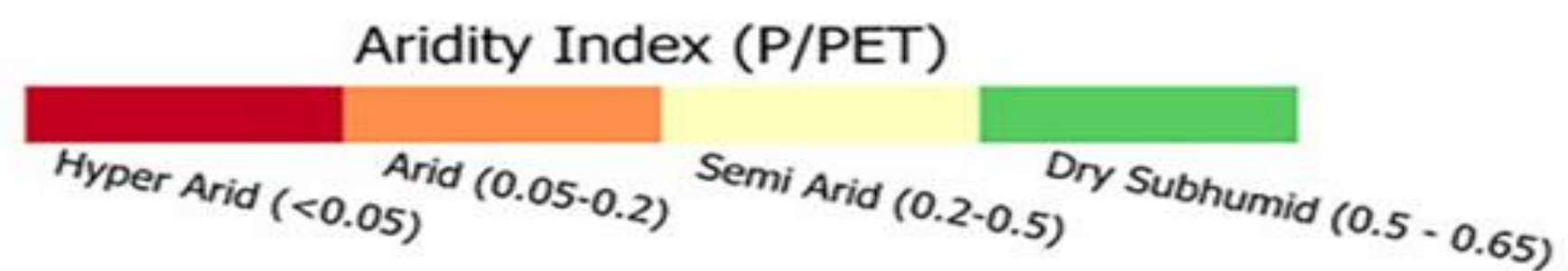
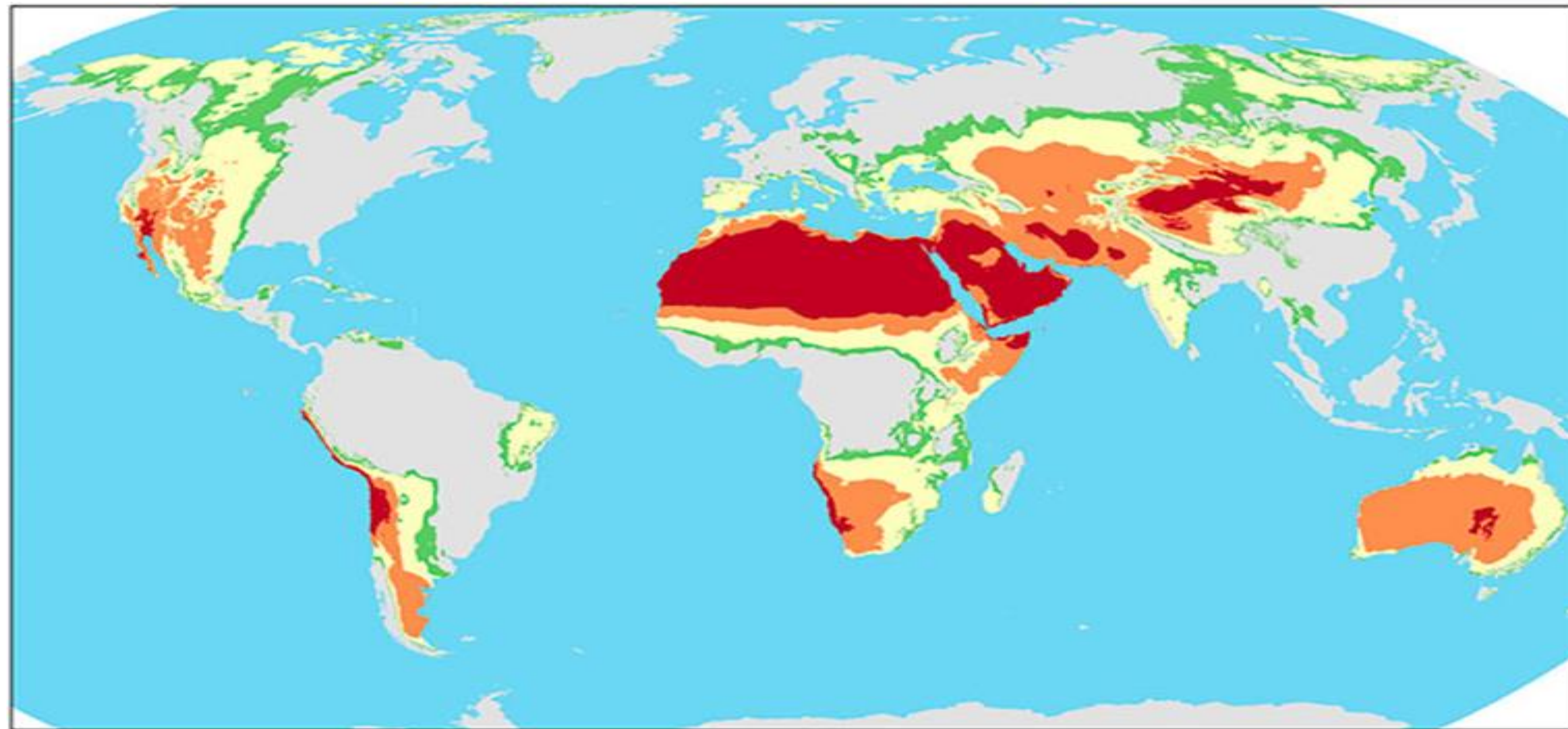
Dr Benjamin Warr, Director, PHYLA Earth

# Summary

1. The scale of the shared challenge and the need for effective finance
2. Farmer challenges are exacerbated by gender inequality
3. Elite Pongamia trees and agroforestry systems overview
4. A contextualized Pongamia agroforestry system generates productivity enhancement and risk reduction.

United Nations Convention to Combat  
Desertification (UNCCD) COP 15 2022

Up to 40 % of the planet's land is degraded,  
threatening roughly half of global GDP (US\$44 trillion)



- Drylands are seasonally dry and "brittle"
- Drylands are home to 3 billion people
- Each \$ invested in land restoration can have returns of \$7-30

<https://www.wri.org/insights/financing-entrepreneurs-reverse-land-degradation>

# Shared challenges and needs



Unlocking investments to reverse land degradation are key to fighting climate change

- Past decade development banks and private sector commitments exceed \$16 billion for Africa (AFR100, GGW Initiatives).

BUT

- There is an incentivization challenge - Globally an investment gap of \$300 billion a year to reverse land degradation and combat desertification.
- There is a disbursement challenge - Unsure how much actually reaches target communities and delivers effective outputs.

Projects need to be contextualized and productive to meet challenges of food, energy and water security.

# Shared challenges and needs

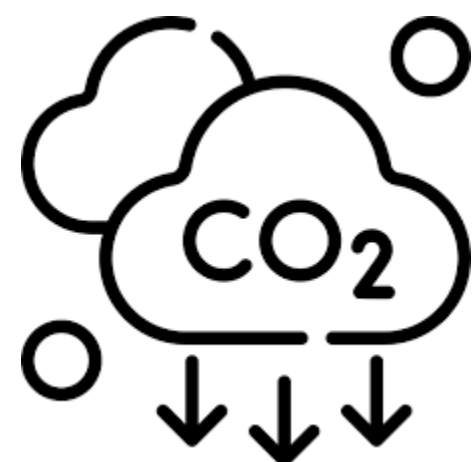
The cliché of “think global, act local” is increasingly relevant

## GLOBAL FINANCE

Profitable investments  
Effective disbursements

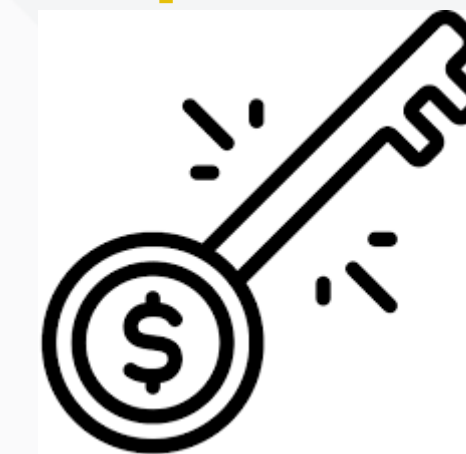


Carbon zero offtake  
commodities and products



## LOCAL FARMERS

Access to finance to  
capitalize production



Equitable access to markets  
and participation in value  
addition



# Farmer challenges – Zambia focus

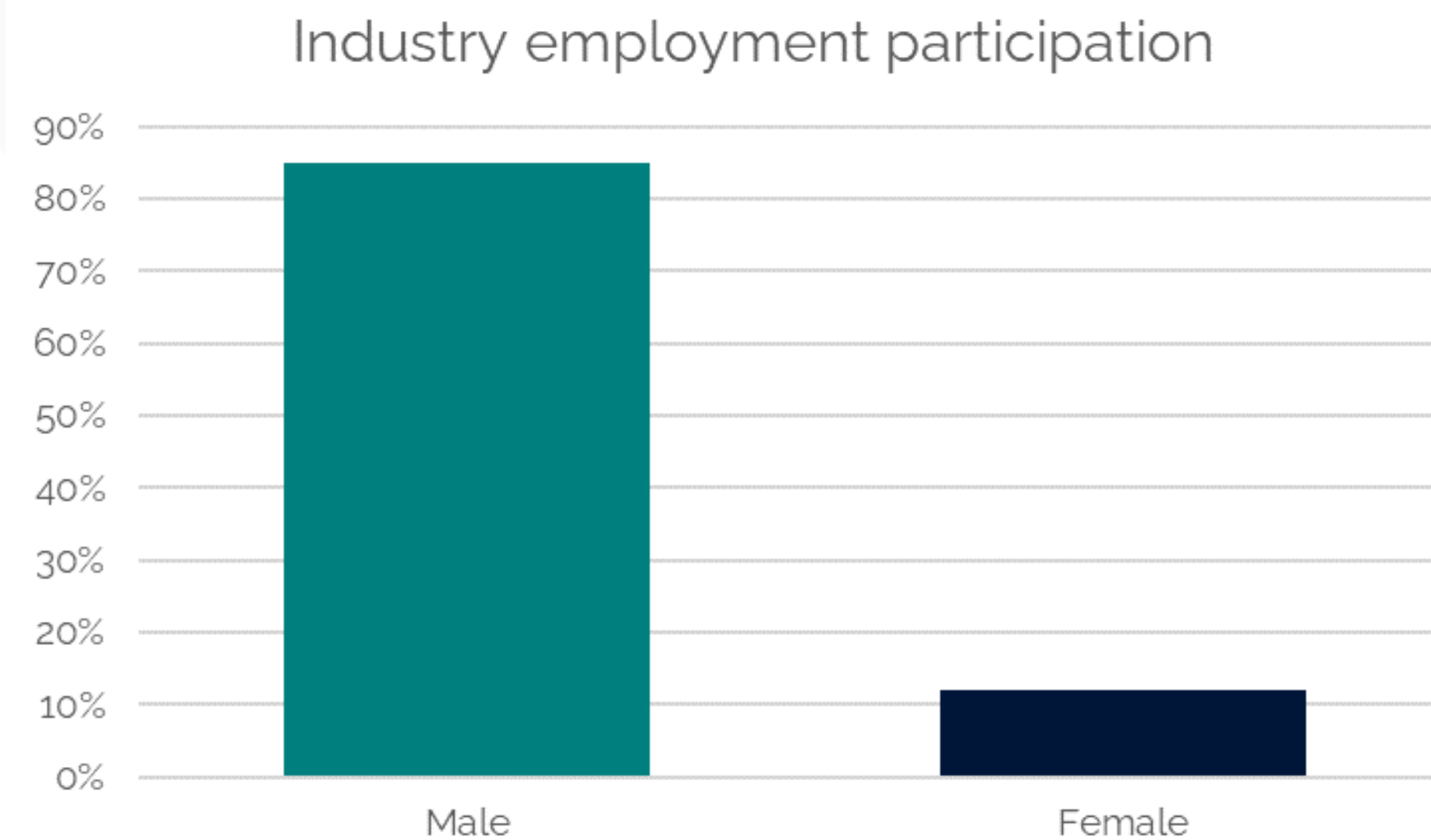
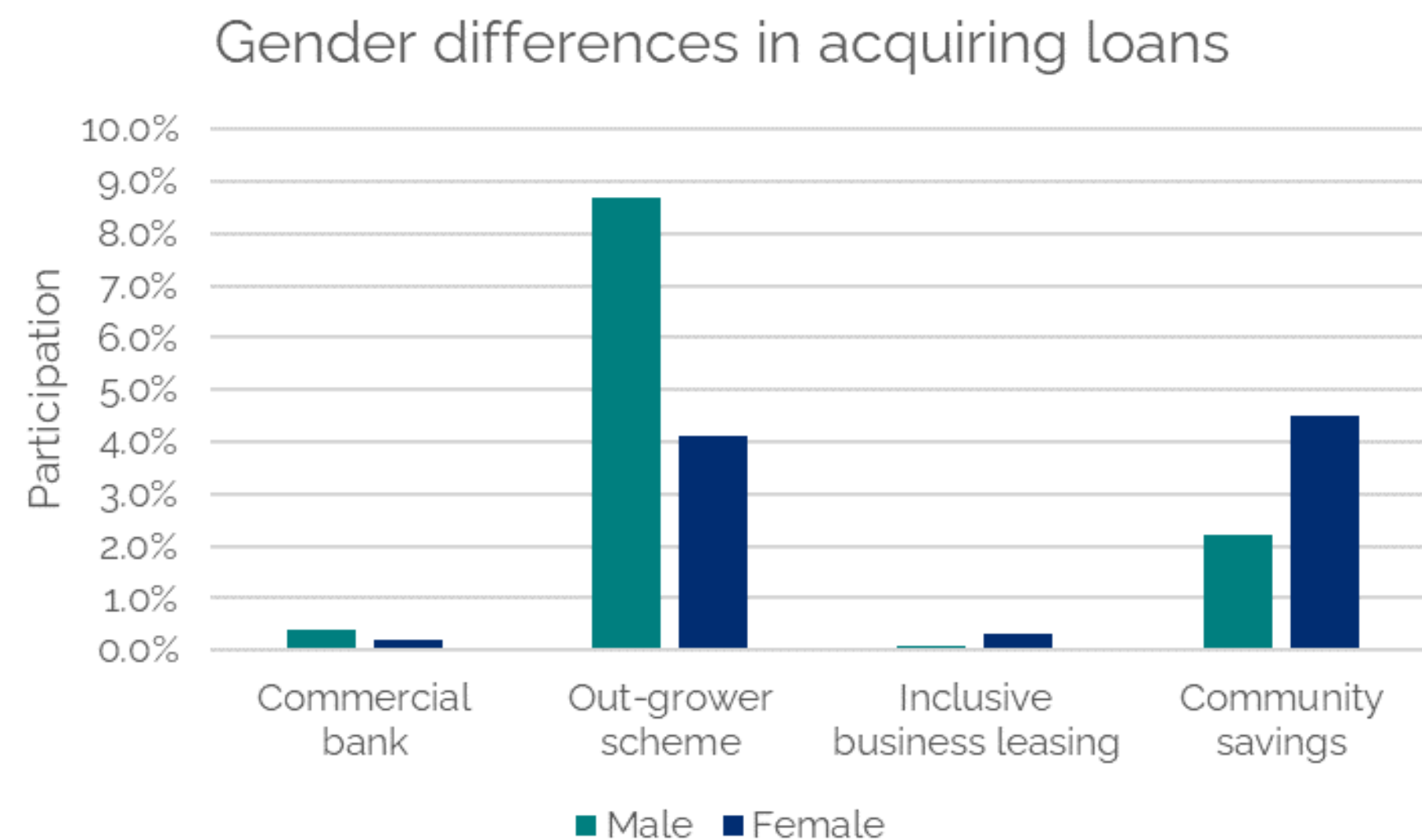
A simplification of a very complex set of challenges

Challenge	Cause	Impact
<ul style="list-style-type: none"><li>• Access to finance</li></ul>	<ul style="list-style-type: none"><li>• Lack of collateral</li><li>• Perceived risk and lack of available funds</li></ul>	<ul style="list-style-type: none"><li>• Deforestation and charcoaling to pay for seed and fertilizer</li></ul>
<ul style="list-style-type: none"><li>• Access to equitable markets</li></ul>	<ul style="list-style-type: none"><li>• Distance from market and profiteering</li></ul>	<ul style="list-style-type: none"><li>• Low prices and low income</li></ul>
<ul style="list-style-type: none"><li>• Access to advisory, training, inputs and value-add facilities</li></ul>	<ul style="list-style-type: none"><li>• Limited risk sharing</li><li>• Underfunded agri. extension services</li></ul>	<ul style="list-style-type: none"><li>• Low and stagnating yields; unnecessarily high input costs.</li></ul>
<ul style="list-style-type: none"><li>• Degrading soil health and fertility</li></ul>	<ul style="list-style-type: none"><li>• Synthetic fertilizers and biocides, bare soils</li></ul>	<ul style="list-style-type: none"><li>• Increasing costs lower margins</li></ul>
<ul style="list-style-type: none"><li>• Degrading ecosystem</li></ul>	<ul style="list-style-type: none"><li>• Loss of biodiversity and hydrologic function</li></ul>	<ul style="list-style-type: none"><li>• Pests and disease</li></ul>
<ul style="list-style-type: none"><li>• Climate change and extreme weather</li></ul>	<ul style="list-style-type: none"><li>• Regional deforestation, loss of ungulates and soil degradation</li><li>• Anthropogenic emissions</li></ul>	<ul style="list-style-type: none"><li>• Flood, fire and drought cycles</li></ul>



# Challenges multiplied for women

- National average 16% of farmers took loans (2% difference male:female)
- Low participation in out-grower schemes, targeting and CS working well
- Very limited ability to earn money in other sectors to capitalize farming
- Farming more marginal land
- Lower level of commercial participation



Christabell Makokha, AFA's Country Director in Zambia. *"When bundled with services that increase farming productivity and access to markets, they (loans) can go a long way to improving livelihoods and life options for women farmers."*

# PHYLA Elite Pongamia pinnata



Resilient and productive



- Drought tolerant with deep taproot growing with annual rainfall less than 650mm.
- Nitrogen fixing meaning no fertilizers are required, reducing costs of production and reducing GHG emissions.
- Carbon removal storing carbon in the tree and building carbon in the soil.
- Salinity and flood tolerant bringing resilience to a world afflicted with global warming.
- Non-invasive sub-tropical dryland tree species.



# Pongamia Production Profile



## Biomass

Podshell used for soil health products or as an alternative to charcoal and coal in industry.

## Bioenergy

Oil produced and used for biodiesel and Sustainable Aviation Fuels (SAF).

## Food proteins

Pea flour used to provide food security from marginal land.

## Biocompounds

Substitute for toxic chemicals used in agriculture to reduce environmental damage.

## Carbon

Sequestered in trees and soil while bioenergy products offset industrial fossil fuel GHG emissions.

PHYLA's Elite *Pongamia pinnata* used in our projects has demonstrated yields of over 50kg seed per tree per annum under dryland conditions of approximately 650mm rainfall per annum. Demonstrating Viable Economic Yields.

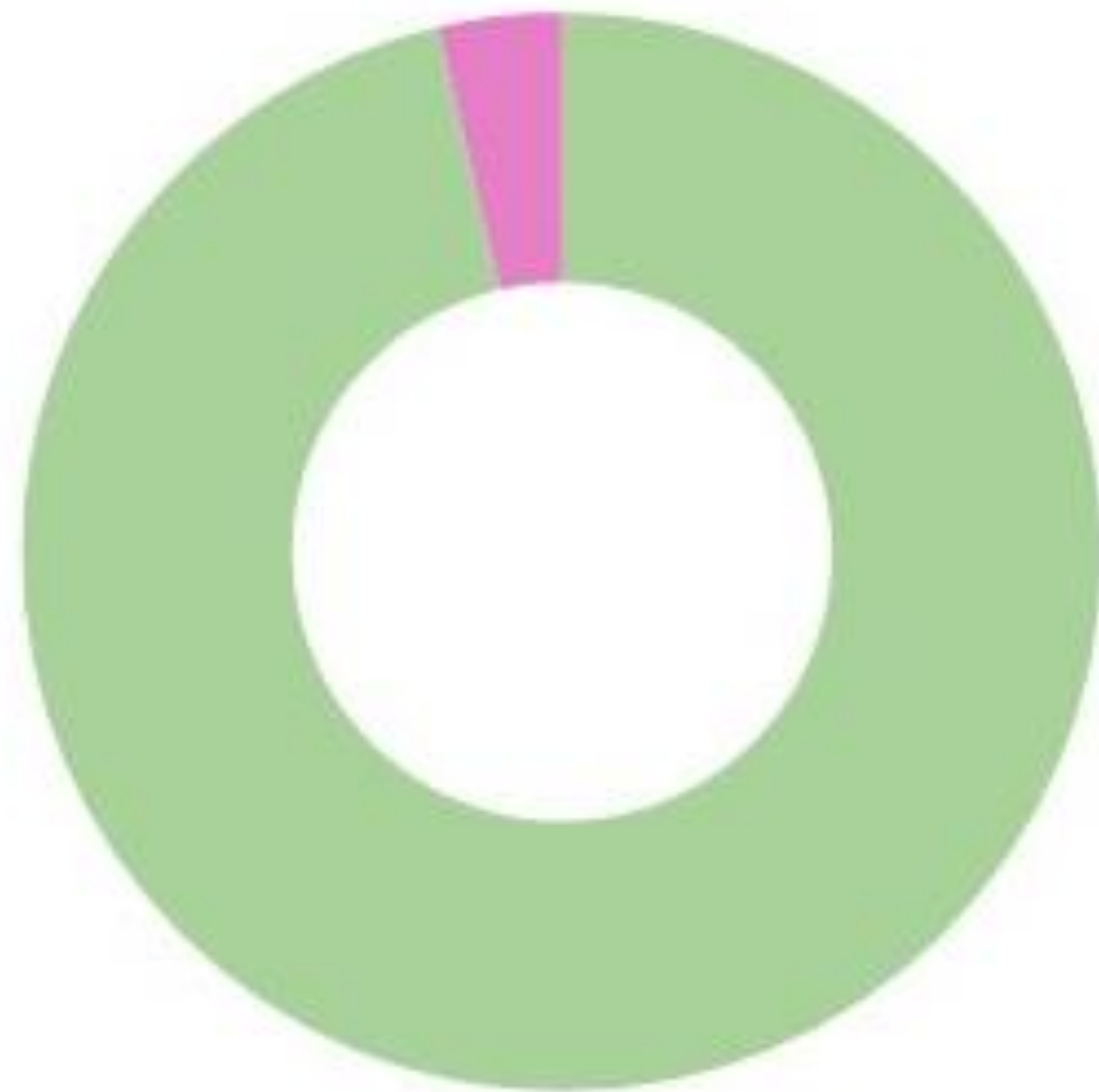


# Unique Cultivar Technology

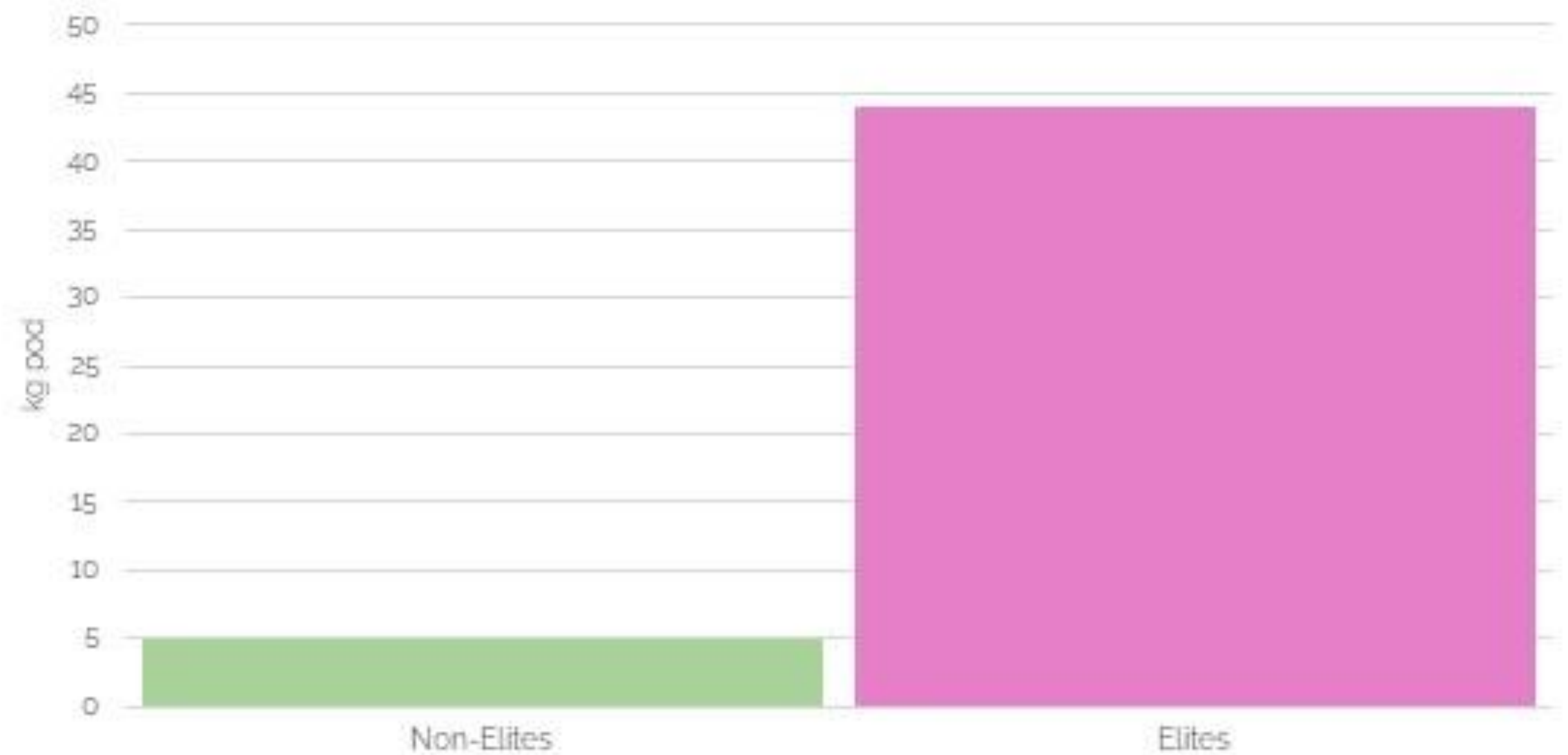


PHYLA stabilises yields with its portfolio of 75 Elite Varieties of *Pongamia Pinnata* from proven high yielding 'Mother Trees' identified from 100,000+ candidates

**Less than 3% of wild trees are elite candidates**



**Elite tree yields in excess of 40kg pod**



High yielding

Drought tolerant

Saline tolerant

Flood tolerant

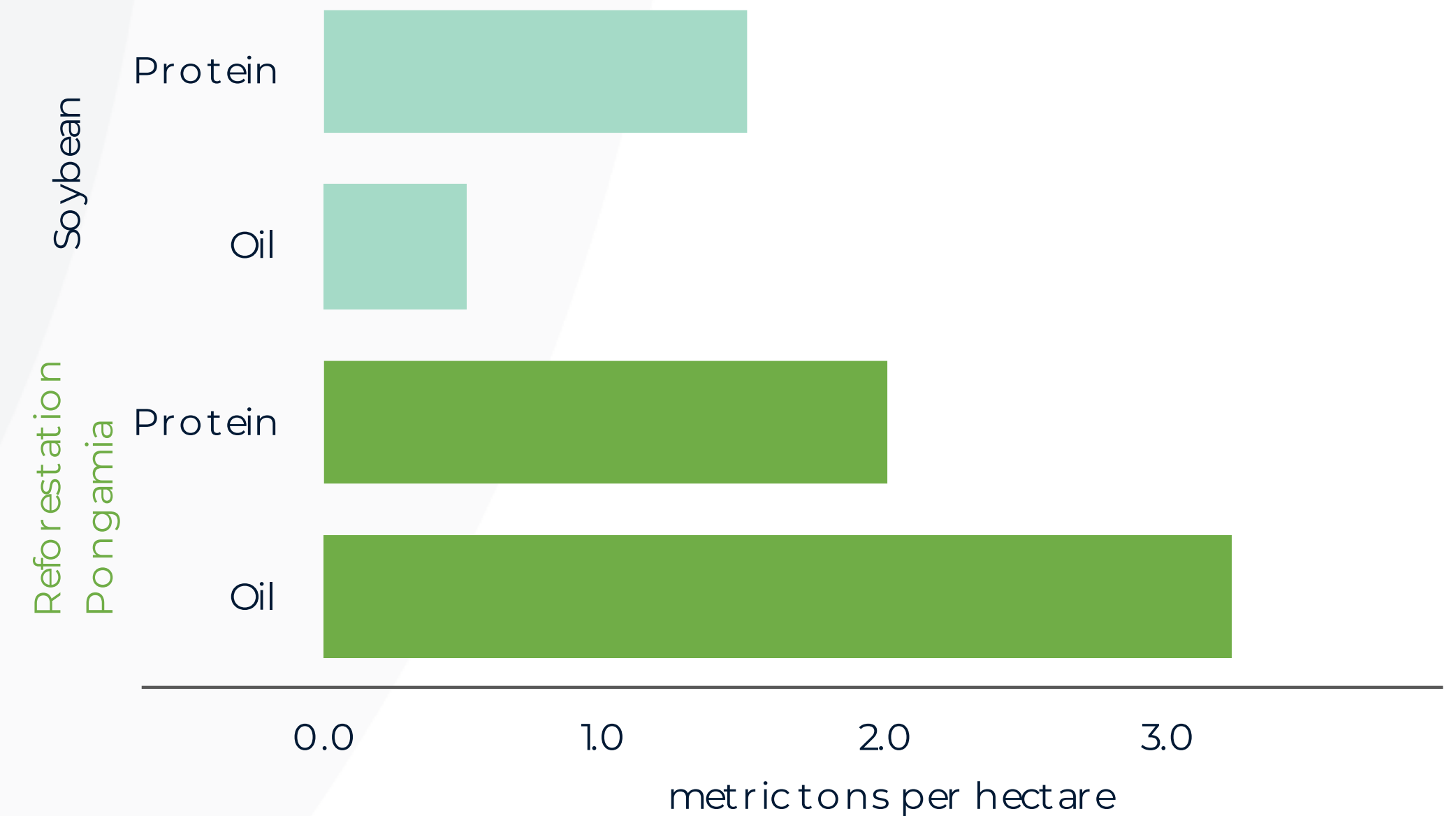
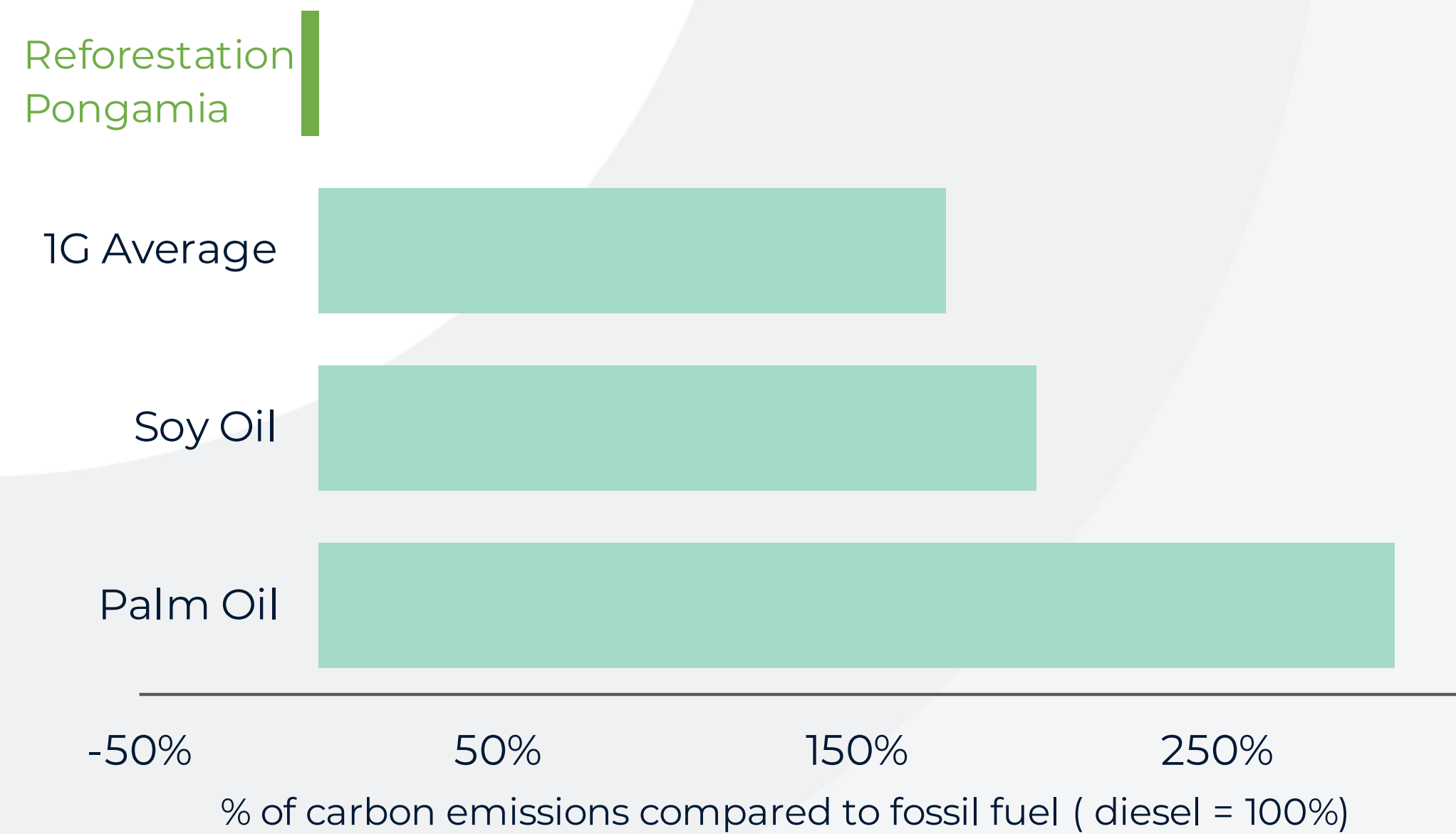
Annual production

Bio compound proportions

# Unique Cultivar Technology



Lower input costs higher revenue compared with alternatives



## Pongamia produces low carbon fuels

- Avoided GHG emissions as Pongamia is N-fixing and requires no fertilizer inputs
- Minimal energy and water requirements for irrigation only during initial establishment further reducing carbon footprint
- One hectare of Pongamia agroforestry can sequester 300mt CO<sub>2</sub>eq above and below ground in the trees and a further 90mt CO<sub>2</sub>eq in the soil.

## Pongamia produces proteins for food & feed

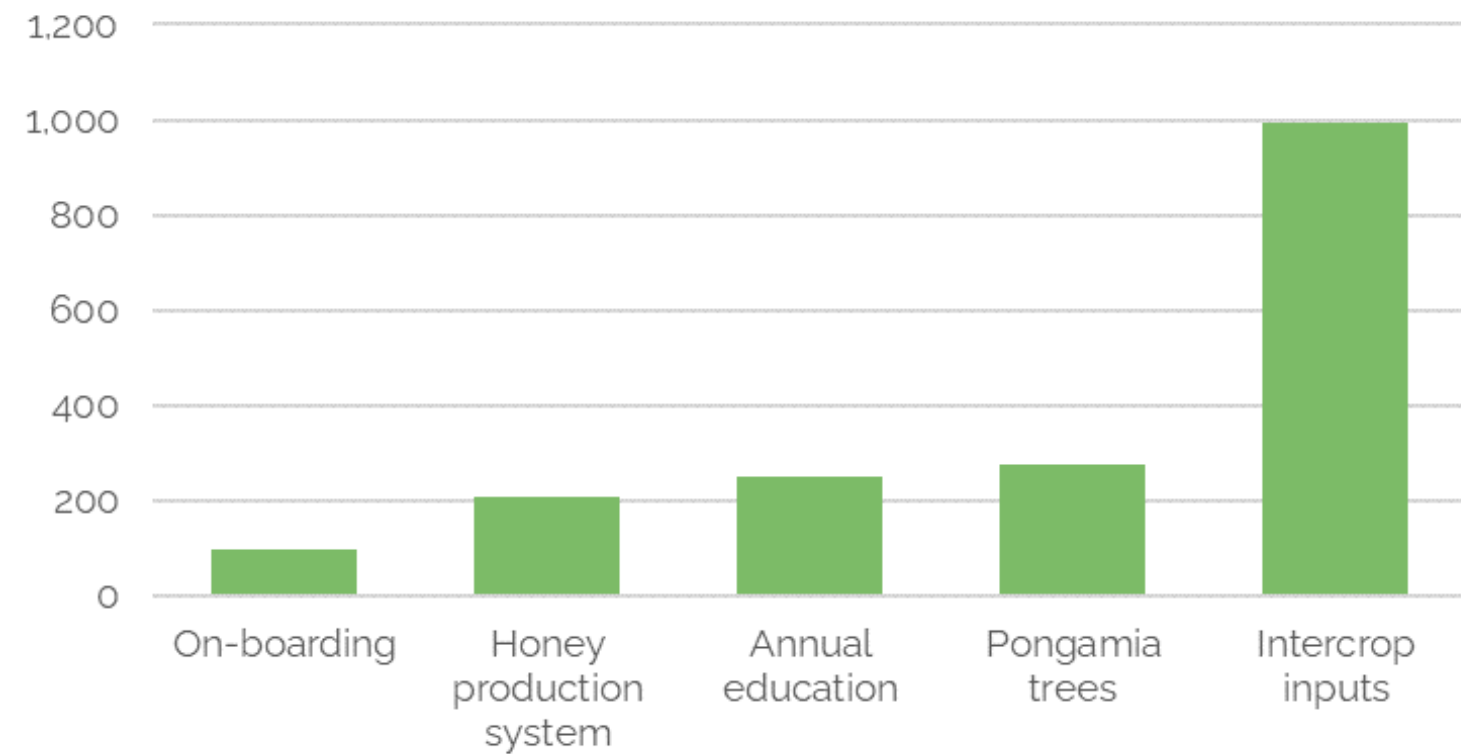
- Elite Pongamia brings the yield advantages, low maintenance and input costs of perennial tree-based crops, as well as all the environmental and habitat benefits that trees bring to the environment
- Other advantages include reduced risk of production through adverse weather conditions including drought and flooding, and ease of production in outgrower systems

# PHYLA inclusive capitalization

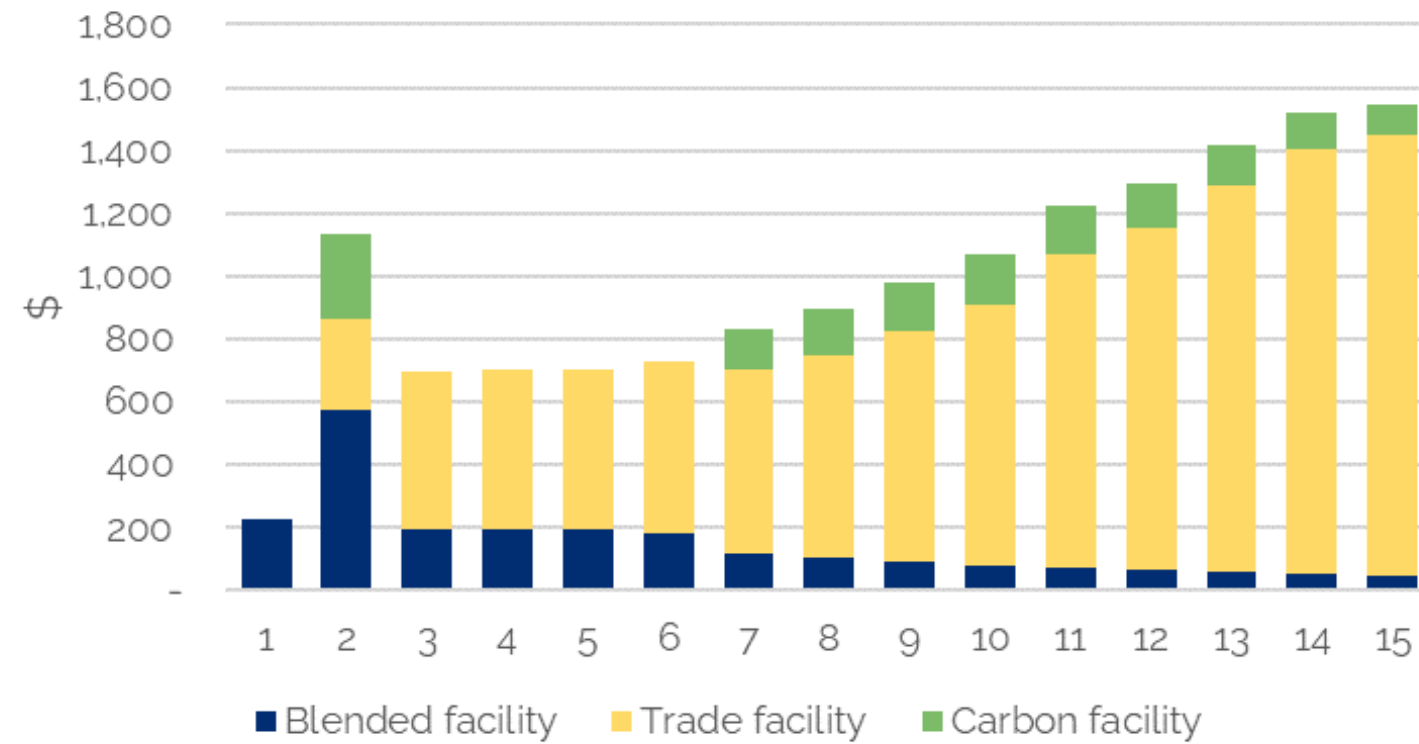


For productivity enhancement and risk reduction

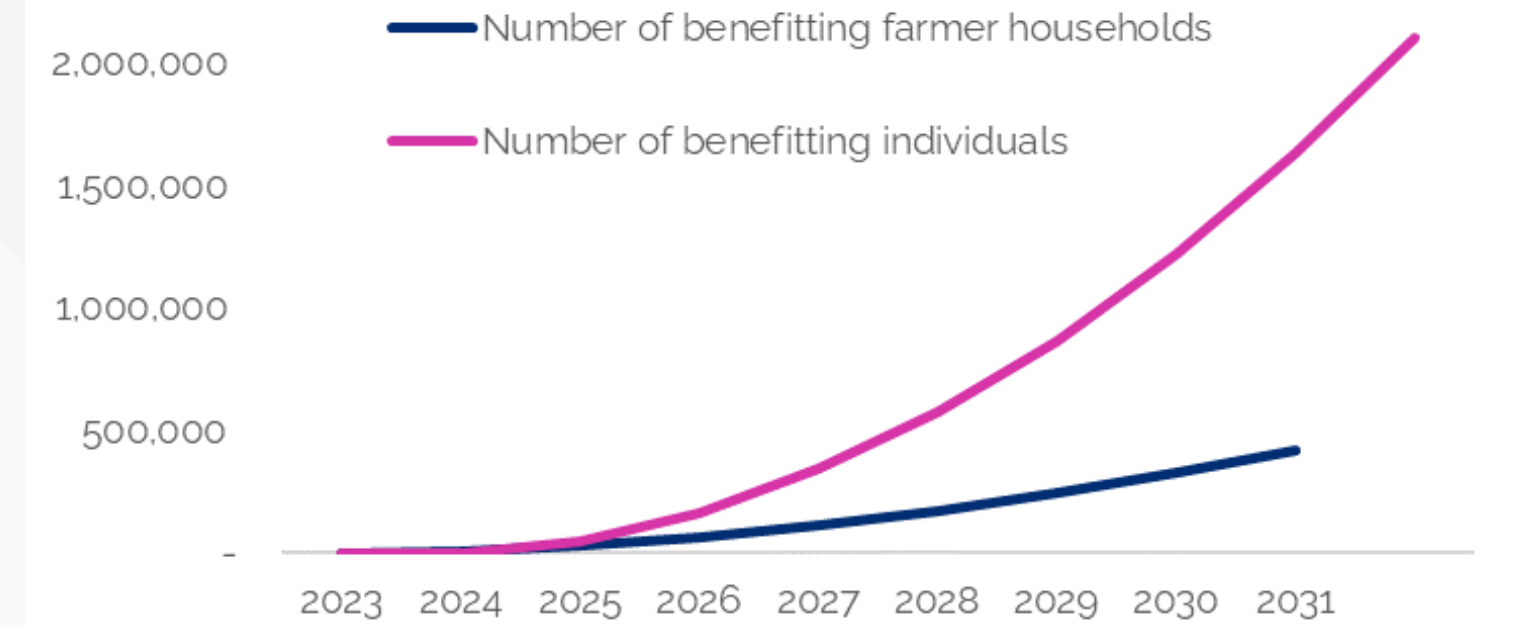
Capitalization loans to farmers (5 year)



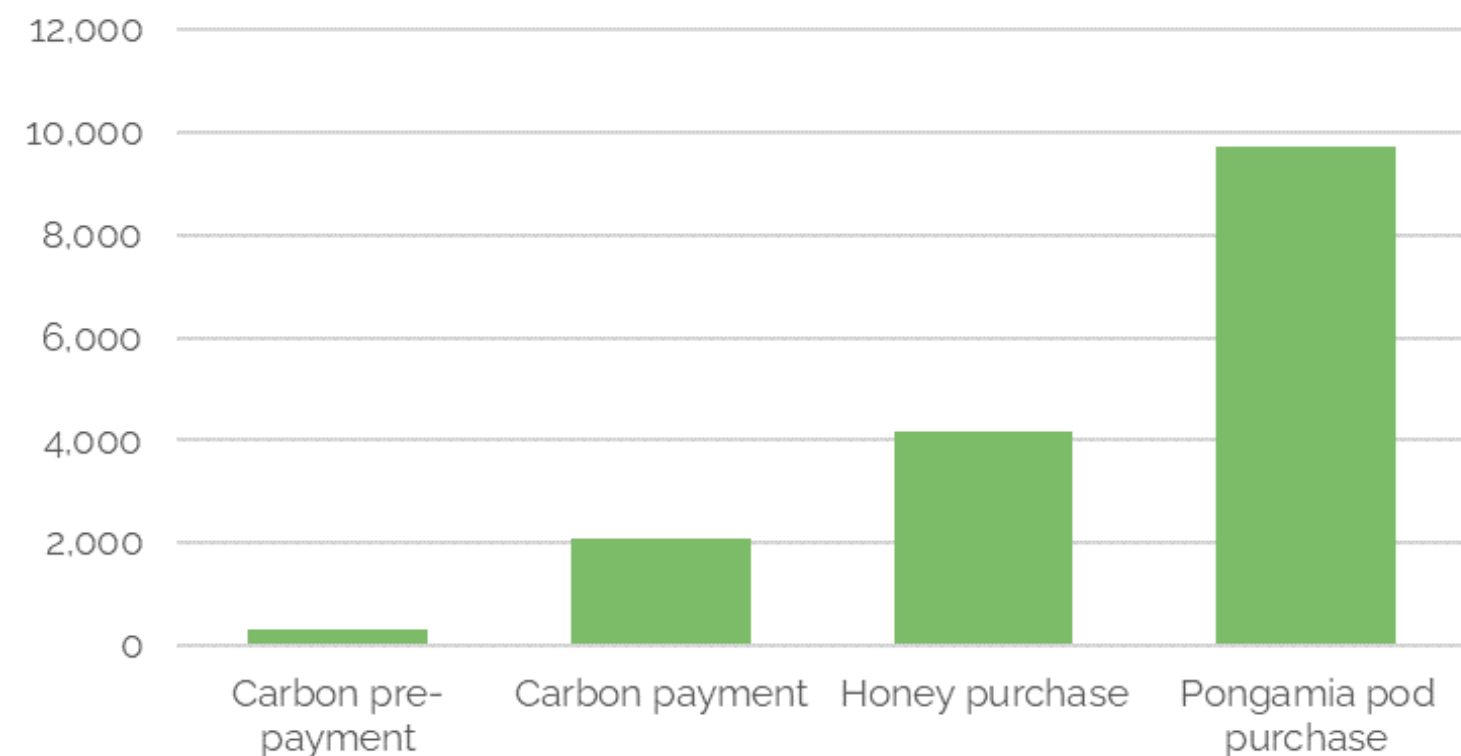
Breakdown of capitalization by facility



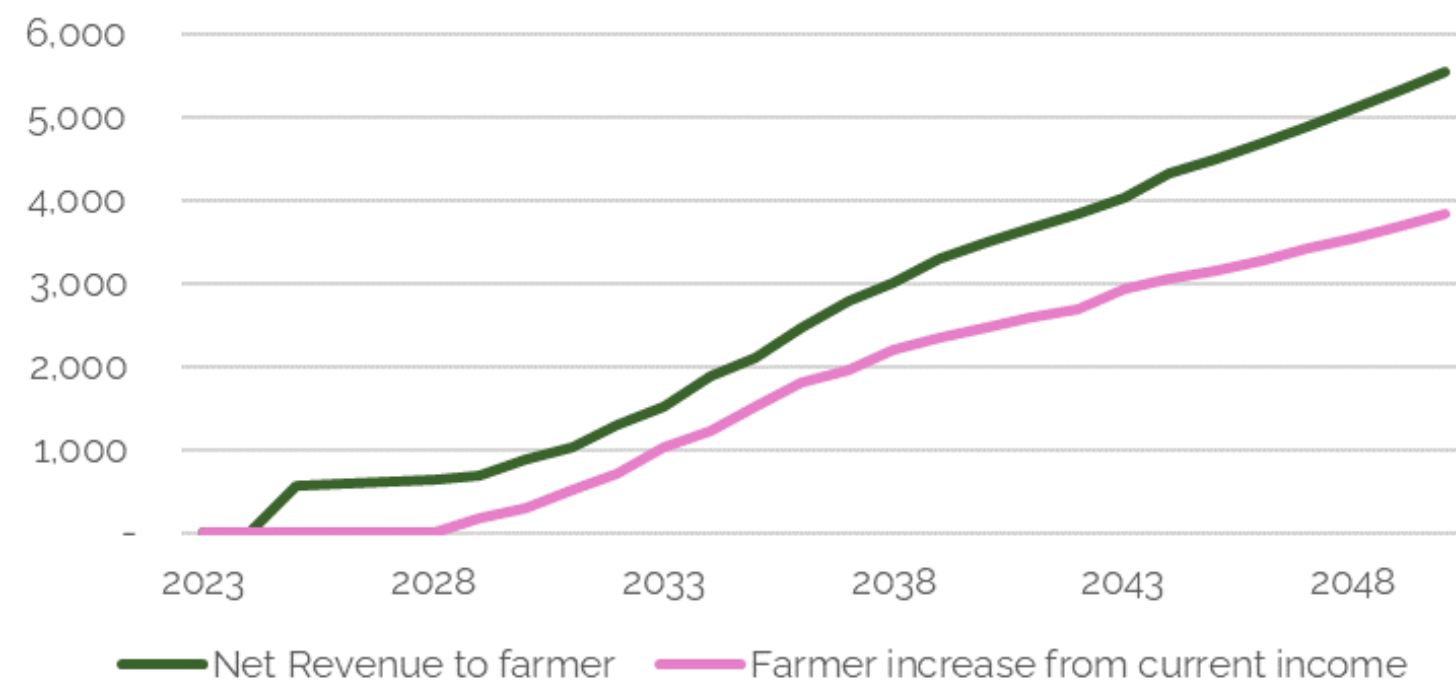
Number of benefitting households and hectares regenerated



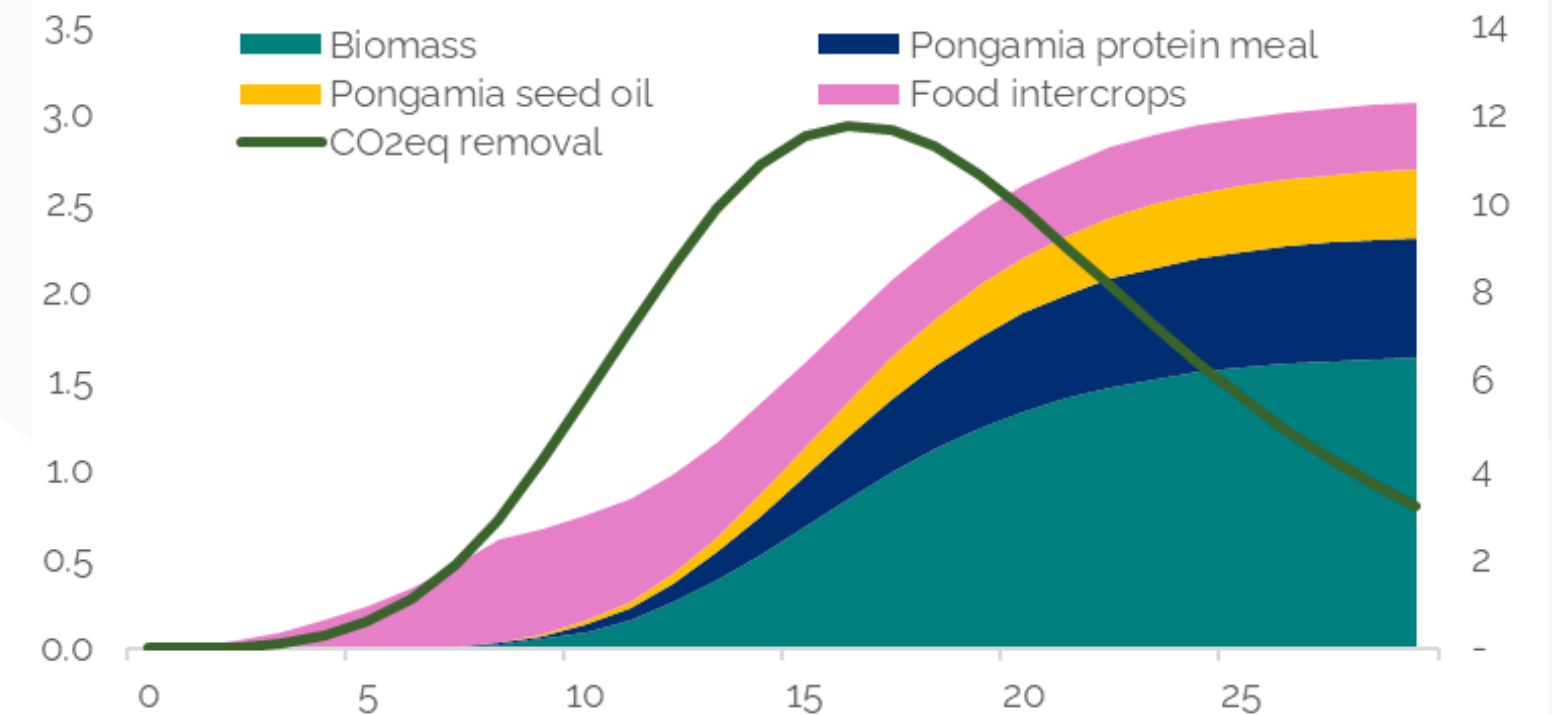
Productivity payments to farmers (15 year)



Growth in farmer revenues (per Ha) (Nominal \$ - 3% inflation)



Production quantities (MMT, 30 year)



20 Hectare PHYLA Elite Pongamia Propagation Facility, \$1.2M regenerating >400,000ha @50 trees per hectare

# Farmer challenges - PHYLA solutions



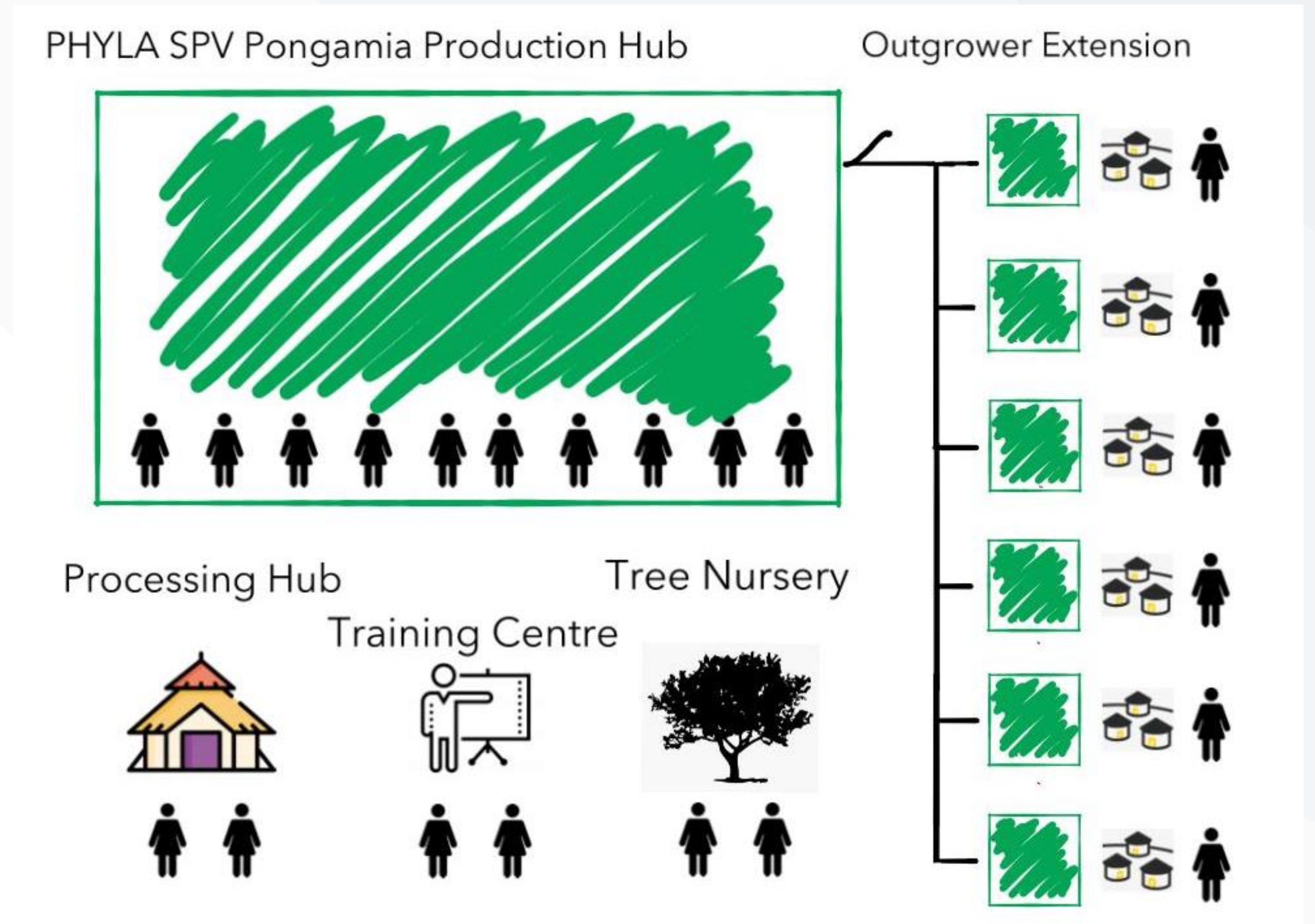
## Pongamia integrates into a holistic solution

Challenge	PHYLA solution	Impact
<ul style="list-style-type: none"> <li>Access to finance</li> </ul>	<ul style="list-style-type: none"> <li>Loans provided against contractable future cashflows from resilient cropping system</li> <li>Gender based quotas (minimum 50% participation target)</li> </ul>	<ul style="list-style-type: none"> <li>Capitalization of production leading to increase output and revenues</li> <li>Stimulating community savings</li> </ul>
<ul style="list-style-type: none"> <li>Access to equitable markets</li> </ul>	<ul style="list-style-type: none"> <li>Offtake contracts; Trade finance; Aggregation of product and QA/QC</li> <li>Identify premium regeneration/organic markets</li> </ul>	<ul style="list-style-type: none"> <li>Reliably sell more produce with better quality and higher prices</li> </ul>
<ul style="list-style-type: none"> <li>Access to advisory, training, inputs and value-add facilities</li> </ul>	<ul style="list-style-type: none"> <li>Rural aggregation hubs serving as inputs provision, training and primary processing facilities</li> </ul>	<ul style="list-style-type: none"> <li>Reduce production risk through training and enhance rural circular economy</li> </ul>
<ul style="list-style-type: none"> <li>Degrading soil health and fertility</li> </ul>	<ul style="list-style-type: none"> <li>Transition toward perennial carbon accumulating agroforestry and transition away from synthetic biocides</li> </ul>	<ul style="list-style-type: none"> <li>Build soil carbon, soil health and fertility</li> </ul>
<ul style="list-style-type: none"> <li>Degrading ecosystem</li> </ul>	<ul style="list-style-type: none"> <li>Restore tree cover across degrading agricultural landscapes (minimum 30% for other tree species)</li> <li>Provide habitat for pollinators (bees)</li> </ul>	<ul style="list-style-type: none"> <li>Regenerate hydrological function</li> <li>Rebuild (conserve) biodiversity</li> </ul>
<ul style="list-style-type: none"> <li>Climate change and extreme weather</li> </ul>	<ul style="list-style-type: none"> <li>Climate change resilient tree species, capable of surviving both drought and flood</li> </ul>	<ul style="list-style-type: none"> <li>Risk reduction, yield and annual income stability</li> </ul>

# Landscape approach

## Hub and spoke cluster model

- FPO out-grower schemes @50 trees per Ha coupled with commercial plantations @275 trees per ha on industrial sites and wastelands.
- Mine regeneration partners provide local offtake for net-zero biodiesel/oil
- Cement plants provide local offtake for net-zero biomass
- Integrated with livestock grazing, benefitting from protein rich pongamia fodder (reduces cattle methane emissions)
- Jobs for urban and peri-urban women in production, processing and value-add.



# Perennial Dividends

We create value that restores ecosystems productivity, biodiversity and resilience to deliver economic, social and planetary scale returns.



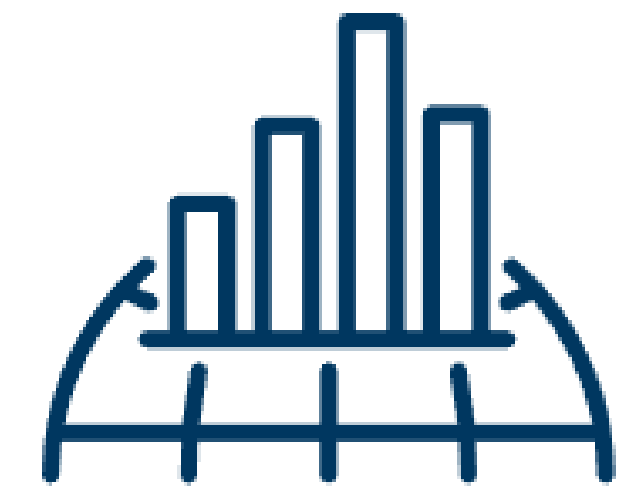
## Enabling Investment

Investments that generate financial, social and environmental returns.



## Increasing Productivity

Increasing returns through enhanced efficiency.



## Developing Markets

Connecting regional and international off-take markets.



# Contact



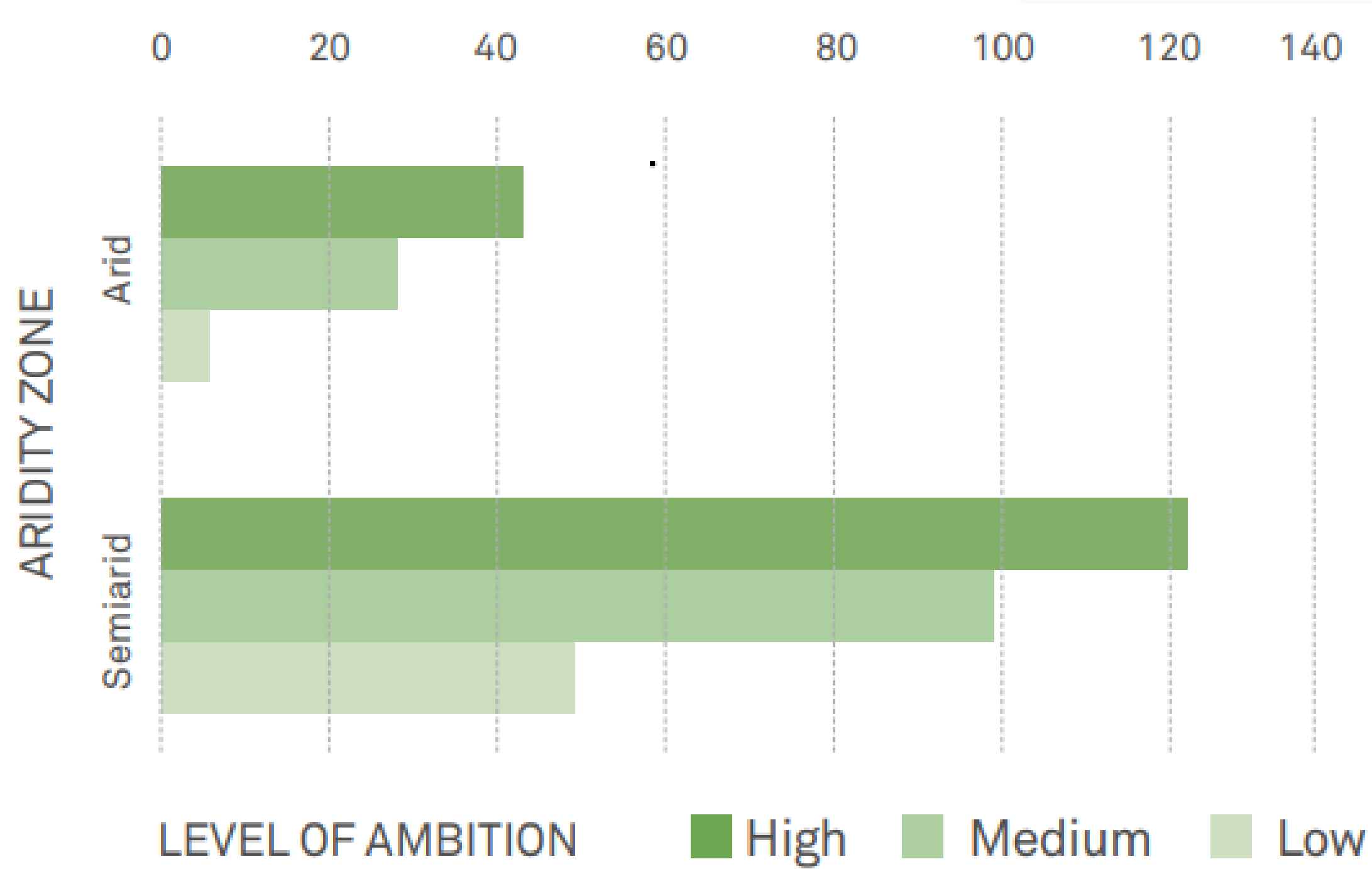
**PHYLA**  
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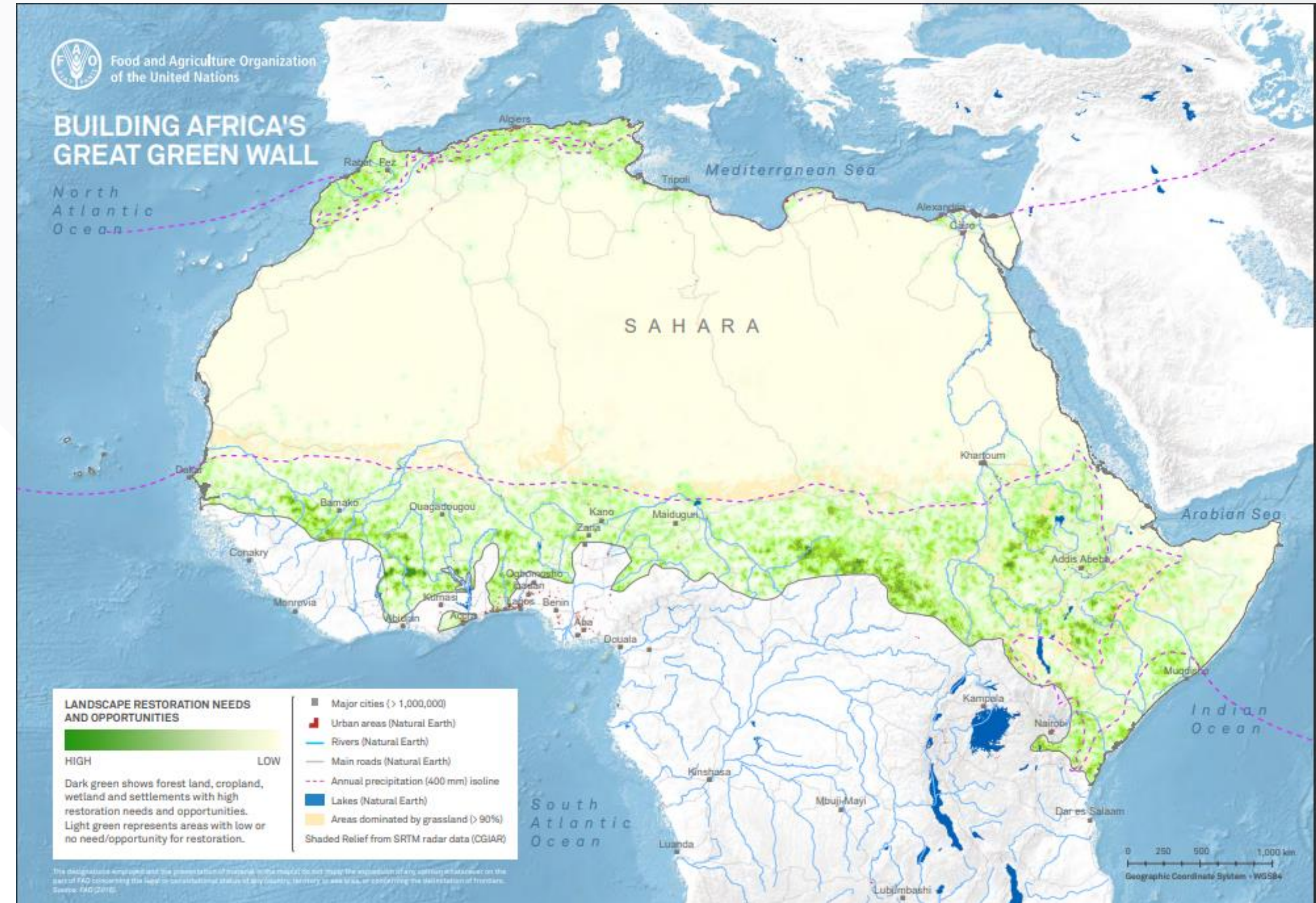
The Albany Boathouse,  
Lower Ham Rd,  
Kingston upon Thames,  
KT2 5BB  
United Kingdom



Additional Slides



Restoration scenarios for the GGW core area (million hectares). Scenarios show the area of land with tree cover below the level of ambition.



# Pongamia intercropped with Pigeon Pea

3 years old, India



Our agroforestry and biotech systems respond directly and powerfully to 5 major driving forces shaping the next 50 years of regional development and offer unique advantages for productive land regeneration in the sub-tropics.

### Land regeneration

Low input  
drought-tolerant  
& biodiverse  
agroforestry

### Natural capital valuation

Building an  
asset class  
in biodiverse  
carbon removal  
systems

### Renewable energy & clean water

Providing  
essential  
support services

### Value chain

Financing and  
adding value  
through  
processing and  
market linkages

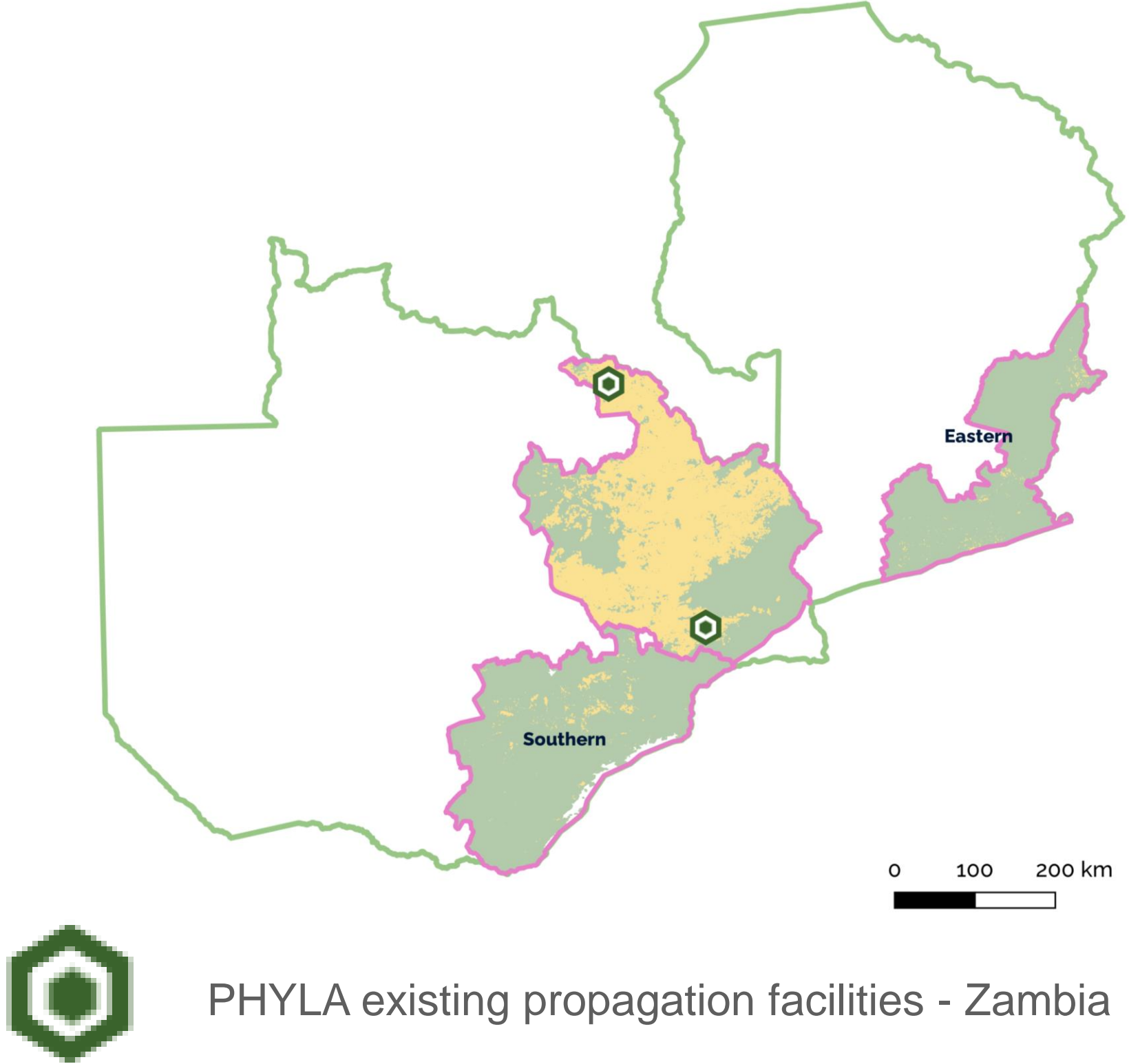
### Jobs & Education

Supporting  
individuals to  
succeed as  
communities

# Phyla Sapling Facilities in Zambia

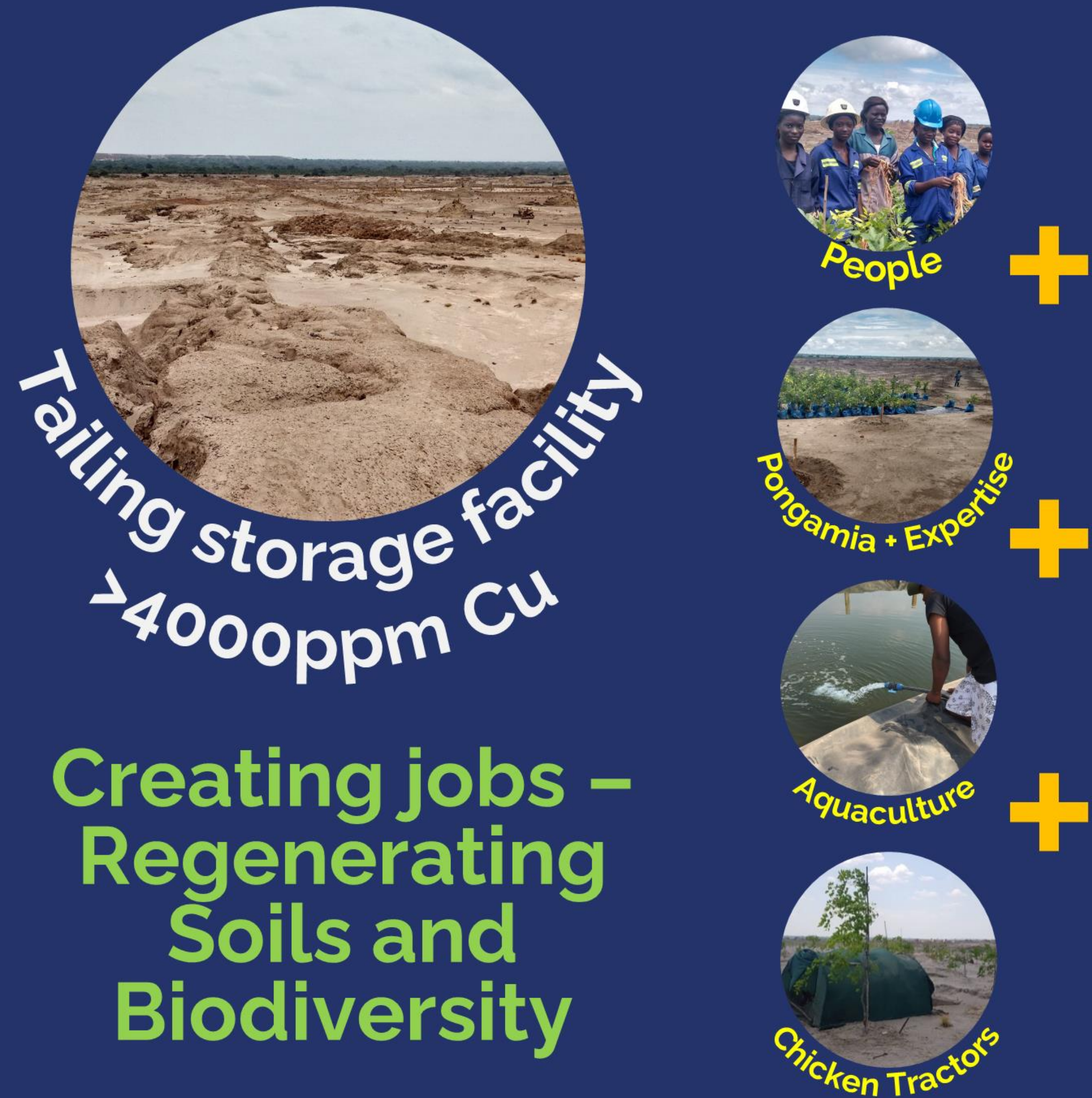


Only elite Pongamia propagation facility in Africa



# A mine facility example

Incentivised regeneration for a future economy - 99% tree survival



# 2017 – Degraded legacy landscape

## Konkola Copper Mines, Chingola, Zambia

>4000ppm copper, high salinity and poor water availability





# PHYLA Tree Planting Team





Tree planting and erosion controls

# 2022 – Proven Pongamia regeneration

- **99% tree survival rate**



2019



2022





2017



2022

# Konkola Copper Mines, Chingola, Zambia

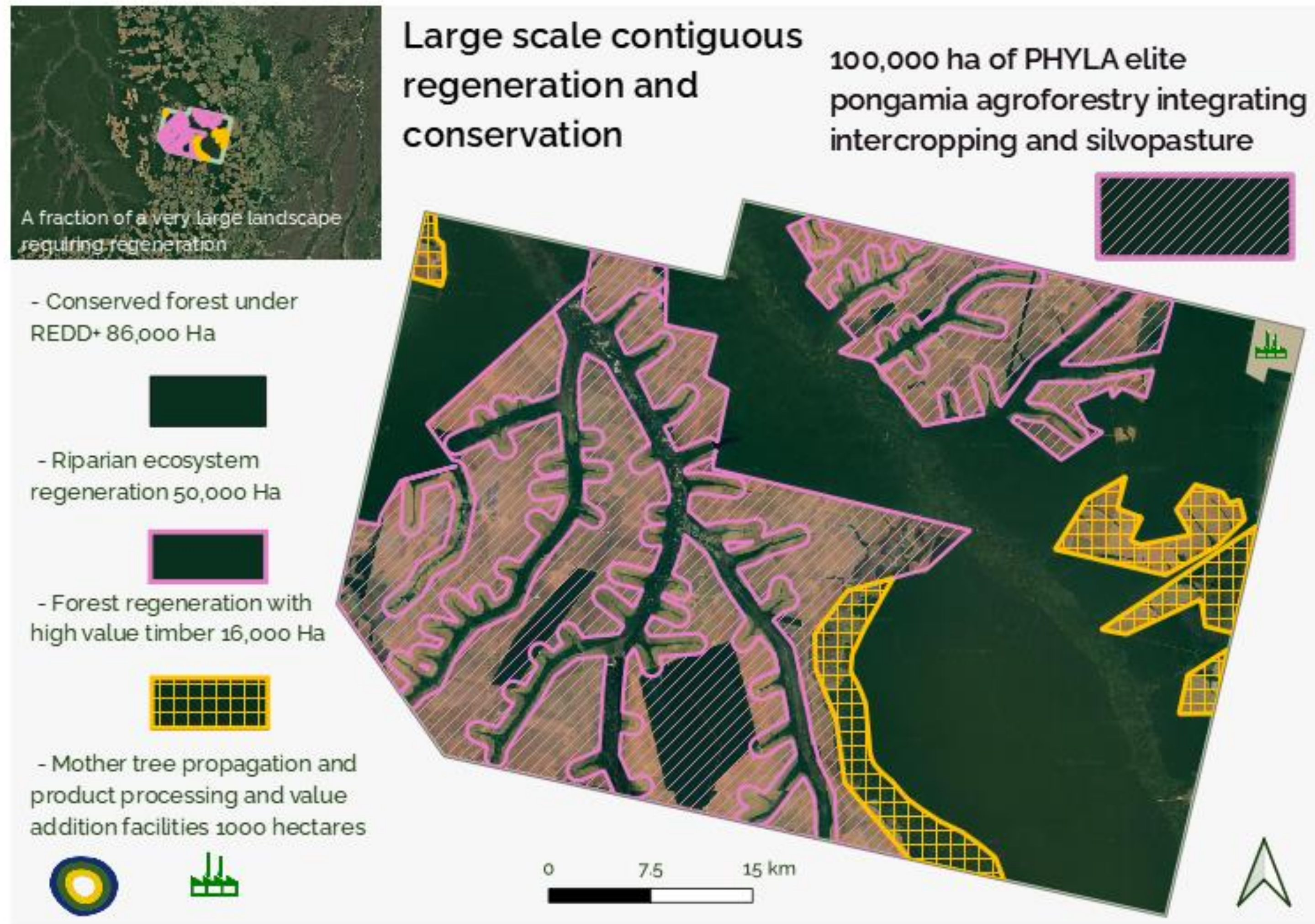


Successful revegetation with no topsoil imported



# Carbon, biodiversity and productivity

## Large-scale “stand-alone” commercial agroforestry

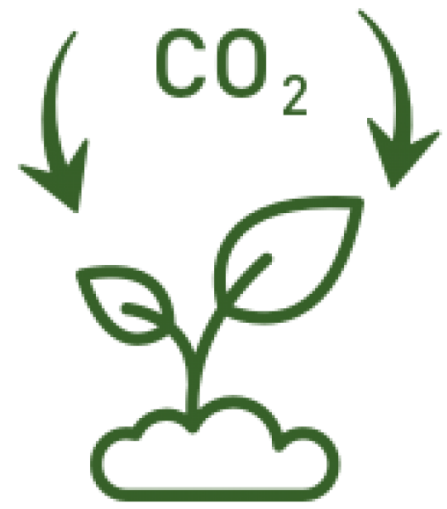


Each project is framed within a fully accounted carbon landscape, and incorporates:

- Commercial agroforestry
- Regenerative high-value timber extraction
- Forest conservation
- Biological approach to soil carbon and system productivity
- Product processing and value addition

# Net Zero through removal and offsets

100,000ha, 30-year project lifespan example

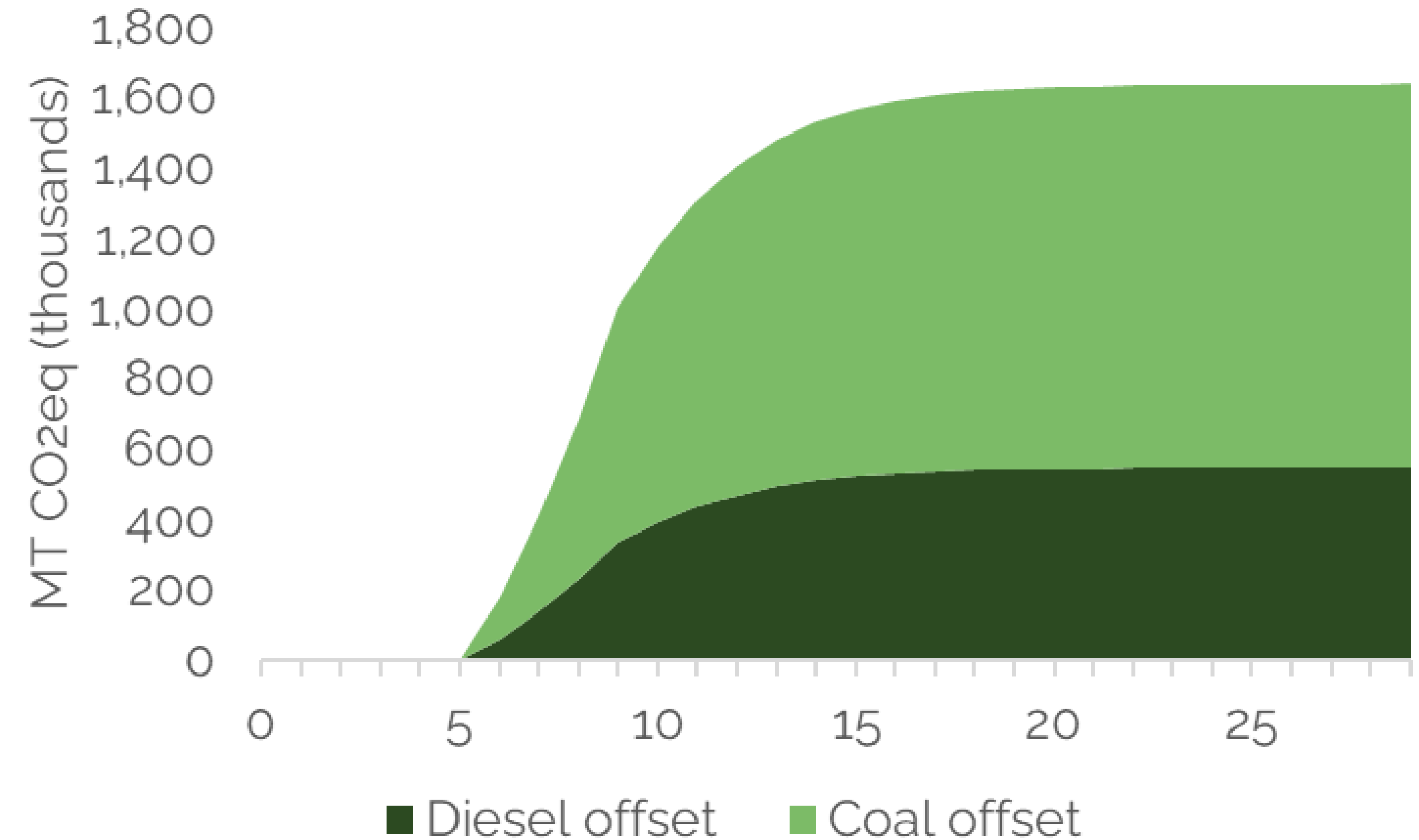
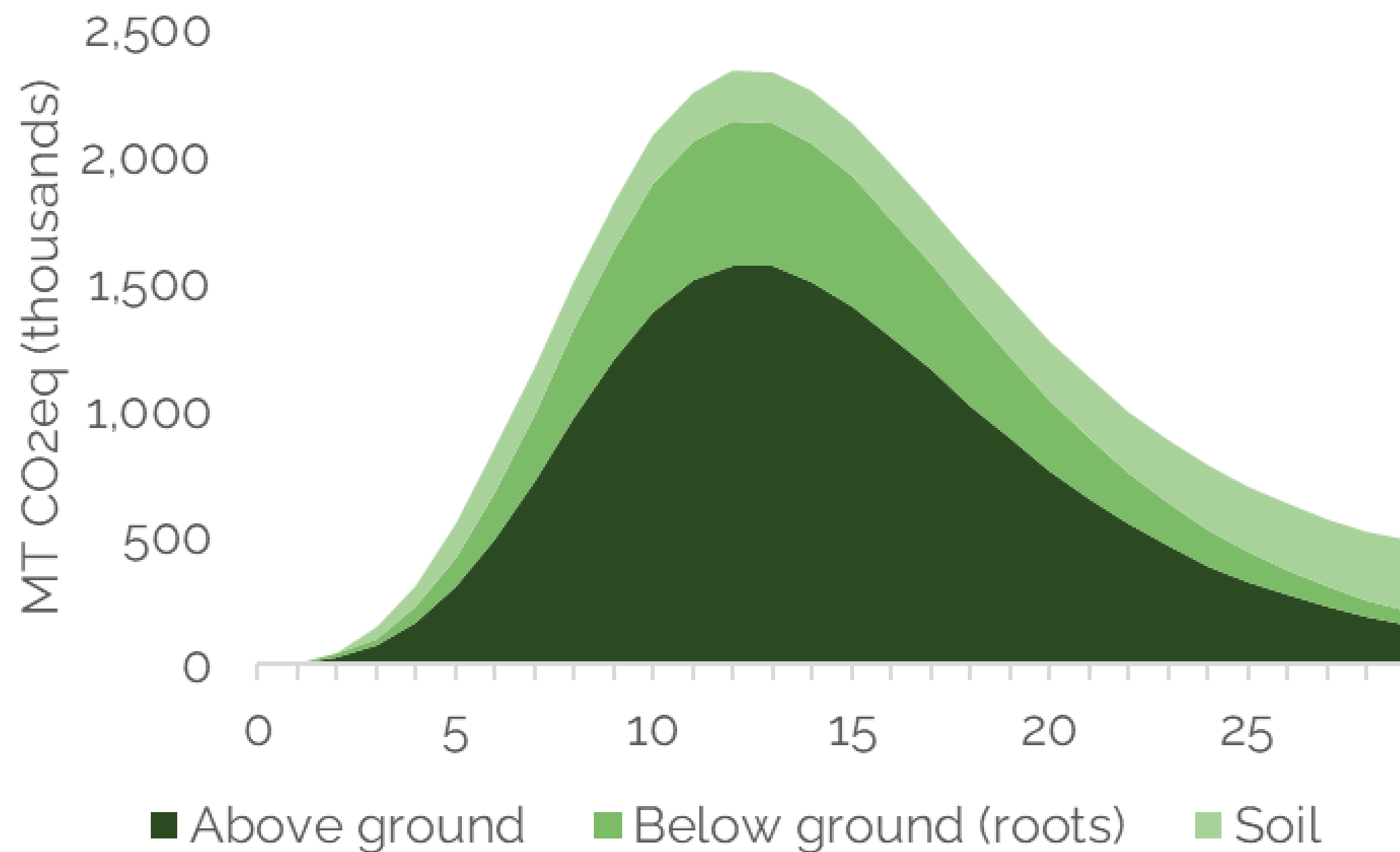


- Above ground and below ground removal credits



ZERO EMISSION

- Diesel and Coal offsets credits

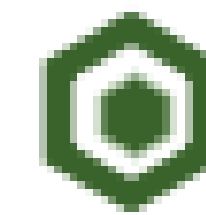




# Soil lab. & advisory

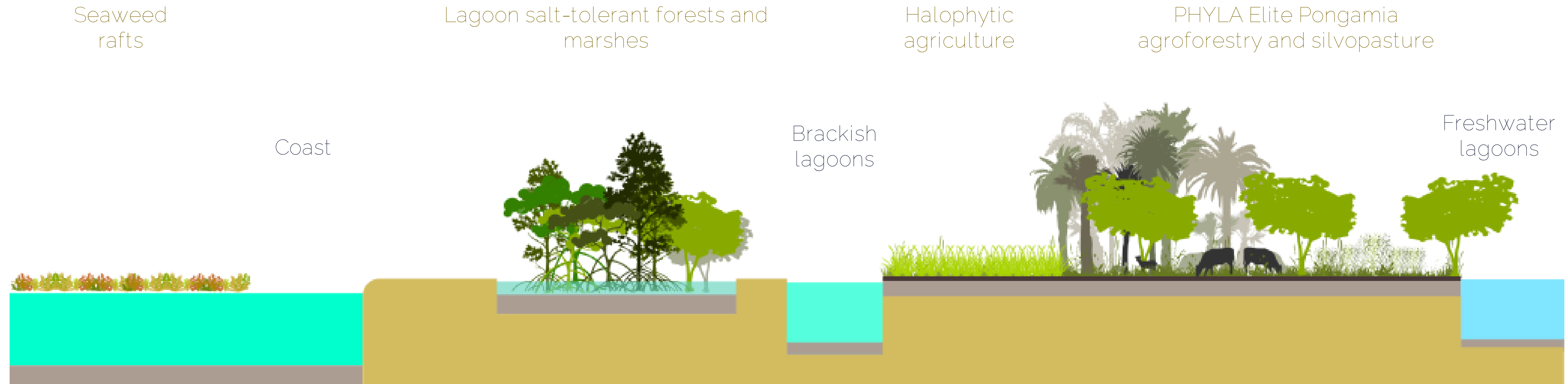


Soil laboratory facilities as a foundation in developing advanced insurance, credit facilities, carbon and SDG impact MRV.



PHYLA soil laboratory - Zambia

ECOSYSTEM



BENEFITS

Diverse seaweed species, *Sargassum spp.*, *Undaria spp.*, *Laminaria spp.*, *Euchema spp.*, capturing nutrients lost from land, storing carbon at sea-bed, producing biomass for soil creation and providing a habitat for many fish, crustacean and mollusc species.

PRODUCTS: VCUs, Biofuels, Soil Enhancers, Fodder

*Therophytes*, *hemicryptophytes*, *chamaephytes* and *phanerotypes* provide erosion control and storm protection, capturing carbon, nutrients and sediments, providing a biodiverse habitat and nursery for fish production.

PRODUCTS: VCUs, Honey, habitat for fisheries.

Halophytic agriculture, with *Salicornia spp.*, *Arundo donax spp.*

PRODUCTS: VCUs, food, fodder, biofuels.

Saline tolerant productive elite *Pongamia pinnata spp.* agroforestry and silvopastoral systems.

PRODUCTS: VCU's food, fodder, biofuels.