Tree root strength and distribution in relation to landslide risk

World Agroforestry Centre
TRANSFORMING LIVES AND LANDSCAPES

UNIBRAW

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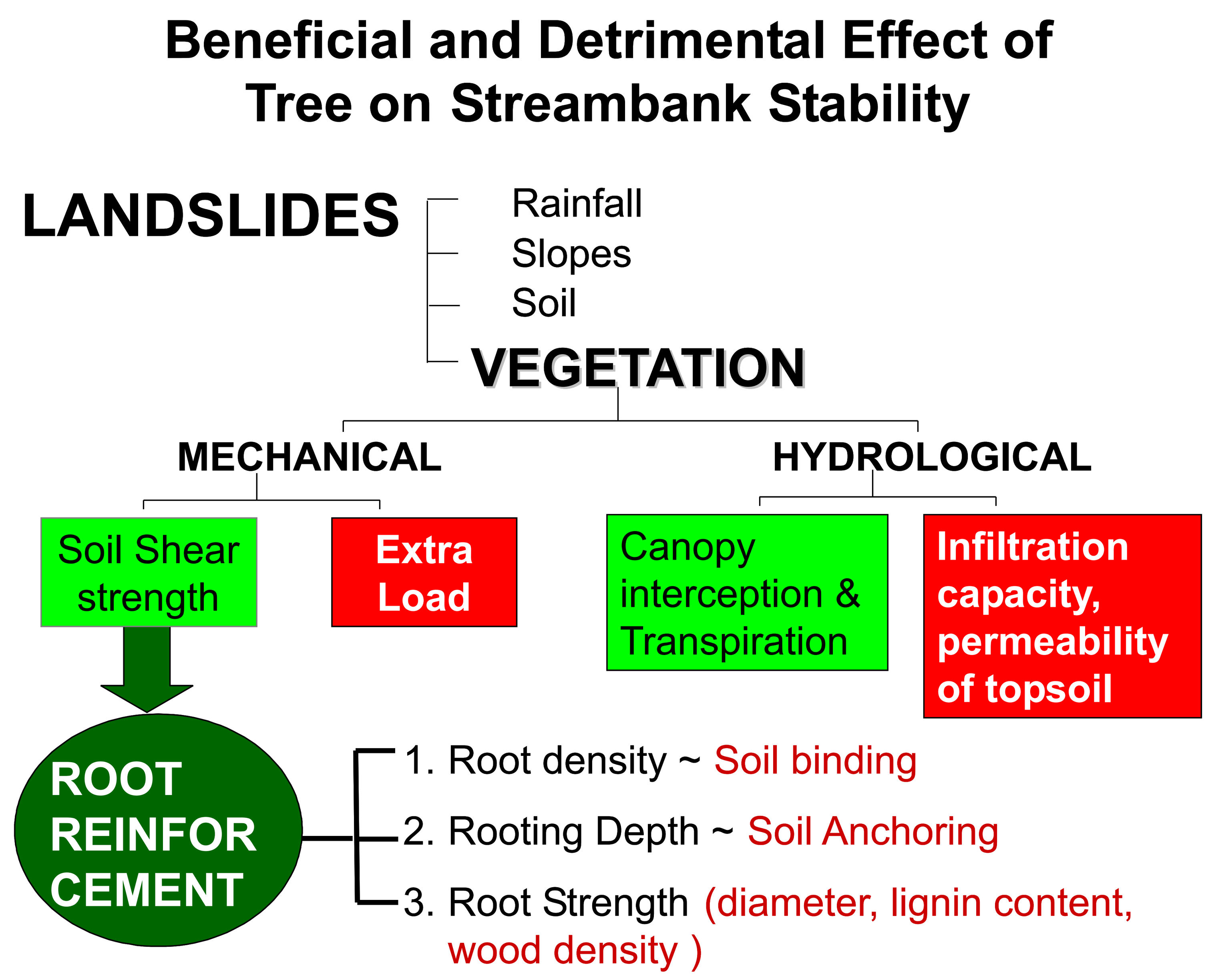
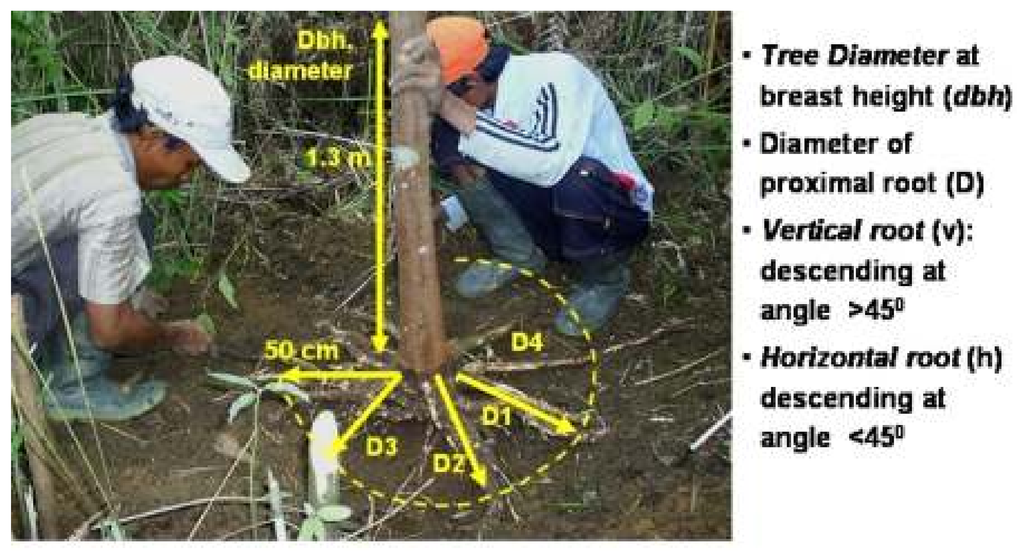
Will Climate Change make it worse?



Can trees help?

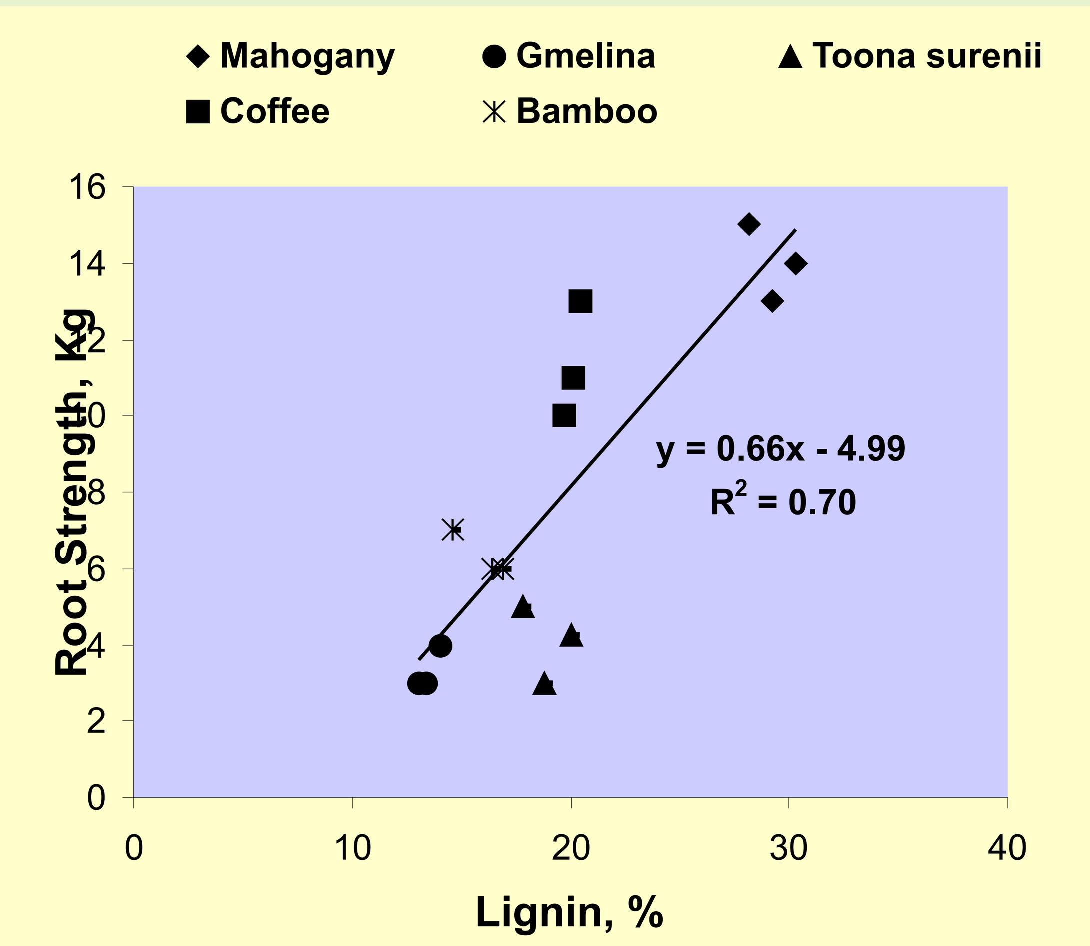


Index of Root Anchoring (IRA)= Σ Dh^2/dbh^2

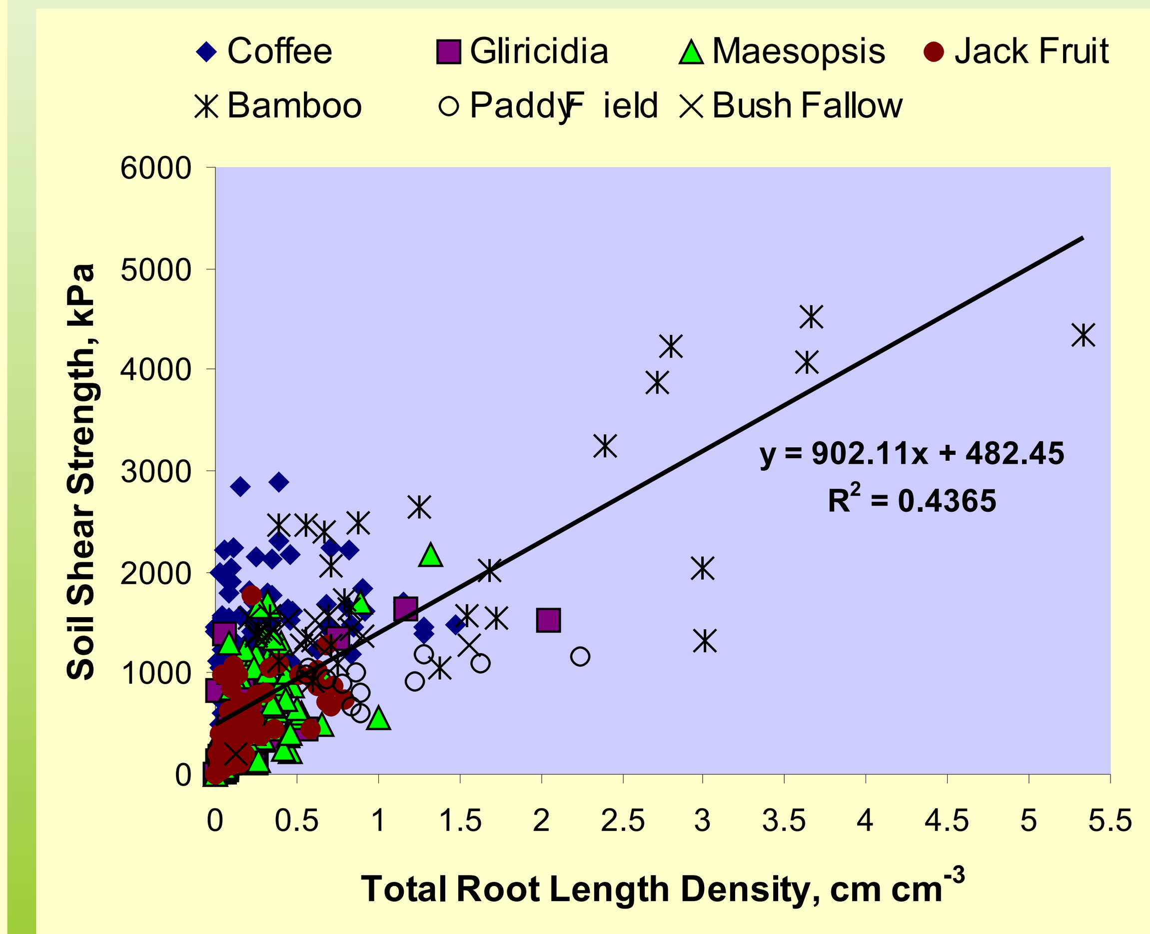
Index of Root Binding of Soil (IRB) = Σ Dv^2/dbh^2

RESULTS

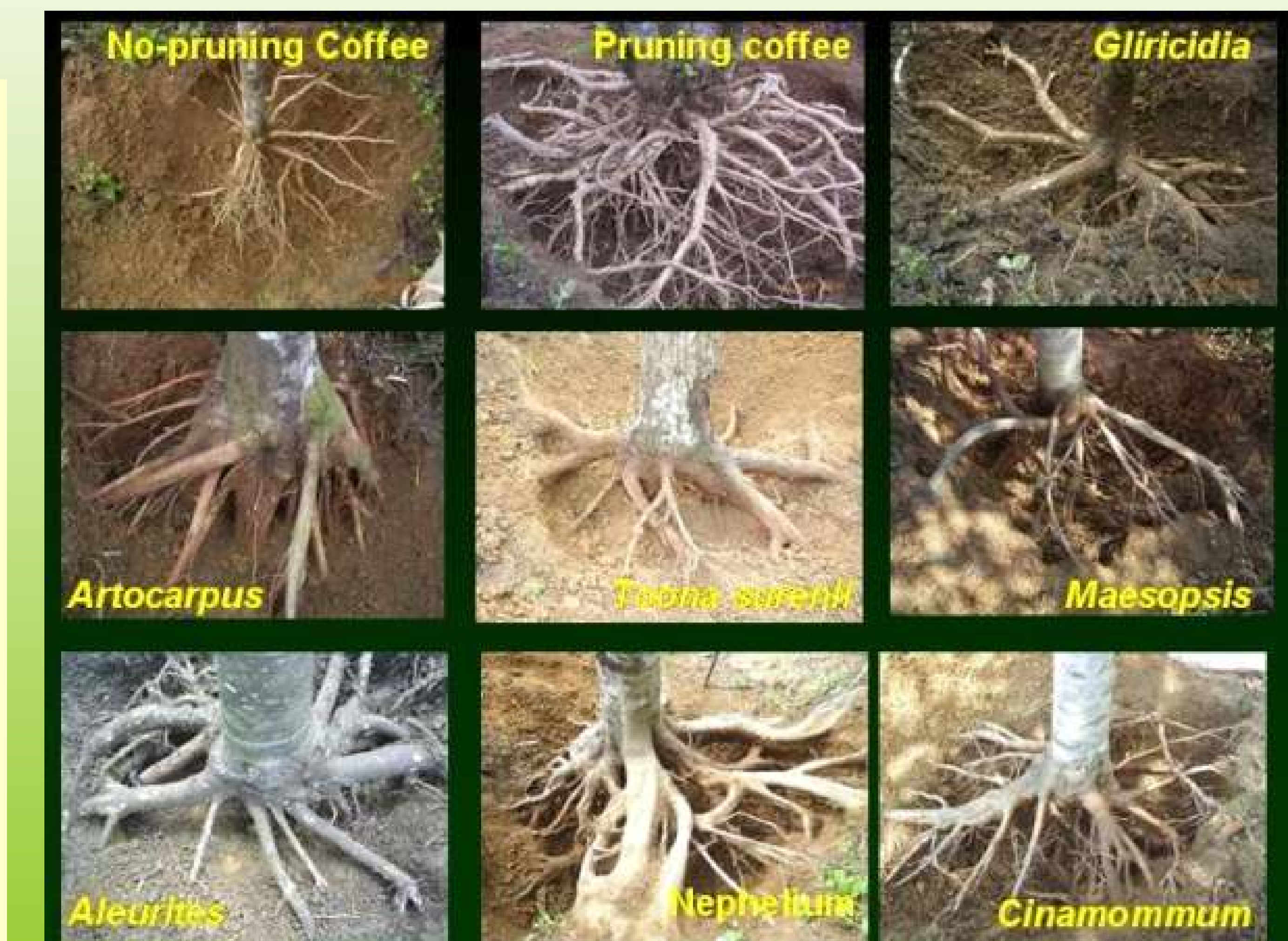
1. LIGNIN CONTENT EFFECTS ON ROOT STRENGTH



2. ROOT LENGTH EFFECTS ON SOIL SHEAR STRENGTH



3. ROOT SYSTEM ARCHITECTURE



CLASSIFICATION OF TREES SUITABILITY FOR STABILIZING RIVER BANK BASED ON IRA and IRB

INDEX	IRA_Low (<0.1)	IRA_Medium (0.1-1.0)	IRA_High (>1.0)
IRB_Low <1.5			*Durio zibethinus* *Parkia speciosa* *Artocarpus elasticus*
IRB_Medium 1.5-3.5	*Macaranga triloba* *Calliandra calothyrsus* *Erythrina subumbrans* *Syzygium aqueum*	*Cinamommum burmanii* *Aleurites moluccana* *Quercus lineate* *Tectona grandis* *Maesopsis eminii* *Gmelina arborea* *Swietenia mahogany* *Psidium guajava* *Nephelium lappaceum* *Artocarpus communis* *Piper aduncum*	
IRB_High >3.5	*Gliricidia sepium* *Toona sureni* *Ficus padana*	*Croton argyratus* *Trema orientalis* *Artocarpus heterophyllus*	*Coffea canephora var. robinson* *Coffea canephora var. robusta* *Coffea canephora ver. robusta* (unpruned)

NEXT STEP

Capability of tree roots system on penetrating into compact soil layer may increase river bank stability. The opportunities unpruned coffee offer for soil stabilization.

CONCLUSIONS

1. **The break strength of woody roots across 5 trees species was related to lignin content (accounted for 70% of the variation)**
2. **Strongest roots: Mahogani and coffee Weakest: *Gmelina* and *Toona*; Intermediate: giant bamboo**
3. **Higher tree root length density (Lrv) followed by higher soil shear strength on top layer 0 – 5 cm. Overall, bamboo plots showed the largest shear strength.**
4. **Trees with a high IRA can probably be used to anchor river banks when grown to mature size. Jack fruit, Parkia and Durian (commonly used as shade tree in agroforestry coffee based system) provide a good anchor, IRA >1.0**
5. **Planting a mix of tree species with different pattern of rooting depth will provide a good protection of the soil surface and also increase river bank stability.**

Acknowledgement

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