Online Newsletter of International Teak Information Network

Teaknet Bulletin

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TEAKNET to Launch Assessment Survey

TEAKNET will shortly roll out a comprehensive Assessment Survey aimed at strengthening member engagement and enhancing the value of its programs and services. The Survey seeks to gather feedback from members across regions to share their views on the quality of activities, communication effectiveness, networking opportunities, and future expectations from the International Teak Information Network (TEAKNET). The inputs collected will play a key role in shaping TEAKNET's upcoming initiatives and international collaborations.

All our esteemed members are encouraged to actively participate in the survey and contribute their insights. The findings will help TEAKNET better align its activities with member needs and further reinforce its role as a global platform for teak research, sustainable management, and knowledge exchange.

The Survey link and details will be shared shortly through official communication channels.

Editorial

This issue of the TEAKNET Bulletin highlights a sector at a critical juncture, where traditional knowledge intersects with emerging innovations and global collaboration. A glimpse on the forthcoming TEAKNET Assessment Survey reflects an effort to strengthen our proactive efforts to engage with the esteemed members and ensure that the Network evolves in line with the needs of its diverse stakeholders. In this issue, we also present an article on smallholder teak plantations that underscores the pivotal role of farmers in sustaining nearly one-fifth of the global teak resource. This issue also presents the application of resistance drilling for rapid and non-destructive wood density assessment, enabling better alignment between productivity and wood quality. Alongside this, the insights into international teak prices and upcoming global forestry events reinforce the importance of market awareness and knowledge exchange in an increasingly interconnected world. Together, these contributions emphasize that the future of teak lies in integrating science, practice, and policy, with TEAKNET playing a vital role as a platform for collaboration, innovation, and sustainable development.

We invite your continued support and feedback on issues related to teak and request you to enrich us with articles/news items of interest/research papers etc. of non-technical nature for inclusion in the bulletin.

Sandeep
TEAKNET Coordinator

Smallholder Teak Production and Livelihood Enhancement

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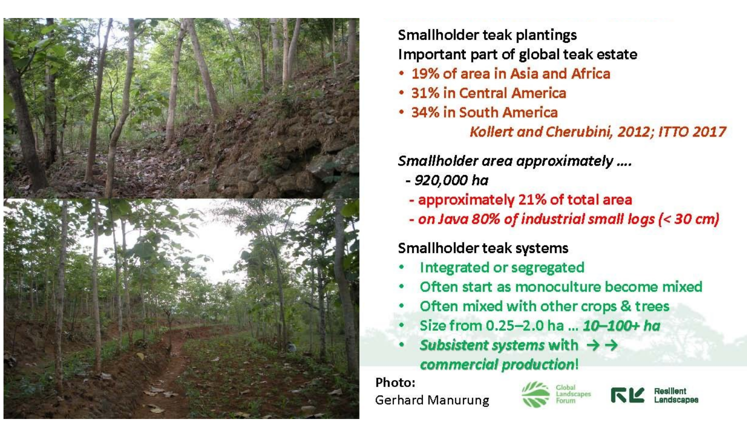
Smallholder teak systems across the tropics vary by tree spacing, companion crops, management intensity, rotation, target market, etc. The objectives linking these systems are farmers' desires to diversify farm production, produce marketable timber, and enhance livelihoods and food security through effective deployment of limited household resources (land, capital, and labor).

Teak is grown on approximately 920,000 ha of smallholder lands, accounting for about 20% of the global teak estate. Most smallholder systems are 0.25-2.0 ha but might be 10 ha or more. Most smallholder teak systems are intercropped with other perennials, annuals and even livestock. Mixed systems reduce risks, yield diverse products, and enhance management flexibility (Roshetko 2020). Most smallholder teak systems are of subsistence origin, with evolving commercial orientation for the commodities produced from both teak and associated species.

Establishment spacing in smallholder teak systems varies from 2x2, 3x3, 4x4 and 6x6 meters. To facilitate long-term annual crops cultivation, distance between rows may be 6 to 10 meters. Annual crops cultivated with teak include peanuts, upland rice, corn, soybeans, casava, other root crops, gingers, Job's tear, and vegetables. Perennial crops commonly associated with teak include other timber species, fruit species, and commodity species (cacao, coconuts, coffee, etc).



The reason farmers cultivate teak include to reduce on-farm labor needs, facilitate opportunities for off-farm employment, build income and wealth, access/claim land, improve management of underutilized land, improve soil quality, and produce timber/ fuelwood for household use (Roshetko 2020). Timber management is generally extensive. Thinning and pruning are usually conducted to enhance conditions for annual crop cultivation, with improved growth and quality of the residual timber trees or stand a welcomed unintended benefit.

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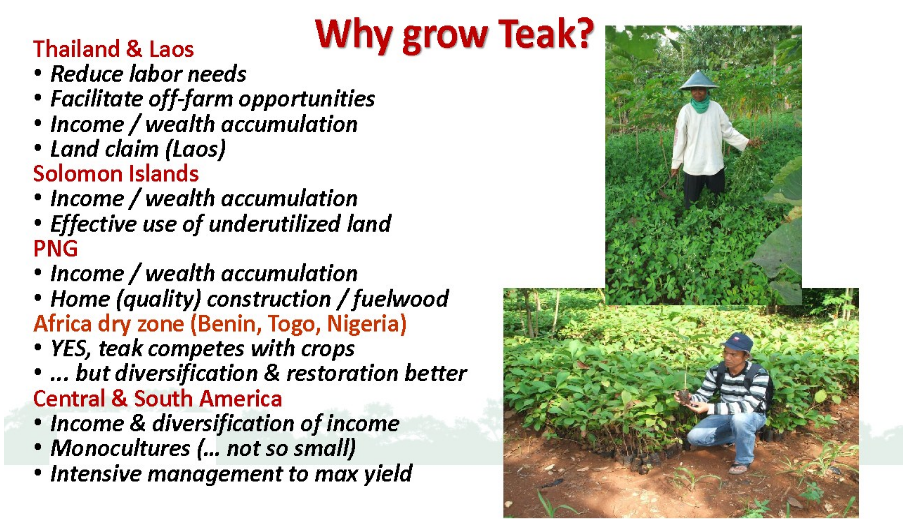
Similarly, fertilizer application and weed control are primarily conducted when cultivating annual crops with teak. A summary of common smallholder teak management practices in Southeast Asia is provided in the following table.

Country	Spacing (m)	System	Crops	Management	Note
Indonesia	2x2, 2x3, 3x3; rows at 6-10m to allow intercropping	Mono and AF – intercropping not limited to establishment	Peanuts, rice, cassava, trees (timber, fruit, commodities…)	Thinning and pruning applied for other purposes	Mixed systems preferred and evolving
Laos	3x3	Mono and AF – intercropping for 2-3 yrs	Rice, maize, Job's tears, other annual species	No thinning or pruning	Land pressure, access to uplands fields
PNG	2x2, 3x3, 4x4, 6x6	Mono – intercropping during establishment	Some intercropping with coconut and Cacao	Thinning and pruning encouraged	Good opportunity for intercropping
Solomon Islands	4x3	Mono	Crops in other fields	Some weeding, no thinning or pruning	No land or labor pressure
Philippines	3x3, various	Mixed			Other species higher priority

Source: Roshetko, Blumfield, Sudomo, Gregorio, Lata, and Dieters (unpublished) in Roshetko (2020).

Historically, establishment at 2x2 or 3x3 meters using local germplasm was promoted when objectives included land rehabilitation or reforestation. Such narrow spacings require intensive management by the farmers, with general recommendations being a 50-60% thinning in year 4 or two consecutive 25% thinnings in years 4 and 5. Branch pruning to 50-60% of total tree height is recommended at the time of thinning operations (Roshetko et al. 2013). Competition for nutrients, water and sunlight at narrow spacings resulting in small tree diameter. The material removed in these thinning operations are not likely to have commercial value, but can be used as fuelwood, fencing or local construction material. Subsequent harvests being determined by household needs and market opportunities (Perdana et al. 2013).

Establishment at wider spacing, 4x4 or 6x6 meters, with quality germplasm facilitates faster uniform growth and intercropping for longer periods. Wider spacing justifies the use of more expensive 'quality germplasm' as thinning operations yield commercial products. In Papua New Guinea, practical farmer management guidelines have been developed, with thinning based on retention of the largest and healthiest trees. For teak established at 4x4 meters (625 trees/ha) – in year 3 reduce stocking to 400 trees/ha, year 5-6 reduce to 300 trees/ ha, year 8-10 reduce to 200-250 trees/ha, with final harvest in year 20-25. Teak established at 6x6 meters is at final density, requiring no thinning until harvest in year 20-25. Pruning is applied to the trees to be retained. In year 1-2 prune branches that can be reached, year 3-4 prune all branches to 4 meters using pole saws, year 5-7 prune all branches to 10 meters using pole saws and ladders as necessary (Jenkin 2019, Devoe 2025).



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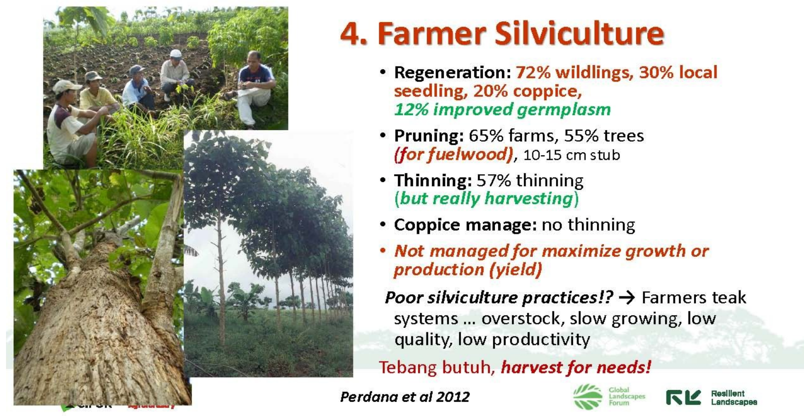
Another option is to establish teak with alternative rows of short-rotation timber species (*Acacia* sp, *Eucalyptus* sp, *Gmelina arborea*, *Falcataria falcata, etc*). This design diversifies risk, timber yields, and income source. In-row spacing for teak can be 4 to 6 meters. Rows of short-rotation species are planted 3 meters from teak with 2 to 3 meters in-row spacing. The short-rotation species are harvested in year 5-7, leaving a residual stand of 278 to 417 teak trees/ha. These mixed designs are in conceptual development (Sudomo et al. 2023). The integration of livestock management in smallholder teak landscapes is an option found to improve sustainable resource extraction, increase fodder supply, reduce farming expenses, increase financial resilience and income, and diversify household production and risks (Seruni et al. 2021, Nugroho et al. 2024).

Constraints to the evolution of teak systems as an economic engine for smallholder households are farmers' limited ability or willingness to proactively manage their systems. The main reasons farmers '*do not manage their teak*' remains as follows. Farmers have limited silvicultural knowledge, limited access to market information and linkages, and weak bargaining positions with traders. Farm households have limited capital and labor to invest in agricultural production. Because household needs are short-term and teak rotations are long, investment (time and capital) in teak management is a low priority (Midgley et al. 2007, Perdana et al. 2013, Sabastian et al. 2014).



Key Messages are:

⇒ Smallholder teak producers are important sources of raw material for national and international teak industries; however, the potential of these systems is hindered by management, market, and governance issues.

⇒ To improve timber quality and quantity, farmers should use superior quality germplasm, plant at wider spacing (4 x 4 m, 6 x 6 m, to 4 x 10 m) and adopt more intensive thinning, pruning and intercropping practices.

⇒ Intercropping with annual or perennial crops improves teak survival and growth, diversifies production and income, and strengthens food security; intercropping can be practised throughout the entire rotation by maintaining wider spacing of teak.

⇒ Smallholder teak producers can improve their market position by producing logs that meet market specifications, engaging in group marketing, and developing shared-value business strategies with traders to reduce transaction costs, achieve economies of scale, facilitate teak supplies, and improve economic returns for all parties.

⇒ Government, research and development agencies and the private sector all have important roles to play in improving the management, market integration, and governance of smallholder teak production systems.

⇒ Extension support should include capacity building, farmer manuals, and other documents.

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A new global analysis of smallholder teak systems is urgently required. Previous assessments of smallholder teak production are over a decade old (Kollert and Cherubini 2012, Kollert and Kleine 2017*)*. Many projects and actions have occurred in the interim. A contemporary review would identify recent development; progress towards advancing smallholder teak systems designs, management, and market orientation; and priorities for subsequent enhancement and assistance to smallholder teak producers. The global teak sector would find common ground and benefit from such an undertaking.

References

Devoe N. 2025. Improvement and management of teak and sandalwood, Papua New Guinea. In: Darabant, A., Pajel, P., Zoveda, F., Baral, H. & Wertz-Kanounnikoff, S. 2025. Agroforestry for wood production – Insights from multi-functional smallholder tree-farming systems in Asia and the Pacific. Bangkok, FAO and Nairobi, CIFOR-ICRAF.

Jenkin BM. 2019. *Silviculture of teak in Papua New Guinea and farmer requirements*. Project report of: *Improvement and management of teak and sandalwood in PNG and Australia* (ACIAR Project FST/2014/069). Canberra, Australia: Australian Centre for International Agricultural Research.

Kollert W, Kleine M (eds). 2017. The Global Teak Study, Analysis, Evaluation and Future Potential of Teak Resources. IUFRO World Series Volume 36. Vienna. 108 p

Kollert W, Cherubini L. 2012. Teak resources and market assessment 2010 (*Tectona grandis* Linn. F.). Rome: Food and Agriculture Organization.

Midgley S, Blyth M, Mounlamai K, Midgley D, Brown A. 2007. Towards improving profitability of teak in integrated smallholder farming systems in northern Laos. ACIAR Technical Reports 64. Canberra: Australian Centre for International Agricultural Research.

Nugroho E, Ihle R, Heijman W, Oosting SJ. 2024. The role of forest user group membership in the extraction of teak forest resources for smallholder cattle farming. *Land Use Policy*, *139*, 107053 https://www.sciencedirect.com/science/article/pii/S026483772400005X

Perdana A, Roshetko JM, and Kurniawan I. 2012. Forces of competition: smallholding teak producers in Indonesia. *International Forestry Review:* 14 (2): 238-248. https://doi.org/10.1505/146554812800923417

Roshetko J. 2020. Smallholder teak systems-value addition management for livelihood enhancement in Southeast Asia. *TEAKNET Webinar series*, *4*.

Roshetko JM, D Rohadi, A Perdana, G Sabastian, N Nuryartono, AA Pramono, N Widyani, P Manalu, MA Fauzi, P Sumardamto, N Kusumowardhani. 2013. Teak agroforestry systems for livelihood enhancement, industrial timber production, and environmental rehabilitation. *Forests, Trees, and Livelihoods* 22 (4): 241-256. https://www.tandfonline.com/doi/full/10.1080/14728028.2013.855150

Sabastian G, Kanowski P, Race D, Williams E, Roshetko JM. 2014. Household and farm attributes affecting adoption of smallholder timber management practices by tree growers in Gunungkidul region, Indonesia. *Agroforestry Systems 8*8:257-268. https://link.springer.com/article/10.1007/s10457-014-9673-x?sa_campaign=email%2Fevent%2FarticleAuthor%2FonlineFirst

Seruni AP, FX Aguilar, Z Cai, MA Gold, JM Roshetko. 2021. Characterization of smallholder agroforestry: Parcelized cut-and-carry system for confined livestock in central Java. *Small-scale Forestry* 20: 119-143. https://link.springer.com/article/10.1007/s11842-020-09460-7

Sudomo A, Maharani D, Swestiani D, Sabastian GE, Roshetko JM, Perdana A, Prameswari D, Fambayun RA. 2021. Intercropping Short Rotation Timber Species with Teak: Enabling Smallholder Silviculture Practices. Forests 12: 1761. https://doi.org/10.3390/f12121761

Resistance drilling for indirect measurement of wood density in teak

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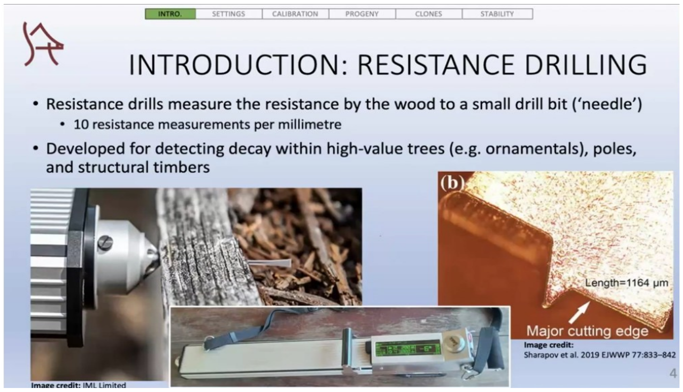
Wood density is an important measure of teak lumber value in the marketplace and it is important that genetic selection for faster growth is undertaken in conjunction with selection on density. Density is expensive to measure in the laboratory, so genetic improvement programs have relied on indirect density measures such as pilodyn penetration as the basis for their density assessments and selections.

Researchers from Treehouse Forest Research, USA had supported Kilombero Valley Teak Company (KVTC) in Tanzania to introduce resistance drilling for density assessment in their genetic and silvicultural experiments. Experimental evidence by the research team proves that resistance drills-originally developed for detecting decay in high-value trees, utility poles, and structural timber can be used for indirect density measurements in genetic improvement programs. The technology offers significant advantages over traditional laboratory methods: measurements can be completed in less than one minute per tree, and the drill provides detailed density profiles through the entire stem rather than just the outer wood.



Optimizing the Technology for Teak

The research team first optimized drill settings specifically for plantation teak by testing 69 standing trees across various ages and sites. They determined that a feed speed of 200 cm/min and 3,000 RPM provided optimal results, achieving resistance amplitude readings of 30-40% without causing equipment overload. Calibration work with 50 mm outer-wood samples from 58 trees showed a strong relationship ($r^2 = 0.70$) between drill resistance and laboratory-measured wood density, validating the technique's reliability. Laboratory work was conducted at the Sokoine University of Agriculture in Morogoro, Tanzania.

Progeny Test Results

The progeny test component of this research represents one of the most comprehensive assessments of wood density genetics in teak to date. Four trials were established on contrasting sites in the Kilombero Valley, with two planted in 2014 and two in 2015. The trials included 80 open-pollinated families from the Tanzanian landrace, 105 second-generation Thai families, 10 Costa Rican seed orchard batches, and 8 Malaysian clones as benchmarks.

The trials were managed as randomized incomplete block designs with plots of 4-6 trees, initially planted at 1,111 stems per hectare and thinned to approximately 555 stems per hectare between ages 6-8 years by retaining the best half of trees per plot. At ages 9-10 years, the team collected bark-to-bark resistance drill measurements on every surviving tree—5,352 trees in total—representing a scale of data collection that would be prohibitively expensive using traditional laboratory methods.

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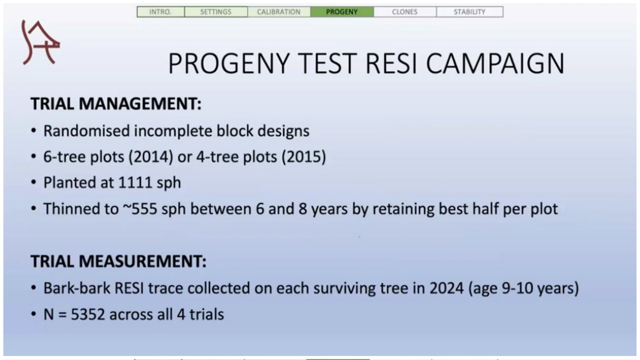
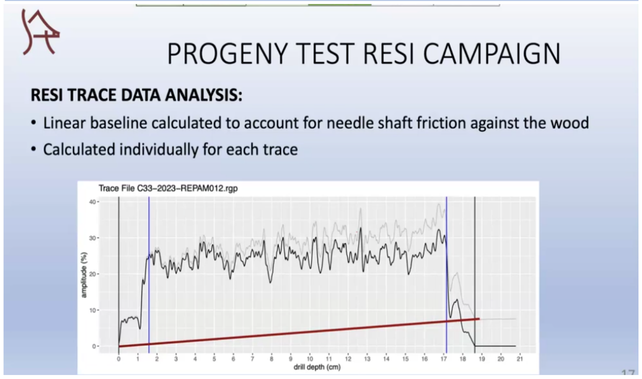
Site quality varied with mean dominant heights at 10 years ranging from 19 to 24 metres, representing average to above-average growing conditions across the KVTC estate. Although this variation was modest, it proved important for expressing genotype-by-environment interactions.





Heritability estimates for density in the Tanzanian population ranged from 0.10 to 0.30 across individual sites, with a cross-site heritability estimate of 0.11±0.02. While these values are moderate, they indicate sufficient genetic control to make selection effective. The Thai population showed somewhat lower and more variable heritability (0.02 and 0.16), though the researchers at Treehouse Forest Research cautioned this may reflect poorer within-family representation due to low germination rather than true biological differences.

Analysis of genotype-by-environment interactions revealed a complex pattern. While additive genetic correlations between some site pairs were quite strong (up to 1.0), the poorest yielding site showed correlations of -0.12 and 0.39 with two sites, indicating that families ranking high for density on some sites may rank poorly on others. Researchers at Treehouse Forest Research who led the study emphasized that the results highlights the importance of testing clones across multiple sites before large-scale deployment.

Perhaps most encouraging for breeding programs was the finding of a weak but positive genetic correlation (0.21) between diameter growth and density within the Tanzanian population. This means breeders can select simultaneously for faster growth and improved wood quality without the antagonistic relationship seen in some other species. The Thai population showed a slightly negative correlation (-0.10).

When comparing genetic values across populations, the Tanzanian landrace showed the greatest range of variation and included many families with higher density than the Malaysian clone average. The best Tanzanian families showed genetic values approximately 30 kg/m³ above the population mean, representing substantial improvement potential. The 2015 trials also included 745 clones-within-families (unselected seedlings that were clonally replicated), though dominance variance estimates were near zero, suggesting additive genetic effects predominate for this trait.

Clone Trial Insights

A 20-year-old clonal trial provided an opportunity to examine density variation at rotation age and investigate within-tree density patterns. The trial included 10 Malaysian clones and 2 Tanzanian commercial seed lots, planted in two replicates with 100-tree plots. After three thinnings to a final stocking of approximately 150 stems per hectare, mean diameter at felling was 39 cm over-bark.

Bark-to-bark resistance drill measurements were collected on all 322 standing trees before harvest. The results revealed highly significant clone differences in mean wood density. Three Malaysian clones showed notably higher density than the Tanzanian commercial checks, with one clone displaying exceptional density values approaching 700 kg/m³. However, most Malaysian clones showed lower density than the Tanzanian material, reinforcing the potential value of the local landrace for genetic improvement.

Beyond mean density, the research team investigated a novel trait: within-tree density uniformity. By calculating the standard deviation of density in 5mm segments along each resistance trace, they could quantify how variable the within-tree density pattern was from bark to pith and back to bark. Significant clone differences emerged for this trait as well. The clone with highest mean density showed the greatest within-tree variation (standard deviation around 100 kg/m³), while other clones combined high mean density with much more uniform patterns (standard deviation around 50-65 kg/m³).

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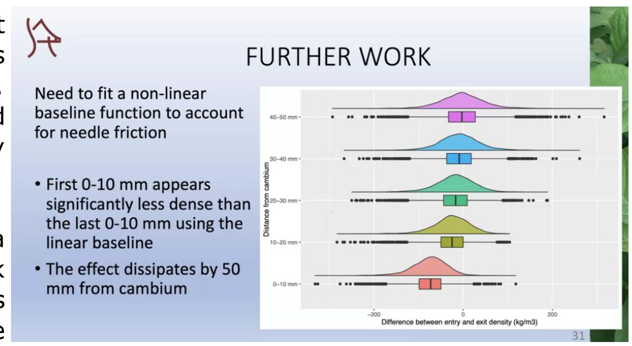
This raised an important question: does within-tree density uniformity matter for wood quality? To investigate, the team selected 12 trees representing a range of uniformity values and processed their 2.5-metre butt logs through the mill. The logs were sawn using standard processing, leaving a central "rough square" averaging 142mm × 236mm. These rough squares were air-dried in a workshop for 10 months, then evaluated for end-checking by measuring the length and width of the longest cracks on each end.

The results showed a moderately strong relationship ($r^2 = 0.50$) between within-tree density variation and crack severity, measured as mean crack width multiplied by total crack length. Trees with standard deviations exceeding 100 kg/m^3 showed substantially more end-checking than those with standard deviations below 50 kg/m^3. However, the researchers from Treehouse Forest Research have emphasized several important caveats. First, this was a small experiment requiring corroboration. Second, the rough squares examined represent an intermediate product that will be re-sawn, and it remains unclear whether this instability will persist into final sawn products. Third, and perhaps most importantly, none of the other boards produced from these logs showed any end-cracks, warping, twisting, or cupping—the checking was isolated to the rough squares containing the pith and juvenile core.

Looking Ahead

Researchers from Treehouse Forest Research notes that further refinement of the baseline correction method is needed to account for non-linear needle friction effects. With over 5,000 traces analysed, the team has identified opportunities to improve the precision of density estimates, particularly in the outer wood.

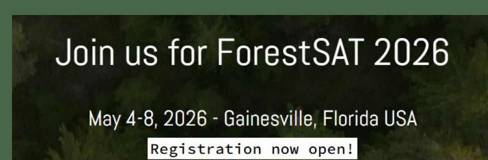


The work demonstrates that resistance drilling is a practical tool for operational density assessment in teak breeding programs, enabling much larger sample sizes than traditional destructive methods with good predictive ability.

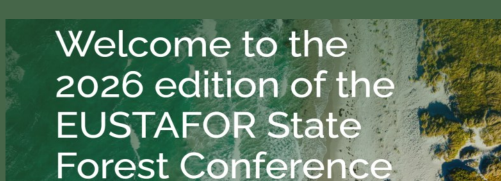
*This research was conducted by KVTC with laboratory assistance from Sokoine University of Agriculture, Morogoro, Tanzania.

Upcoming International Forestry Events

The ForestSAT 2026 will be held from 4–8 May 2026 in Gainesville, USA, bringing together global experts in forestry, remote sensing, and geospatial sciences to discuss advancements in remote sensing, artificial intelligence, and spatial technologies for forest monitoring and management.
For more details : https://www.forestsat.com/



The Global Landscapes Forum Africa 2026 will be held on 6–7 May 2026 in Nairobi, Kenya, bringing together a global community of researchers, policymakers, practitioners, and local stakeholders. This will focus on landscape restoration, agroforestry, and climate resilience, themes highly relevant to tropical forestry and teak-growing regions. For more details: globallandscapesforum.org/africa-2026/



The EUSTAFOR State Forest Conference 2026 will be held from 10–12 June 2026 in Denmark, bringing together key stakeholders from Europe's state forest sector to promote knowledge exchange, policy dialogue, and collaboration on sustainable forest management and the future role of forests in environmental and economic resilience.
For More details : https://sfc2026.dk/

ONE-DAY TRAINING PROGRAM ON

MICROPROPAGATION FOR QUALITY PLANTING MATERIAL PRODUCTION IN TEAK

Date: 22nd April 2026

Venue: KSCSTE-KFRI Sub-Centre, Kuzhur
Kakkulissery, Kuzhur P.O.
Thrissur, Kerala-680734, India

Scan here to register !

Last date for registration
15th April 2026

Organized by

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LiFE Lifestyle for Environment
TEAKNET
ITTO INTERNATIONAL TROPICAL TIMBER ORGANIZATION
MAFF Ministry of Agriculture, Forestry and Fisheries
Ministry of Agriculture,Forestry and Fisheries, Govt. of Japan

Prices of Plantation Teak Imported to India

Prices for recent shipments of plantation teak logs and sawnwood imported to India

Teak Logs	Hoppus cu.m	US$ C&F
Brazil	341	520
Colombia	224	465
Costa Rica	279	360
Tanzania	384	488
South Sudan	380	690
Guatemala	212	420

Price range depends mainly on length and cross-sections

Courtesy: ITTO TTM Report 30:05; 01-15 Mar 2026

Sawnwood	Hoppus cu.m	US$ C&F
Benin	390	665
Brazil	328	655
Costa Rica	314	525
Ghana	284	440
Ivory Coast	385	815
Nigeria	313	450
South Sudan	287	605
Togo	343	520
Panama	196	495

Teaknet Bulletin is a quarterly electronic newsletter of TEAKNET brought out through its website. It is intended for circulation among the members of TEAKNET and other stakeholders of global teak sector. The views expressed in the newsletter are those of the authors and do not necessarily reflect the views of the organization. The readers are welcome to express their opinions or pass on information of value to teak growers, traders, researchers or others concerned with teak. However, TEAKNET reserves the right to choose the contributions for publishing and also to make necessary editorial modifications in the articles in consultation with the authors.

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