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Development and application of an Economic-Financial Model to evaluate the feasibility and profitability of Teak (*Tectona grandis*) and Melina (*Gmelina arborea*) plantations at the Panamerican Agricultural School, Zamorano.

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Abstract*– This study develops and applies an economic–financial model to evaluate the feasibility and profitability of Teak (Tectona grandis) and Melina (Gmelina arborea) plantations established at the Panamerican Agricultural School, Zamorano, Honduras. The analysis integrates technical, economic, and financial components, including establishment and maintenance costs per hectare, wood volume estimates derived from growth records and allometric equations, and historical and projected timber market prices. Independent cash flow projections were developed for each species, considering their biological growth cycles and optimal harvest ages, with a 25-year evaluation horizon for Teak and a 19-year horizon for Melina. Financial feasibility was assessed through the calculation of Net Present Value (NPV) and Internal Rate of Return (IRR) under two discount rate scenarios (8% and 15.41%), representing institutional and private opportunity costs of capital. In addition to deterministic evaluation, uncertainty and risk were incorporated through Monte Carlo simulations using the @RISK software, allowing the probabilistic assessment of key financial indicators and the sensitivity of project outcomes to variations in critical variables such as timber prices, production volumes, and investment costs. The results show that although Teak exhibits a higher unit market value, its longer rotation period increases capital immobilization and financial exposure. In contrast, Melina achieves higher harvested volumes per hectare and faster investment recovery, which leads to superior financial performance under the evaluated conditions. The stochastic analysis further indicates a higher probability of favorable economic outcomes for Melina, reflecting lower overall project risk. The findings confirm that both species are financially viable forestry alternatives in Zamorano; however, Melina represents a more efficient and lower-risk option for sustainable forest investment under local conditions in Honduras.

***Keywords*-- Tectona grandis, Gmelina arborea, forest profitability, financial evaluation, risk analysis**

I. INTRODUCTION

The Pan-American Agricultural School, Zamorano, has developed forest plantations with high commercial value species such as *Tectona grandis* (Teak) and *Gmelina arborea* (Melina), covering approximately 30 hectares under the management of the Forest Conservation Unit. To take advantage of their economic potential, it is essential to implement sustainable and profitable management practices, considering the growing global demand for high-quality timber [1].

Tectona grandis, native to Southeast Asia, is widely cultivated in tropical regions due to the quality of its wood, which is noted for its durability and dimensional stability [2]. This species is internationally recognized for its natural resistance and physical-mechanical properties [3]. On the other hand, *Gmelina arborea* was initially cultivated for medicinal purposes more than 3,000 years ago in Southeast Asia and has been introduced worldwide because of its economic value and versatility [4]. It is an important source of timber in tropical and subtropical regions, with a natural distribution in South Asia and Southeast Asia [5].

Despite the productive and commercial potential of both species, Zamorano currently lacks a structured economic–financial model that integrates technical growth parameters with financial performance to evaluate the long-term viability and profitability of its forest plantations. This absence of a comprehensive analytical framework limits the capacity to assess investment efficiency, compare alternative species, and quantify the economic implications of long production cycles and uncertain market conditions. Consequently, there is a clear need for a model that systematically links biological growth, cost structures, and expected economic returns.

In response to this gap, the purpose of this research is to develop and apply an economic–financial model that enables the evaluation of establishment and maintenance costs, timber growth, and economic returns of Teak and Melina plantations under the specific conditions of Zamorano. The analysis incorporates conventional financial indicators, such as Net Present Value (NPV) and Internal Rate of Return (IRR), to assess profitability, complemented by a stochastic risk analysis using the @RISK software to account for uncertainty in key variables and long-term investment risk. By integrating deterministic and probabilistic approaches, the model provides a more robust basis for evaluating forest investment decisions.

The relevance of this study lies in its contribution to informed and sustainable forest management decision-making at Zamorano University, offering a practical tool for evaluating the economic feasibility of long-term forestry projects. Furthermore, the proposed modeling framework can be adapted to other regions with similar edaphoclimatic and market conditions, thereby supporting broader applications in sustainable forest investment and management planning. Although this study does not explicitly incorporate artificial intelligence techniques, the use of advanced stochastic simulation tools, such as Monte Carlo analysis implemented through @RISK, represents a significant form of technological innovation in forest engineering. These tools enable the probabilistic modeling of uncertainty and enhance decision-making processes by supporting data-driven analyses, which are conceptually aligned with the principles of artificial intelligence and predictive analytics.

II. METHODOLOGY

A. *Scope and Delimitation*

The study was conducted at the Pan-American Agricultural School, Zamorano, located in the municipality of San Antonio de Oriente, department of Francisco Morazán, Honduras. Two forest plantations established within the campus were analyzed: The first plantation analyzed was Las Gradas, with a total area of 0.407 hectares, established in 1989 with *Gmelina arborea* (Melina). The second plantation, Maya Viejo, covers 0.53 hectares and was established in 1988 with *Tectona grandis* (Teak). Together, the two study sites represent a combined area of 0.937 hectares. Although the analyzed area is limited in spatial extent, the plantations provide sufficient technical and financial information to support a comparative evaluation of growth performance, production potential, and economic feasibility between the two species.

The temporal scope of the analysis was defined according to the optimal technical rotation periods identified for each species under the conditions of the Yeguare Valley. A 25-year evaluation horizon was adopted for *Tectona)*, reflecting its longer biological growth cycle and commercial rotation, while a 19-year horizon was established for *Gmelina arborea*, consistent with its faster growth and earlier harvest potential. These time horizons allowed the analysis to capture the full production cycle of each species, including establishment, maintenance, thinning operations, and final harvest.

Data collection was carried out during the first semester of 2025 and relied on multiple sources to ensure consistency and reliability. Technical data were obtained from historical forestry records, growth measurements, and institutional databases maintained by Zamorano. Economic and financial information was gathered from internal financial reports and cost records associated with plantation management activities. In addition, semi-structured interviews were conducted with personnel specialized in forest management to validate cost structures, management practices, and operational assumptions used in the economic–financial modeling. This combination of primary and secondary data sources provided a robust basis for the methodological framework adopted in the study.

B. *General Methodological Approach*

The study employed a quantitative and descriptive approach, focusing on the technical-productive and economic-financial analysis of the plantations. This approach allowed for an objective evaluation of the profitability and sustainability of the species through the measurement of productive variables (timber volume and yield per hectare) and financial variables (costs, revenues, cash flows, and profitability). The methodology comprised three interrelated phases:

1) Technical Study: The technical study aimed to identify and quantify the establishment and maintenance costs per hectare of *Tectona grandis* and *Gmelina arborea* plantations at the Pan-American Agricultural School, Zamorano. Although the plantations analyzed are mature, it was necessary to describe their initial establishment process and maintenance activities, as this information constitutes the basis for the economic and financial evaluation of the project.

The research was carried out using a mixed approach, combining qualitative and quantitative techniques to estimate costs under agroclimatic conditions similar to those of Zamorano. A review of historical and administrative records was conducted, including technical and financial reports and specialized documents. To complement this information, semi-structured interviews were carried out with forest technicians, managers, and workers responsible for the plantations.

Previous studies on plantations established in areas with similar agroclimatic conditions, both nationally and internationally, were also consulted. Expenses were classified into two categories: establishment costs and maintenance costs. Establishment activities included land preparation, fencing, plantation layout and design, hole digging, and planting.

Maintenance activities included fertilization, manual weeding, chemical weeding, girdling, thinning of shoots, pruning, monitoring, pest control, and thinning operations.

To analyze the Mean Annual Increment (MAI), historical forest measurement records were used, considering diameter, height, and volume. The volume of *Gmelina arborea* was calculated using the formula proposed by Contina in 2008 [6]. while that of *Tectona grandis* was estimated using the formula developed by Isaula in 2011 [7].

The variables measured included Diameter at Breast Height (DBH), total height, and basal area. The instruments used were calipers, diameter tape, hypsometer, measuring tape or ruler, and GPS.

Based on this information, an economic model was developed to determine the average costs per hectare over the life cycle of the plantations, adjusting values to constant currency using the average inflation rate of the agricultural sector and applying a discount rate representative of the forestry sector.

2) Financial Study: The financial study aimed to determine the profitability of *Tectona grandis* and *Gmelina arborea* plantations through the calculation of Net Present Value (NPV) and Internal Rate of Return (IRR), considering different market scenarios and timber prices. For this purpose, data on establishment and maintenance costs were compiled.

The results of the Mean Annual Increment (MAI) and timber volume projections were used to estimate potential revenues. In addition, historical and current timber prices in local and international markets were analyzed and adjusted to different future economic scenarios. Key assumptions were established based on the references used by Cole (2023).

The annual inflation rate published by the Central Bank of Honduras (2025) was applied, according to the definition of inflation as a sustained increase in prices within the economy. Depreciation was considered as the allocation of asset value over its useful life [8]. and salvage value was defined as the expected amount at the end of the asset's useful life [9].

The currency used was the United States dollar (USD) for all revenues, costs, and projections. Cash flows were prepared by species, incorporating annual costs and revenues throughout the entire project life cycle.

The financial indicators NPV and IRR were calculated to assess the profitability and economic feasibility of the plantations, considering the relevance of the discount rate for determining the present value of future cash flows. NPV was used to measure investment profitability by determining whether discounted future cash flows generate gains or losses [10].

The NPV was calculated using the following formula:

$$\mathrm{NPV} = -I_0 + \frac{F_1}{(1+k)} + \frac{F_2}{(1+k)^2} + \cdots + \frac{F_n}{(1+k)^n} \qquad (1)$$

Where:

- F_t represents the cash flows in each period t
- I_0 is the initial investment (at $t = 0$)
- n is the number of time periods
- k is the discount rate or required rate of return

The IRR was used as an indicator of project performance; the higher its value, the greater the expected profitability. The IRR is the rate that equates future revenues with expenditures, resulting in an NPV equal to zero [11]. The decision criteria were:

- IRR > k: the project is accepted.
- IRR = k: the project may be accepted if it improves the competitive position.
- IRR < k: the project is rejected.

The formula used was:

$$-I_0 + \frac{F_1}{(1+\mathrm{IRR})} + \frac{F_2}{(1+\mathrm{IRR})^2} + \cdots + \frac{F_n}{(1+\mathrm{IRR})^n} = 0 \qquad (2)$$

Where:

- F_t represents the cash flows in each period t
- I_0 is the initial investment
- n is the number of time periods

The Equivalent Annual Annuity (EAA) was also calculated to compare scenarios with different Weighted Average Cost of Capital (WACC) rates, allowing the determination of a uniform annual flow representative of the project's average profitability [12].

The formula applied was:

$$\mathrm{EAA} = \frac{\mathrm{NPV} \times i}{1-(1+i)^{-n}} \qquad (3)$$

Where:

- EAA represents the equivalent annual annuity
- NPV is the net present value obtained in each scenario
- i is the specific discount rate (WACC) used
- n is the project evaluation horizon, expressed in years

3) Risk Analysis: To assess project uncertainty and risk, an analysis was conducted using the @RISK software, a Microsoft Excel add-in that employs Monte Carlo simulation techniques. This technique predicts different outcomes of uncertain events by using random values within an estimated range, generating multiple possible results that increase in accuracy with more iterations [13].

The @RISK software virtually displays all possible outcomes and their probability of occurrence, facilitating decision-making regarding which risks assuming [14]. A simulation model was built in Excel based on the financial analysis of the forestry project, integrating key variables such as operating costs, sales prices, maintenance expenses, harvesting, and transportation costs.

The main uncertain variables included timber price, inflation and discount rates, volume per hectare, and investments in fixed and pre-operating assets. Each variable was assigned specific probability distributions based on historical data, including the Vary distribution, the PERT distribution, and the Triangular distribution.

To analyze the economic feasibility of the project, financial indicators such as Net Present Value (NPV), Internal Rate of Return (IRR), and the Desirability Index (DI) were calculated. The DI measures how many discounted cash flows are generated per unit of invested capital [15].

The formula used was:

$$\mathrm{DI} = \frac{\mathrm{NPV}}{\text{Initial Investment}} \qquad (4)$$

Where:

- DI: Desirability Index

- NPV: Net present value of future cash flows
- Initial Investment: initial capital invested in the project

The decision criteria were:

- DI < 1: the project is not viable.
- DI = 1: the project may break even.
- DI > 1: the project is profitable.

The Payback Period (PP) was also calculated, indicating the time required to recover the invested capital [16].

Finally, a Monte Carlo simulation with 10,000 iterations was conducted using @RISK, incorporating the probability distributions of the uncertain variables. This procedure provided probabilistic results for each financial indicator, offering a comprehensive view of the expected risk level and profitability of the forestry project.

III. RESULTS

A. *Technical Study*

The technical results obtained from the analysis reveal clear and consistent differences in growth dynamics, productivity, and land-use efficiency between the two forest species evaluated. These differences are primarily associated with the biological growth patterns and rotation characteristics of *Gmelina arborea* and *Tectona grandis*, which directly influence their productive potential and economic performance over time. While both species are well adapted to the local edaphoclimatic conditions of Zamorano, their growth trajectories differ significantly in terms of speed, volume accumulation, and long-term yield behavior.

Gmelina arborea exhibited rapid development during the early stages of the production cycle, characterized by vigorous growth and efficient biomass accumulation. In contrast, *Tectona grandis* showed a comparatively slower initial growth rate, followed by a more prolonged development period. Despite its slower growth, Teak is recognized for producing timber with higher density and superior physical–mechanical properties, attributes that contribute to its higher unit market value and long-term commercial appeal.

Table 1 presents the technical data for *Tectona grandis* (Teak), while Table 2 summarizes the corresponding technical data for *Gmelina arborea* (Melina). These tables highlight substantial differences in productivity, growth continuity, and commercial valuation across the evaluated time horizons. The analysis of the Mean Annual Increment (MAI) indicates that *Gmelina arborea* maintains a constant yield of 23 m^3/ha/year from the third to the nineteenth year, reflecting stable and sustained growth throughout its productive cycle. This consistent MAI suggests that Melina reaches its optimal productive performance relatively early and maintains it overtime, which is particularly advantageous for medium-term forestry investments.

In contrast, *Tectona grandis* exhibits an MAI of 11.62 m^3/ha/year up to the twelfth year, after which a pronounced decline is observed. From approximately the twentieth year onward, the MAI decreases to 5.73 m^3/ha/year, indicating a reduction in growth efficiency during the later stages of the rotation. This pattern reflects the biological limitations of prolonged rotations in Teak plantations under the evaluated conditions and suggests diminishing marginal returns in terms of volume accumulation over extended time horizons. Consequently, Teak requires a longer rotation cycle to achieve commercially significant volumes, with reduced growth efficiency toward the end of the cycle.

With respect to total timber volume per hectare, *Gmelina arborea* reaches 429 m^3/ha at nineteen years, substantially exceeding the 255 m^3/ha obtained by *Tectona grandis* after twenty-five years. Even at intermediate stages of development, Melina consistently outperforms Teak. At ten years, *Gmelina arborea* accumulates 75 m^3/ha, whereas *Tectona grandis* reaches 62 m^3/ha at twelve years. These results confirm that Melina not only grows faster but also achieves higher cumulative volumes within shorter time frames, resulting in more efficient land utilization.

Overall, the technical analysis demonstrates that *Gmelina arborea* offers superior short- and medium-term productivity under the conditions of Zamorano, while *Tectona grandis* follows a slower growth trajectory with lower volumetric efficiency but higher timber quality. These contrasting technical characteristics provide a critical foundation for the subsequent economic and financial evaluation, as differences in growth rates, rotation length, and volume accumulation directly influence cash flows, investment recovery, and overall project profitability.

TABLE I
SUMMARY OF TECHNICAL DATA FOR *TECTONA GRANDIS*

		Evaluation Horizon (years)		
Species		Year 8	Year 12	Year 25
Teak	MAI (m^3/ha/year)	11.62	11.62	5.73
	Volume (m^3/ha)	9.97	62.68	255.2
	Price (m^3)	USD 374.61	USD 896.89	USD 2,639.37

[a]MAI = Mean Annual Increment.

TABLE II
SUMMARY OF TECHNICAL DATA FOR *GMELINA ARBOREA*

		Evaluation Horizon (years)		
Species		Year 3	Year 10	Year 19
Melina	MAI (m^3/ha/year)	23	23	23
	Volume (m^3/ha)	10	75	429
	Price (m^3)	USD 192	USD 526	USD 1,184

[a]MAI = Mean Annual Increment.

B. *Financial Study*

The financial performance of the *Tectona grandis* (Teak) and *Gmelina arborea* (Melina) plantations was evaluated under two capital cost scenarios, represented by Weighted Average Cost of Capital (WACC) rates of 15.41% and 8%. These scenarios reflect alternative investment conditions, capturing both private and institutional opportunity costs of capital. The evaluation focused on key financial indicators commonly used in long-term forestry investment analysis, including Net Present Value (NPV), Internal Rate of Return (IRR), Payback Period (PP), Desirability Index (DI), and Equivalent Annual Annuity (EAA).

The results summarized in Table 3 indicate that *Gmelina arborea* consistently outperforms *Tectona grandis* in terms of financial attractiveness across both discount rate scenarios. Under the higher WACC of 15.41%, Melina achieved an NPV of USD 21,746, nearly doubling the NPV obtained for Teak (USD 11,999). When the discount rate was reduced to 8%, the difference between the species became more pronounced, with Melina reaching an NPV of USD 93,347 compared to USD 85,556 for Teak. This result highlights the sensitivity of long-term forestry investments to discount rates and underscores the advantage of shorter rotation cycles in reducing the impact of capital costs.

In terms of return on investment, *Gmelina arborea* recorded an IRR of 23%, exceeding the 20% IRR obtained for *Tectona grandis*. This difference indicates that Melina generates a higher return per unit of invested capital, reflecting its faster growth, higher volume accumulation, and earlier revenue generation. These characteristics contribute to a more favorable financial structure, particularly under conditions of capital scarcity or high discount rates.

The payback period further reinforces the superior financial performance of Melina. Investment recovery occurs in approximately 9.02 years for *Gmelina arborea*, while Teak requires approximately 11.3 years to recover the initial investment. This shorter payback period implies lower exposure to long-term risk and enhances liquidity, which is a critical consideration in forestry projects characterized by extended production cycles. Similarly, the desirability index consistently favors Melina, with values of 3.23 and 10.57 under WACC rates of 15.41% and 8%, respectively, compared to Teak's values of 2.23 and 9.78. These results demonstrate that Melina generates a higher present value of benefits per unit of capital invested, indicating greater capital efficiency.

The calculation of the Equivalent Annual Annuity (EAA) provides an additional comparative perspective by converting the net present value of each project into an equivalent uniform annual return. For *Tectona grandis*, evaluated over a 25-year horizon, the EAA was USD 2,408 under a 15.41% WACC and USD 17,293 under an 8% WACC. In contrast, *Gmelina arborea*, evaluated over a 19-year horizon, achieved higher annualized returns of USD 5,188 and USD 21,899 under the same discount rates, respectively. The higher EAA values obtained for Melina across both scenarios confirm its superior annual profitability and reinforce its financial advantage over Teak under the conditions evaluated.

The financial analysis demonstrates that while both species are economically viable, *Gmelina arborea* offers a more favorable balance between profitability, investment recovery, and capital efficiency. These findings provide a strong financial foundation for the subsequent risk analysis, which further evaluates the robustness of project outcomes under uncertainty.

TABLE III
SUMMARY OF FINANCIAL INDICATORS FOR *TECTONA GRANDIS* AND *GMELINA ARBOREA*.

Financial Indicators	*Tectona grandis*		*Gmelina arborea*	
Evaluation Horizon (years)	25	25	19	19
WACC	15.41%	8.00%	15.41%	8.00%
NPV	11,999	85,556	21,746	93,348
IRR	20%	20%	23%	23%
PP (years)	11.3	11.3	9.02	9.02
DI	2.23	9.78	3.23	10.57
EAA (USD)	2,408	17,293	5,188	21,899

[a]WACC = Weighted Average Cost of Capital; NPV = Net Present Value; IRR = Internal Rate of Return; PP = Payback Period; DI = Desirability Index; EAA = Equivalent Annual Annuity.

C. *Risk Analysis*

The stochastic risk analysis performed using Monte Carlo simulations with the @RISK software provides additional insight into the robustness of the financial outcomes under uncertainty. The probabilistic results indicate that *Gmelina arborea* exhibits lower variability in financial performance and a higher probability of obtaining positive values for both NPV and IRR compared to *Tectona grandis*. The narrower dispersion of simulated results reflects greater economic stability in the presence of uncertainty related to market conditions, price volatility, and long-term productivity.

Figure 1 presents the tornado sensitivity chart of the Net Present Value (NPV) for the *Gmelina arborea* project simulated under a discount rate of 8%. This figure ranks the model variables according to their impact on the mean NPV, which reached USD 94,862 based on 10,000 Monte Carlo iterations. The sensitivity analysis reveals that the timber selling price at year 19 is the most influential variable affecting project profitability. A decrease in the final harvest price reduces the NPV to USD 88,055, whereas an increase raises it to USD 101,719, generating an impact range exceeding USD 13,600. This confirms that revenues from the final harvest represent the primary source of financial risk.

Annual inflation also exhibits a significant effect on project performance. Under lower inflation conditions, the NPV increases to USD 98,543, while higher inflation reduces it to USD 88,988, highlighting the relevance of the time value of money in long-term forestry investments. The third most influential variable corresponds to timber sales volume (m³) at year 19, with an NPV range between USD 92,388 and USD 97,446. This result underscores the importance of sound technical management practices to maximize harvestable volume.

Other variables, such as timber price and sales volume during the commercial thinning at year 10, initial investments, and plantation certification costs, exhibit moderate impacts on NPV, with variation ranges between approximately USD 400 and USD 1,000. Although these variables are not critical drivers of risk, their effective management contributes to improving the overall financial resilience of the project.

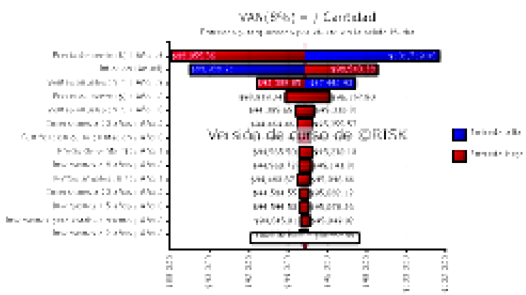

Fig. 1 Tornado sensitivity chart of the net present value (NPV) for *Gmelina arborea* under a discount rate of 8%.

From a technical and operational perspective, *Gmelina arborea* demonstrates superior adaptation to Zamorano's conditions, characterized by faster growth, a more uniform stand structure, and lower requirements for intensive silvicultural interventions throughout the production cycle. Although the optimal harvest age for both species converges at approximately 19 years, Melina achieves higher commercial volumes while maintaining acceptable wood quality without the need for complex or high-cost management practices. These characteristics complement the favorable financial and probabilistic results, reinforcing the economic robustness of *Gmelina arborea* under conditions of uncertainty.

IV. CONCLUSIONS

The study concludes that *Gmelina arborea* should be considered the priority forest species for investment projects at Zamorano, as it offers higher profitability, lower financial risk, and more efficient operational management compared to *Tectona grandis*.

The economic–financial model developed confirmed the viability of both species; however, *Gmelina arborea* demonstrated superior technical and financial performance. Establishment and maintenance costs per hectare were identified and quantified, determining that Melina has lower accumulated costs, which increases its efficiency in capital utilization.

The analysis of the Mean Annual Increment (MAI) revealed sustained growth up to 19 years, identified as the optimal harvest age. *Gmelina arborea* exhibited a higher MAI, greater timber volume, and better economic returns.

Financial indicators showed positive profitability for both species, with *Gmelina arborea* standing out due to a higher Net Present Value (NPV) and an Internal Rate of Return (IRR) above 20%, demonstrating its greater economic attractiveness.

The use of @RISK and Monte Carlo simulations made it possible to incorporate market uncertainty, identifying timber price and growth rate as the most sensitive variables. The results indicated that *Gmelina arborea* presents greater financial stability and lower result dispersion, making it ideal for investors seeking security and rapid capital recovery.

It is recommended to consider external factors such as silvicultural practices, soil conditions, climate, and international market fluctuations, as these may influence projected profitability and the applicability of the model to other regions or species.

Finally, despite the robustness of the results, their applicability may be limited by site-specific conditions such as microclimatic variability, soil characteristics, and the relatively small scale of the analyzed plantations. Therefore, the outcomes should be interpreted within the context of the study area, as differences in environmental and operational conditions could lead to variations in economic performance.

V. RECOMMENDATIONS

Because *Gmelina arborea* showed better financial performance than *Tectona grandis*, including a higher Net Present Value (NPV at 8%), a shorter Payback Period (PP), and a higher Internal Rate of Return (IRR), its prioritization is recommended for forestry projects seeking faster returns, simplified technical management, and greater resilience to price fluctuations and climatic conditions.

For *Tectona grandis*, it is recommended to evaluate harvesting at 19 years rather than at 25 years, since beyond this point annual growth declines considerably and does not generate additional economic value. Proper technical management from the establishment phase is essential, with particular attention to planting density, thinning management, and pest prevention in order to achieve the projected timber volumes.

The use of risk analysis tools such as @RISK is recommended for any long-term forestry project, as they allow the identification of the most critical variables and support more informed decision-making. Investors seeking faster and more stable returns should prioritize Melina, especially in institutional schemes or projects with lower discount rates.

It is suggested to replicate this financial model in other regions or with other forest species, making the necessary adjustments, as it is a flexible and useful tool for evaluating agroforestry projects.

Finally, it is advisable to periodically update timber prices and operating costs to maintain the accuracy and relevance of the model and to ensure well-informed decision-making.

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