

## RESEARCH ARTICLE

### Analysis of Costs and Returns of Tree Crops Planting in Tropical Environment

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Received: 20-05-2022; Revised: 10-06-2022; Accepted: 15-07-2022

#### ABSTRACT

This article analyzed the costs and returns on tree crops planting in tropical environment. Trees crops planting offer financial and social returns over the years and it is a lucrative long-term investment in tropical and sub-tropical environments. Despite the substantial gain on investment in tree planting, only few people are still involved in the business. Benefit Cost Ratio and Net Present Value (NPV) were calculated to determine the financial viability of tree crop planting. The study showed that tree crop planting is a profitable business as shown by positive NPV of ₦2,187,822.0 and N2, 782,214.97 for *Gmelina aborea* and *Moringa oleifera* plantations, respectively, after 10-years of maturation and harvesting at 14% discount rate with a B/C ratio of 1.97 and 1.6, respectively. Furthermore, NPV of N1, 575,487.10 for a 5-year small scale private nursery establishment with a B/C Ratio of 2.79 at a 14% discount rate also confirm that the investment on nursery establishment is highly profitable. It is recommended that with adequate support and incentives, farmers can take advantage of these opportunities and invest in nursery enterprise and tree crop sub-sector of the economy.

**Key words:** Analysis, Costs and returns, Tree crops planting, Tropical environment

#### INTRODUCTION

Tree crop planting have been proven to provide a range of restoration systems to degraded environments and lands with positive effects on food production, ecosystem health and profitability (Program on Forests, 2011). Forest trees provide materials for domestic construction, furniture, cosmetic and mining industries, for growing urban populations, and in some countries are significant sources of export revenue (World Bank, 2014). Investing in trees offer financial and social returns for years to come and it is a lucrative long-term investment. Trees increase in value exponentially as they grow, with relatively low startup costs, low

labor costs, and low maintenance costs (Ohaga, 2019). The loss of tropical forest resources on which millions of rural people depend has been rapid over the past century. An estimated 350 million hectares of tropical forests have been deforested, while 500 million hectares of secondary and primary tropical forests have been degraded (Le *et al.*, 2011). Tree planting can help reverse some of the more severe impacts of forest loss and degradation on rural communities in the tropics by providing secure access for local people to a range of forest products, including fuelwood and non-timber forest products; improved hydrological regulation and nutrient cycling; providing more diverse and better connected habitats, thus supporting more biological diversity; and options to increase the resilience and adaptability of existing agricultural systems (Maginnis and Jackson, 2002). In addition to their

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potential financial returns, trees help fight against climate change by sequestering carbon, preventing erosion and water runoff, while certain varieties such as *Moringa* spp. can improve land fertility by fixing nitrogen in the soil (Ohaga, 2019). Tree planting also strengthens the resilience of people and communities to climate change.<sup>[1-9]</sup>

To preserve the livelihoods of rural communities in the tropics, and for global climate change mitigation, it is clear that tree planting is necessary (Le *et al.*, 2011). Small-scale forest plantations provide a range of benefits to rural communities, including fuel wood, fodder and wood for building and everyday uses, as well as environmental and amenity benefits (Nawir *et al.*, 2007). At present, unemployment is becoming one of the serious problems in Nigeria. Therefore, small scale nursery production plays a great role for job creation and poverty reduction combined with adding to both ecological and aesthetic values (Molla *et al.*, 2020). The importance of trees on farm land is therefore well established and promoted by many development agencies (Oli *et al.*, 2015). The agroforestry value chain has a lot of opportunities, whether in timber felling and lumber processing, transportation, construction, or plant breeding and tree nursery operations. There exist in Nigeria opportunities for tree crops seedling production to meet estimated demand (Adepoju, 2015). Market trends are promising for a wide-range of tree-based crops, including timber, fruits, fiber, fodder, medicinal, and agroforestry systems. Based on their economic uses, tree crops planting for marketing can be done through: Commercial tree planting, for example, *Tectona grandis*, *Gmelina* spp., Amenity planting purpose, for example, *Hildegardia barteri*, Tree planting for conservation purpose, for example, *Khaya senegalensis*, *Nauclea* spp., Tree planting for multiple uses, for example, *M.oleifera*, and Fruit trees, for example, *Irvingia* spp., *Garcinia kola*, Fibre trees (Sisal).

However, despite the substantial gain on investment in tree planting, only few people are still involved in the business. This paper therefore, analyzed the profitability of investment in tree crop planting for income generation. Gross Margin (GM), Benefit-Cost Ratio (BCR) and Net Present Value (NPV) were calculated to determine the financial viability of tree crop planting.

## MATERIALS AND METHODS

### Data Collection

The data for this study were collected from both primary (interview method) and secondary data sources. This include interview of experts in the field of forestry. The existing literature on small scale nursery production according to was reviewed in this paper.

### Method of Data Analysis

The data were analyzed using financial analytical procedures such as profitability analysis. *Profitability analysis of selected tree crop plantation and nursery establishment*: The profitability of the selected tree crop plantation was calculated using the formula below:

$$GM = TR - TC \text{ --- 1}$$

$$= \sum_{t=1}^n \left( \frac{B_t}{(1+i)^t} \right) - \sum_{t=1}^n \left( \frac{C_t}{(1+i)^t} \right) = \frac{PVB}{PVC} \text{ --- 3}$$

Where; B = benefit (Returns), C = cost, t = time, i = interest rate; BCR = Benefit Cost Ratio, NPV = Net Present Value; GM = Gross Margin, TR = Total Revenue and TC = Total Cost

The cost-benefit ratio (B/C R) is determined by dividing the revenue generated in the plantation by the costs incurred. If B/C R is >1, then the enterprise is operating at a profit but if B/CR <1, it is a non-profitable venture.

*Discount rate*: Discount rate of 14% was used in the analysis because that is the present lending rate in tropical environment (NLR, 2020).

## RESULTS AND DISCUSSION

*Costs and Returns in Tree Crop Planting*: The investment analysis on Tables 1 and 2 showed that tree crop planting is a profitable venture. For example, Tables 1 and 2 showed that ₦10,452,000 and ₦ 4,565,341.2 will be earned as profit from plantation establishment of one hectare of *G. aborea* and *M. oleifera* plantation, respectively, after 10 years of maturation and harvesting. The estimated value of ₦2,187,822.00 and ₦2,782,214.97 will also be realized as profit

if ₦10,452,000 and ₦ 4,565,341.2 is brought to its present worth. Furthermore, the benefit cost analysis of 1.97 and 1.6 in Tables 1 and 2, respectively, showed that for every 1 million naira invested the return will be 1 million nine hundred thousand naira

**Table 1:** Projected cash flow for a 10-year-rotation of *Gmelina aborea* plantation establishment on one hectare of land at FRIN arboretum using 14% as discount rate

Year	Costs in naira	Benefits in naira	Net present value (benefits)	Net present value (costs)
1	201000	180000	157860	176277
2	626000	180000	138420	481394
3	626000	180000	121500	422550
4	526000	180000	106560	311392
5	476000	240000	124560	247044
6	350600	240000	109440	159873.6
7	350600	240000	96000	140240
8	350600	240000	84240	123060.6
9	350600	240000	73920	107984.8
10	350600	12740000	3439800	94662
Total	4208000	14660000	4452300	2264478

Gross Margin (GM) = ₦10,452,000; NPV = ₦2,187,822.00; BCR=1.97

**Table 2:** Projected cash flow for a 10-year-rotation of *Moringa oleifera* plantation establishment on one hectare of land at FRIN arboretum using 14% as discount rate

Year	Costs in naira	Benefits in naira	Net present value (benefits)	Net present value (costs)
1	2246808	1399336.8	1970450.616	1227218.374
2	1912212	1191968.4	1470491.028	916623.6996
3	1627620	1014568.8	1098643.5	684833.94
4	1385098.8	863395.2	819978.4896	511129.9584
5	1178857.2	734984.4	611826.8868	381456.9036
6	1003419.6	625477.2	457559.3376	285217.6032
7	853815.6	532221.6	341526.24	212888.64
8	798672	452970	280333.872	158992.47
9	618411.6	385483.2	190470.7728	118728.8256
10	526315.2	385483.2	142105.104	104080.464
Total	12151230	7585888.8	7383385.847	4601170.878

Gross margin=4,565,341.2; NPV=2,782,214.97; BCR=1.6

**Table 3:** Projected cash flow for a 5-year small scale private plant nursery enterprise establishment at 14% discount rate

Year	Costs (₦)	Revenue (₦)	Discounted costs (₦)	Discounted revenue (₦)	Net present value (₦)
1	351000	390,000	307,897.20	342,108.00	34,210.80
2	176000	500,200	135,432.00	384,903.00	249,471.90
3	210000	750,000	141,750.00	506,250.00	364,500.00
4	256000	980,000	151,577.60	580,258.00	428,680.40
5	270000	1,230,000	140,238.00	638,862.00	498,624.00
Total	1,263,000	3,850,200	876,894	2,452,381.00	1,575,487.10

GM=2,587,200;NP=1,575,487.10; BCR=2.79, Source: Adapted from Olugberi (2020)

on *G. aborea* plantation establishment and 1 million six hundred thousand naira on *M. oleifera* plantation establishment. This implies that the investment on plantation establishment is highly profitable.

Table 3 showed the projected cash flow for a 5-year small scale private plant nursery enterprise establishment at 14% discount rate as adapted from Olugberi *et al* (2020) research. The total benefit-cost ratio of the enterprise was 2.79. Since the cost benefit ratio for the past 5 years is above 1, this means that small scale private plant nursery enterprise is a viable venture that one can engage in even if one cannot invest in tree crop plantation. Furthermore, according to Larinde and Santus (2014), small scale private plant nursery enterprise is a viable venture that one can engage in for income generation and as means of conservation of plant species as well as for the control of environmental problem like climate change.

*And nursery establishment:* The profitability of the selected tree crop plantation was calculated using the formula below:

Where; B = benefit, C = cost, t = time, i = interest rate; BCR = Benefit Cost Ratio, NPV = Net Present Value; GM = Gross Margin, TR = Total Revenue and TC = Total Cost

The cost-benefit ratio (B/C R) is determined by dividing the revenue generated in the plantation by the costs incurred. If B/C R is >1, then the enterprise is operating at a profit but if B/CR <1, it is a non-profitable venture.

## CONCLUSION

Costs and returns on tree crop planting in tropical environment are critical in the development, processing and marketing of tree crop resources in tropical environment. Forest-based businesses often provide substantial direct or indirect employment and

income for those who are engaged in it. Tree based business has the potential to contribute significantly to the economic growth and development of the tropical countries. Therefore, with adequate support and incentives, farmers can take advantage of these opportunities and invest in tree crop sub-sector of the economy.

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