INTRODUCTION

Teak (Tectona grandis Linn. f.) has been considered as a high-value hardwood with its attractive appearance, durability, decay resistance, and easy workability. It is believed that teak plantation was introduced to Indonesia more than 500 years ago from India, Myanmar, Thailand and Laos (Faculty of Forestry - Gadjah Mada University, 2009). Currently teak is grown well in Java, Lampung, South Sulawesi, Southeast Sulawesi and East Nusa Tenggara.

In the past, most teakwood was planted and managed by government's enterprise, PT Perhutani. Farmers in Yogyakarta Province planted teak trees since 1960’s as the main source of long term saving on their dry lands properties (Pramono et al., 2010). In 2007, PT Perhutani produced about 512,000 m³ per year in Java island whereas in Yogyakarta Province the private teak forest occupied over 58,000 hectares of land without any available production data (Perdana, 2011).

At the present time, most of teakwood is produced from intensively managed plantations due to the limited availability of native teak as well as due to the increasing demand being supported by high selling prices (Hallet et al., 2011; Murtinah et al., 2015).

While harvesting time of teakwood from Perum Perhutani take a relatively long period of time, markets require continues supply of such wood (Efansyah et al., 2012). This supply-demand gap in most cases is filled by younger and lower quality of teakwood being planted by smallholder farmers with cheaper price to fulfill their daily need.

In order to increase the value of teak belong to smallholder farmers, the Indonesian Ministry of Environment and Forestry offers another alternative of financing to postpone the harvesting time (BLU Pusat P2H, 2017). However, due to limited fund available, minimum required diameter, and interest on loan, this arrangement is not popular among the smallholder farmers.

The problems being faced to get cash fund from government's financing and, at the same time to avoid having low price of young teak being harvested, the smallholder
farmers have been forced to fulfill their daily need through loan shark individuals with very high interest rate.

To the extent of our knowledge, there is an absence of an empirical research to assess the feasibility of providing loan by financial institutions in which teak trees was employed as collateral. To overcome the financial problems by smallholder farmers who have teak trees as biological assets, this research aims to explore the economic feasibility of financing arrangement by way of postponing the harvesting time.

Further, the smallholder farmers also faced problems of having fund to pay interest on loan. Therefore, instead of conventional loan arrangement in which the debtor shall follow a scheduled payment of principal and interest on loan, this research introduce mudharabah profit sharing agreement. The valuation tool being applied is enterprise budget method in which only two most relevant criteria i.e net present value (NPV) and internal rate of return (IRR) have been employed.

LITERATURE REVIEW

Biological assets

The International Financial Reporting Standards (IFRS) section IAS 41 stated that biological assets are defined as crops or livestock owned by entities that obtained from past activities. It should reflect the characteristics of biological transformation, which follows a process of growth, degeneration, production, and procreation that aims to produce new assets in the form of agricultural products.

Biological assets are not depleted and classified in the financial statements as both current assets and non-current assets, depending on the biological transformation period owned by the asset or the period required to be ready for sale. Reconstruction of biological assets valuation in Indonesian agriculture by using IAS 41 was carried out by Kamayanti et al. (2014).

Islamic financing structure

There are two common financing structures in Islamic finance, among other are ijarah (leasing) and mudharabah (partnership). This research is concentrated in mudharabah structure as shown in Figure 1. The rabb al-mal (investor) and mudharib (land owners and farmers) sign a contract for the development of agriculture with an agreed profit sharing.

The profit being generated out of the project will be shared between the investor, land owners, and farmers, however, if the project experience any loss, the loss will be the responsibility of the investor (Dusuki, 2010; Sugiharto and Lestari, 2014). In Islamic finance, additional collateral beyond the object of the business is not required (Fitriani, 2017).
Forestry financial valuation

An enterprise budgets approach to value the agricultural development have been published covering different commodities in several parts of the world (Kibirige, 2014). This method had also been applied for forest plantations (McConnell et al., 2016; Purnomo et al., 2016; Frey et al., 2018; Chemuliti et al., 2019). It was found that forest plantations under current market conditions is profitable.

In Indonesia, studies on the feasibility analysis of community forest had been carried out by Widyaningsih and Achmad (2012). In order to achieve a maximum value of the teakwood, Sugiharto et al. (2012) proposed a strategy of harvesting time. Further, Sugiharto et al. (2014) proposed a more advance of financial analysis as well as the incorporation of financial valuation and social impact for strategic decision-making process (Sugiharto et al., 2013). An Islamic financing arrangement was proposed by Sugiharto and Lestari (2014) whereas a detail fair distribution of teak’s revenue to all stakeholders by using mudharabah method was proposed by Sugiharto (2017).

METHODS

The object of this study was located in Gunung Kidul Regency, Yogyakarta Province, Indonesia, between 7° 46’ – 8° 09’ south latitude and 110° 21’ – 110° 50’ east longitude between year 2008 and 2019 in area of 10 hectares (Figure 2). This research have been carried between 2008 and 2019.

Figure 2. Research location

Figure 3. Enterprise budget valuation framework

Note. Adapted from Gitinger (1982); Sugiharto et al. (2014).
This noncontrived field research was conducted in natural environment in which researcher’s interference was limited to the selection of teak clones, trees’ treatment, and harvesting schedule. The data being utilized were secondary data from the available publications as well as primary data. The primary data being collected was considered as longitudinal study by measuring teak’s growth (diameter and height) over times. Systematic random sampling (measured in every five trees) and cluster sampling (based on the plant locations, time of plantations, and teak’s clones) were applied (Sugiharto, 2013).

For the purpose of economic valuation of teak plantation, forecasted diameters and heights was modelled based on limited past primary field data and the secondary data from teak plantation in Costa Rica (Perez, 2005) and Indonesia (Pramono et al., 2010).

An appraisal process was carried out by using the method of enterprise budget. Figure 3 demonstrates an enterprise budget valuation framework being adapted from Gitinger (1982) and Sugiharto et al. (2014).

Prior to the field activities, technical and social aspects was conducted. Project planning covered the availability of land, timing of plantation, and the availability of manpower.

Detail enterprise budget analysis was carried out to determine the capital investment, operating expenses, revenues, taxes, zakat, etc. For financial projection, costs and teakwood price increases were forecasted. Valuation criteria such as total investment, net cash flow, net present value, internal rate of return, and payback period were analyzed (Godsey, 2008; Salvatore, 2008).

### Analytical tools

The data processing method is carried out by quantitative methods. The investment criteria being analyzed are, among others, Net Present Value (NPV) and Internal Rate of Return (IRR).

NPV is defined as the present value of expected future net cash flow, discounted at the cost of capital, minus the initial project cost (Nurmalina et al., 2009):

\[ NPV = \sum_{t=0}^{n} \frac{B_t - C_t}{(1+i)^t} \]

Where:
- NPV: Net Present Value
- \( B_t \): Benefit from t-year
- \( C_t \): Cost from t-year
- \( i \): Interest rate
- \( t \): year

IRR is the interest rate when NPV is equal to zero. IRR value greater than or equal to a predetermined discount rate refers that the business is feasible to run. Meanwhile, if the IRR is less than the predetermined discount rate, then the business is not worth the effort (Nurmalina et al., 2009).

![Figure 4. Teak’s growth](image_url)
\[ IRR = i_1 + \frac{NPV_1}{NPV_1 - NPV_2} \times (i_1 - i_2) \]

Where:
- IRR : Internal Rate of Return
- \( i_1 \) : Interest rate that produce a positive NPV
- \( i_2 \) : Interest rate that produce a negative NPV
- \( NPV_1 \) : Positive NPV
- \( NPV_2 \) : Negative NPV

**RESULTS AND DISCUSSIONS**

The teak diameter was measured at breast height and getting smaller away from the ground. To overcome the difficulty of measuring the diameter at the top of the sampled trees, several trees had been cut down and measured at different heights. The measurements indicated that the average diameter at the top of the trees was getting smaller to 0.7 and, therefore, for the purpose of volume calculation, a diameter adjustment of 0.7 had been employed. Figure 4 demonstrates the growth of teak in terms of diameter and height over a period of 10 years. Teak diameter grows around 8.70% per year whereas the average growth of height is 8.43% per year. These resulting the average volume growth of 28.10% per year.

Teak price per m³ increases per year is depending on the diameter of the teak wood.

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**Figure 5.**
Teak’s price and value increases

**Figure 6.**
Investor’s annual return
In general, for the same amount of volume, the smaller the diameter, the cheaper the price of teak wood. It is most likely happened that by postponing the harvesting time, the value of teak wood increases not only due to the volume and price increases, but also due to moving the price range to the higher price range. Figure 5 demonstrates that in average, teak price increase per year as a combination of diameter growth and price increase is 22.20% per year. Multiplying with teak’s volume increase per year, yielding teak’s value increases per year of 56.66%.

The investor’s annual return is depended on the percentage being received by investor after the investment is paid. Sugiharto (2017) suggested that the fair percentage being received by investor is the range between 23% and 70%. Figure 6 shows the investor’s annual return as function of investor’s share of profit and the harvesting delay. Three different investor’s profit sharing of 30%, 40%, and 50% were analysed.

If the profit sharing for investor is 40% and the delay of harvesting is 5 years, the average annual return for investor is 40% per year. This is well above the conventional interest rate for loan.

CONCLUSIONS

The average annual return for investor is much higher compare to conventional interest rate on loan. In term of financial value, teak trees as biological assets should be considered as secure and safe loan collateral for investors or commercial financial institutions. For the smallholder farmers, postponing the harvesting time being supported by financial institutions by way of bridging loan will overcome their problem of being trapped by loan shark individuals.

Due to lack of regulation, it is proposed that government issue a regulation allowing financial institutions to provide mudharabah based loan, especially to smallholder farmers, by using biological assets as collateral.

REFERENCES


Kibirige, D. (2014). A Comparison of Estimated Maize and Cabbage Enterprise Budgets of Ideal Small-Scale Commercial and


