

**ALTERNATIVE PRICING MECHANISM OF TEAK FOREST
PLANTATION SAW-LOGS IN TANZANIA**

BY

NURU-KAUYE ATHUMAN CHAMUYA

**A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE
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ABSTRACT

The main objective of the study was to analyze the various pricing mechanisms that can be used in setting prices for teak saw-logs and the prevailing market characteristics influencing prices in Tanzania. Primary data on the factors influencing auctioning and stumpage appraisal and, teak saw-logs production and trading costs were collected through questionnaires and field observations from Mtibwa and Longuza teak forest plantations, FBD head offices and winners of the various auctions conducted between 1998/1999 and 2005/2006 in the country. The visited stakeholders also provided data on the royalty fee and public auctioning stumpage values of the teak saw-logs. Secondary data were obtained from various reports and documents. From the data collected, the appraisal stumpage values of the teak saw-logs were calculated and, comparisons were made between royalty fee, public auctioning and appraisal stumpage value pricing mechanisms to know which one among the three generates more revenues to the teak saw-logs producers and, what market structure favours each pricing mechanism. The results of the study indicate that the Tanzania government's effort to generate more revenues through selling her teak saw-logs by public auctioning instead of royalty fee has significantly increased revenues. However, conditions that favour pure competitive market structure, in which public auctioning operates effectively are lacking. The study further found out that there is a significant difference among the stumpage values of the logs obtained through royalty fee, public auctioning and appraisal stumpage value pricing mechanisms. For example, in the last auctioning (2005/2006) conducted at Mtibwa plantation forest the royalty fee and public auction stumpage values of the teak saw-logs were TAS 55 759/m³ and TAS 108 000/m³ respectively;

while, the appraisal stumpage value of the same logs was TAS 219,000/m³. This shows that the royalty fee stumpage value was 51% of the public auctioning stumpage value and only 25% of the appraisal stumpage value. The auctioning stumpage value was only 41% of the appraisal stumpage value. However, the appraisal stumpage value was 73% of the FOB price (TAS 300 000/m³) of the 2005/2006 auctioned teak saw-logs. This information shows that the appraisal stumpage value of the teak saw-logs has the highest value compared to royalty fee and public auctioning pricing mechanisms and, it estimates the timber value at production site closer to its market value. Therefore, in order to generate more income through timber selling the government of Tanzania could consider charging her timber by applying the appraisal stumpage value pricing mechanism. It is recommended to use the appraisal stumpage values as a floor price when auctioning publicly timber and, a review of the training syllabus for certificate and diploma courses to incorporate the application of stumpage appraisal timber pricing mechanism, which many foresters are not conversant with.

DECLARATION

I, Nuru-Kauye Athuman Chamuya, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my original work and has not been submitted for a higher degree in any other University.

NURU-KAUYE ATHUMAN CHAMUYA
Msc. Forestry - Candidate

Date

The above declaration is confirmed

PROFESSOR YONIKA M. NGAGA
(Supervisor)

Date

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I, indeed, remain indebted to my beloved wife Verdiana Urilck Chamuya, our only kid Majaliwa Nuru Chamuya for their patience, inspiration and heartfelt encouragement during my whole study period. Sincerely; 'God is great!'

DEDICATION

This work is dedicated to my late parents Samhina Chamuya and Wanamhina Kauye for their sweet love, sincere guidance, trust and encouragement, which I will miss for the rest of my life. May Almighty God rest their souls in Eternal Peace! Amen

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ABBREVIATIONS AND ACRONYMS

CHAPTER ONE

CPI	Consumer Price Index
CTB	Central Tender Board
DoFBD	Director of Forest and Beekeeping Division
E.A	East Africa
FAO	Food and Agriculture Organization.
FBD	Forest and Beekeeping Division
FOB	Freight On Board
FTI	Forest Training Institute
GDP	Gross Domestic Product
GoT	Government of Tanzania
ID	Intelligence Department
KICD	Kurasini International Container Depot
Km ²	Square Kilometer
LMDA	Logging and Miscellaneous Deposit Account
MNRT	Ministry of Natural Resource and Tourism
SUA	Sokoine University of Agriculture
TAZARA	Tanzania Zambia Railway Authority
TRA	Tanzania Revenue Authority
TAS	Tanzania shillings
UN	United Nations
URT	United Republic of Tanzania
USA	Unites States of America
USD	United States Dollar

INTRODUCTION

1.1 Plantation forests in Tanzania

The history of plantation forests in Tanzania mainland dates back in 1900s when the German colonial administration started tree planting on a trial basis to restock the areas of natural forests it cleared for timber use (Kajembe and Mgeni, 1996). However, a large-scale establishment under the management of the current Forest and Beekeeping Division (FBD) commenced in the 1950s and culminated in most projects in late 1960s or early 1970s (Kajembe and Malimbwi, 1996). Currently, the Government of Tanzania (GoT) owns about 89 000 ha of plantation forests located in 16 different places all over the country. The major species in these plantation forests include pines (*Pinus patura*, *P. elliottii*, *P. caribaea*) cypress (*Cupressus lusitanica*),

eucalypts (*Eucalyptus maidenii*, *E. saligna*) and teak (*Tectona grandis*) (MNRT, 2001). The choice of where and which tree species to plant was based on wood quality, growth success, growth rate, stem quality and disease resistance. Out of the 89 000 ha of plantation forests owned by the government, 2800 ha, are planted with *Tectona grandis* in places such as Mtibwa (856 ha), Longuza (1709 ha) and Rondo (235 ha) in Morogoro, Tanga and Lindi regions respectively (Hamza *et al.*, 1999; Malende, 1987).

The estimated annual cutting potential from these state owned plantation forests is one million cubic metres (MNRT, 2001). However, Mtuy (1996) reported that there are about 70 000 ha of other plantation forests of various kinds owned privately scattered all over the country. This non-state owned plantation forests are under the management of district councils and private organizations like business companies, religious institutions, schools, villages and individuals. Although, these government-owned plantation forests were established and managed primarily for the purpose of supplying raw materials for the wood industries in the country, they also provide household energy, environmental conservation and, sometimes, they are mixed with annual agricultural crops to boost food crops production and facilitate forest management activities (Figure 1). However, these plantation forests were not established in order to substitute but rather to complement production from the natural forests (Mtuy, 1996).



Figure 1: One-year-old teak tree mixed with maize at Mtibwa plantation forest.

So, the primary objective of the government to establish plantation forests (Mtibwa and Longuza teak plantation forests inclusive) is to produce timber for sale hence, generate enough revenues to make the forest sector contribute significantly to the country's Gross Domestic Product (GDP). The GDP contribution of the forestry sector is currently estimated at 3.3%. However, the sector contributes 10% of the country's registered exports (MNRT, 1998). But, the recorded contribution of the forest sector to the total GDP is underestimated because the parallel economy transactions such as wood-fuel and other forest products have not been well assessed. Therefore, currently there are no reliable records for the GDP share and growth figures for the forest industry (O'Kting'ati and Behelo, 1996).

Teak (*Tectona grandis*) is a large sized deciduous tree. Although teak is native in India, Lao and Thailand, Myanmar is the worldwide known home of the tree species. Of the four teak native countries only Myanmar continues to export teak logs; India and Thailand now import teak timber (Daniela, 2005). Teak has been advocated for planting in many countries not only because of its exceptional high price but also due

to its fascinating wood colour, fine grain and durability (Kjaer and Foster, 1996; Monela *et al.*, 1999; Wint, 2000). Teak is used in ship building, joinery, furniture, flooring, carving, cabinet work, paneling, turnery tanks, railway planks and fixtures requiring high resistance to acids. Sawn teak timber fetches very high price in both local and international markets. Although, export opportunities are good, the domestic market of teak timber in Tanzania is limited. Wood from thinning and low quality saw logs can be sold locally but all quality saw-logs or sawn teak timber can potentially be exported to overseas countries such as India, Thailand, China and Western Europe (MNRT, 2001). For example, teak saw-logs from Tanzania exported to India through the Dar es Salaam port had a Freight On Board (FOB) price of 300 USD/m³ (about 300 000 TAS/m³) in 2006 (FBD, 2006).

Teak was first introduced to Tanzania by Germans between 1900 and 1936 on a trial scale basis. However, commercial planting of the tree species dates back to 1956 and 1961 at Longuza in Tanga Region and Mtibwa in Morogoro Region respectively (Monela *et al.*, 1999; Hamza *et al.*, 1999; Malende, 1987). The impetus for growing *Tectona grandis* in Tanzania arose from its value which is considerably more than most of the best fine indigenous hardwoods, and the ease with which it can be raised in plantation. Since then teak has become one of the most important exotic hardwood species under industrial plantation management in the country.

Due to the prevailing free market structure (imperfect market) which usually stirs-up price rises, the private sector in Tanzania has started investing in timber production. However, to date the state in Tanzania still dominates timber production (including teak saw-logs), controls and monitors its trading. In Tanzania, it is the state which

has set the legal ways on how timber prices should be determined in the state owned forests and has set conditions for timber traders to fulfill in order to be granted timber trading licenses. For example, regulations 31 and 32 of the subsidiary legislation of the Forest Act No. 14 of 2002 empower the Director of Forestry and Bee-keeping Division (DoFB) and authorized officers to dispose timber either by royalty fee or by tendering or by public auctioning (URT, 2002). These state interferences and supply monopoly market characteristics violate the main features of pure competitive market structure. Therefore, timber trading in Tanzania operates in an imperfect market structure of the mixed economy in which there are influences of monopoly, oligopoly and state control.

Royalty fee timber pricing mechanism has been used in Tanzania since 1957. In its effort to secure more revenues, the FBD started auctioning publicly, seized saw-logs and sawn-timber from the natural forests since 1991. The government raised more revenues through auctioning of these forest products than it could have been possible if she sold the products using royalty fee approach (Iddi, 2003). However, the Government of Tanzania officially started auctioning publicly saw-logs legally harvested from Mtibwa and Longuza teak plantation forests since 1998/1999. This saw-logs selling style was however stopped in 2005/2006 and replaced by tendering the standing volumes of teak trees ready for harvesting at Mtibwa and Longuza plantation forests.

1.2 Problem statement and justification

Royalty fee is a well-known and mostly used timber stumpage charging systems in Tanzania. The government however started auctioning teak saw-logs at stumpage site since 1998/99 and this proved to accrue more revenue than would have been the case if royalty fee pricing system was used (Iddi, 2003). But, both royalty fee and public auction selling approaches have problems in optimizing production and sales values (revenues) as they do not reflect accurately the production and operating costs of the forest industry (FAO, 1983).

Furthermore, there is another method of determining timber stumpage value known as residual stumpage price or stumpage appraisal. Many forest economists (see Mwaipopo, 1981; Monela and Kowero, 1991) recommended this approach to be applied in Tanzania in order to yield more profit than the traditional royalty fee pricing mechanism can offer. For example, Monela and Kowero (1991) generally commented that the royalties payable for plantation saw logs were lower than the residually determined saw-log values implying that the former did not reflect true saw log values and therefore favoured the saw-millers. Stumpage price through the appraisal method is determined after the deduction of harvesting costs and profit margin from the delivered/gate price or Freight on Board (FOB) price for the export timber products (Gregory, 1972; Leslie, 1971).

In Tanzania, the famous commercial hardwood tree species from the natural forests are declining in the 'traditional' areas. For example, the declining availability of merchantable log size of *Pterocarpus angolensis* (Mninga) and other indigenous hardwoods has resulted into reduced hardwood cut machines leading to closure of a

number of hardwood sawmills in recent times with a consequence of increasing pit-sawing (MNRT, 2001). Therefore, the only foreseeable potential complement tree species to these unavailable indigenous tree species is teak (*Tectona grandis*) as it exhibits almost all the qualities of indigenous hardwood species. Owners of some of the closed indigenous hardwood sawmills are shifting to teak in order to rescue their idle capital. This has created pressure on teak production due to an increasing demand.

It has already been stated earlier that teak has good export opportunities. It is high time therefore that all alternative pricing mechanisms are assessed to see which one is the best so as to convince decision makers to use a pricing mechanism that captures the highest return for sustainable forest management.

The results of this study will help teak plantations owners in two folds. One, maximize profit by employing the best timber pricing mechanism among royalty fee, public auction and stumpage appraisal. Second, the mechanism that maximizes profit may be used by teak growers to set the floor price of their products during public auctioning or tendering and leave for the market forces to raise the prices for the benefit of growers as the USA does (Wint, 2000).

1.3 Objectives

1.3.1 Overall objective

The overall objective of this study is to analyze various pricing mechanisms that can be used in setting prices for teak saw-logs and the prevailing market characteristics influencing prices.

1.3.2. Specific objectives

Specifically, the study intends to

- i) Identify and examine factors influencing auctioning and stumpage appraisal of teak saw-logs.
- ii) Examine teak saw-logs production and trading costs.
- iii) Calculate stumpage value of teak as a residual value of its saw-logs delivered/gate price.
- iv) Compare revenue accrued from royalty fee, public auction and stumpage appraisal pricing mechanisms of teak saw-logs at stump site.

Also, the study intended to lay down saw-logs pricing precedence that could be applied to other tree species' saw-logs for the plantation forests pending some local variations owing to terrain, site conditions and species.

1.4 Research questions

The study was guided by the following research questions:-

1. What other timber pricing mechanisms can be applicable to Tanzania but are not in use currently?
2. How do the market characteristics in Tanzania influence positively or negatively the different pricing mechanisms?
3. Under what circumstances each approach of pricing mechanism is appropriate?
4. What maximizes profit to teak growers in Tanzania?

5. To what extent would teak growers benefit from applying the most profit maximization pricing mechanism?

1. 5 Hypotheses

The study hypothesizes were as follows:-

- Ho: There is no significant difference between royalty, auctioning and stumpage appraisal approaches in price determination ($H_{01}=H_{02}=H_{03}$).
- Hi: There is significant difference between royalty, auctioning and stumpage appraisal approaches in price determination. ($H_{01}\neq H_{02}\neq H_{03}$).

CHAPTER TWO

LITERATURE REVIEW

2.1 Stumpage price evaluation

Stumpage refers to timber standing on the stump or the raw material from which saw-wood is derived after felling, skidding, haulage and milling, (FAO, 1983; Gregory, 1987; Pearce and Stenzil, 1972). Therefore, stumpage is a raw material with a value because it can be fashioned into a finished or semi-finished product that can be sold profitably. Stumpage price then, is a reflection of the value of timber at stump site after the various processing costs have been deducted from the price of the finished goods derived from the timber.

Stumpage value has been defined as the maximum price that a buyer could afford to pay for a particular lot of standing timber; the price that buyers are willing to pay for standing timber; and the sale value of standing timber per unit volume (FAO 1978; Leslie, 1971). However, FAO (1983) defines, stumpage price as the value of standing timber expressed per unit volume when visualized as a residual value from the price of a timber product or sawn-wood value after the deduction of all non-timber production cost and profit margin. This is the definition which this study has adopted.

Stumpage price is a significant component of production cost and selling of timber at stump site (Gregory, 1987). Therefore, update and accurate knowledge of stumpage price is a critical and important factor to landowners especially those in developing

countries when scheduling timber for harvesting because the production of stumpage has been their traditional objective, and timber still remains their major source of revenue to-date and will still be so in the foreseeable future. Stumpage value is also a key factor for successful sustainable forest management, and timber pricing is one of the challenges that the forest sector in developing countries had been facing and still faces (Mwaipopo, 1981).

In their endeavours to improve revenue collection system from stumpage sales, in early 1980s, the developing countries requested the Food and Agriculture Organization (FAO) of the United Nation (UN) to review or update their forest products charging systems. These countries had the feeling that their timber charging systems were not adequately reflecting the value of timber cut from their forests (FAO, 1983). FAO then suggested that because state-owned forests are not sold outright, it is therefore economically wise to estimate the stumpage value from the market price of the timber final products. The procedure is as follows: the volume of commercially valuable timber in a given area is assessed based on a pre-felling inventory. This volume is multiplied by the market price of final logs, adjusting for the size and species composition. From this timber final product price, the estimated costs of extraction are deducted, including a profit margin for the most efficient harvester. Where the logger undertakes forest management, these costs should also be deducted. The residual value after these deductions represents the maximum amount that an efficient harvester should be willing to pay for the standing timber.

2.2 Methods of stumpage value determination

Price determination is one of the major challenges that entrepreneurs, including forestry industry, face because price is the only component in the market mix that is associated with revenues. Therefore, determination of stumpage price is one of the challenges forestland owners face (Ngaga, 2006). Emphasizing this aspect, Gregory (1972) comments that stumpage price determination is a complex undertaking to forestland owners. However, Price (1989); Lesilie (1971) and FAO (1983) identify royalty fee, tendering, public auction, stumpage appraisal and transaction experience as the main stumpage pricing mechanisms used worldwide.

1.2.1 Royalty fees

The term royalty is defined in the commonwealth forest terminology as *the fee paid to the owner of the forest*. For public owned forests, royalty fees are fixed by the government and published in the government gazette. According to FAO (1983), royalty fee timber charging system is the oldest and the most practiced timber pricing mechanism worldwide. However, the system is very common in communist and developing countries. In these countries, almost all the major means of production are under the control of the state and pricing is part and parcel of the national policy of equitable distribution of the national wealth. Under royalty fee, a fixed sum is payable for each exploited unit or a fixed percentage of the finished good. Apart from Tanzania, the mechanism is also common in Brazil, Malaysia, Ghana and Cameroon.

In Tanzania, the royalty fee timber pricing mechanism dates back to 1957 when the British colonial legislature passed the famous Forest Ordinance of 1957 CAP 389. After independence, the government inherited the law, and its pricing methods and the rates therein. The Ordinance was replaced in 2002 when the national assembly (the Parliament) enacted the Forest Act No.14 of 2002, which, among other things, changed the royalty fee rates charged to different tree species per cubic metre. Table 1 shows the Forest Ordinance of 1957 CAP 389 and the Forest Act No. 14 of 2002 royalty fees for teak saw-logs.

Royalty fee is the most popular and properly practiced timber pricing mechanisms in Tanzania because it has been taught in all forestry training institutions and has been used for quite a long time. Foresters of different levels of forestry education can explain and apply well the procedures involved in charging timber at stump site using the royalty fee timber charging system.

Table1: 1957 and 2002 royalty fees for teak saw-logs

Class	Log mid-diameter class	Royalty fee TAS/m ³	
		1957	2002
I	< 10 cm	Be sold as firewood	
II	11-20	10 000	30 000
III	21-25	20 000	50 000
IV	26-30	30 000	60 000
V	> 35	40 000	80 000

Source: Forest Ordinance (1957) and Forest Act (2002)

2.2.1.1 Procedures of selling timber by royalty fee for Tanzania plantation forests

In Tanzania, the procedures for selling timber from plantation forests using royalty fee method are follows: First, the Forest and Beekeeping Division (FBD) identifies the compartments due for harvesting (thinning and clear-felling). Then, the Division conducts pre-felling inventories to determine the merchantable volumes of the standing timber to be harvested. These volumes are multiplied by the fixed royalty fees per cubic metre, to get the amount of money a customer has to pay in order to access the timber. (See Table 1 for teak saw-logs). However, a person must be a registered timber dealer first before being granted a license to access timber from a national forest (Ngaga, 2005).

2.2.1.2 Suitable market structure for the royalty fee pricing mechanism

Since 1967 Tanzania has been practicing Socialism and Self-reliance political ideology (URT, 1998). This political ideology follows the principles of communism whose domain is the centrally planned economy. Usually in the centrally planned economy, the royalty fee is the commonly used timber pricing mechanism because prices are fixed by the state. Despite the continued ideology of Socialism and Self-reliance in the country's constitution, its main economical features have changed since 1986, when Tanzania embarked on policy and institution reforms whose overall objective has been to revamp the national economy and facilitate wholesale economic growth. These reforms have changed the micro-economic environment quite significantly (MNRT, 1998). Some of the reforms include trade liberalization,

deregulation of foreign exchange controls, privatization, and removal of subsidies, and new marketing and finance systems (Reed, 2001). International trade of forest products including timber has also been affected either positively or negatively by these reforms (Ngaga *et al.*, 1999). For example, through trade liberation and economic reforms the timber domestic markets in Tanzania are now open to import and at the same time attracting foreign investors hence increased competition in the markets. Thereon, the private sector slowly picked-up the control of the major means of production previously owned by the state. The state now concentrates on policy making. However, the government has set intervention mechanisms which monitor and regulate the private sector on how it manages the production and marketing sectors of the economy.

As mentioned earlier, the royalty fee timber pricing mechanism operates better in a centrally planned economy than in a free market economy which Tanzania has opted to follow. Therefore, a substitute to royalty fee timber pricing mechanism was inevitable and the substituted approach such as public auctioning and tendering must be competitive by nature; regardless of the state monopoly in timber production. Pure competitive markets normally tend to raise prices and thus encourage investments. So, if timber in Tanzania will be sold in a competitive public auctioning or tendering, prices will raise. On the one hand, this situation will attract the private sector to invest in timber production and on the other, it will force the public to use wood economically hence, improve environmental conservation and wood supply in the market, leading to a price fall in the long-run. The changes from centrally planned to free economy is one of the reasons that made Tanzania to sell teak saw-logs by

public auctioning at Mtibwa and Longuza plantation forests, and now selling the standing volume through tendering instead of royalty fee.

2.2.2 Tendering

Tendering pricing mechanism is one way of solving the difficulty of calculating timber stumpage value. The method introduces standing timber to the market and leaves the forces of supply and demand to determine the value of the timber on sale (FAO, 1983). Under this timber pricing method, customers submit sealed bids to the government for the right to purchase timber owned by the state.

Tendering of timber at stump site was the first option Tanzania adopted in replacing the royalty fee timber charging system. However, the approach became unpopular amongst foresters because it was used in few selected timber species like teak timber while the determination of stumpage value for other tree species continued to use the royalty fee timber pricing mechanism. Tendering was also used for a short period of time before being replaced by public auctioning pricing mechanism in 1991. Furthermore, tendering pricing mechanism became less known because it involved other organizations outside the forestry sector like, the Central Tender Board (CTB) whose purchasing procedures are known to few foresters. However, the mechanism was re-adopted for teak timber since 2005/2006 when the GoT sold its teak trees ready for harvest at Mtibwa forest plantation by tender (MNRT, 2004). The reason for the re-adoption was that the public auctioning did not bring the expected competition among timber traders.

Table 2: Amount of standing timber purchased through tender from Mtibwa plantation Forest

Year	Volume purchased (m³)	Price /m3 (TAS/m³)	Total Revenue (TAS)	Winner
2005/2006	42 947	174 000	7 472 778 000	Fibreboard (2000)Ltd
2006/2007	32 647	204 218	6 667 000 255	Olam (T) Ltd
Total	75 594		14 139 778 255	

Source: MNRT (2006)

2.2.2.1 Procedures of selling timber by tendering in Tanzania

The procedures of selling timber by tendering in Tanzania start with pre-selling inventory in the national plantation forests conducted by the FBD, in order to determine the amount of timber available for sale. Thereafter, MNRT through CTB advertises the availability of timber in the mass media (MNRT, 2004). In the advertisement the MNRT invites interested timber customers to submit their sealed bids to the Ministry. The advertisement clearly states the location, and the amount of timber volume available, the procedures for submitting the sealed bids and the deadline (Appendix iv). Potential bidders are allowed to inspect the timber on sale and make their own evaluation before submitting their sealed bids to the Ministry. The prospective buyers submit their sealed bids together with their corporate profiles, certificate of registration as timber dealer/trader; timber oriented business license, bid security and recently audited balance sheets. Bidders are also required to adhere to the stated bidding deadline. After the deadline, the MNRT evaluates the bids and the highest bidder is selected as the winner of the tender (FBD, 2001). Thereafter, the Ministry notifies the winner who, in turn, confirms by either agreeing

or disagreeing with the award before the signing of a purchase contract between the seller (MNRT) and the buyer (winner) (MNRT, 2004). After the execution of the purchased contract, the buyer has to pay 60% of the contract price within seven days and the remaining 40% within 90 days from the signing date. Completion of the above procedures warrants the customer to cut, and transport the timber consignment from the forest after being given a transit pass (Appendix v).

2.2.2.2 Suitable market structure for tendering pricing mechanism

Tendering pricing mechanism is effective when it operates in a competitive market structure, in which commodity prices are only determined by the market forces of demand and supply. Despite being effective in the competitive market structure, tendering has a weakness of not reflecting timber production costs (FAO, 1983). The method also demands a perfect and understandable agreed-way of assessing the resource on sale between the seller and the buyer otherwise unnecessary complaints from one party may arise during the execution of the contract (MNRT, 2006).

2.2.3 Public auctioning

The Concise Oxford dictionary 10th Edition defines auction as *a public sale in which goods or property are sold to the highest bidder*. Therefore, timber auctioning tries to raise timber value at stumpage site by allowing buyers to express publicly their willingness to pay for the available timber. Under timber auctioning approach, the timber suppliers handover the job of calculating stumpage value to buyers, who have better access to information on timber values and production costs (FAO, 1979a). Unlike royalty fees pricing mechanism in which producers are price makers and

customers are price takers in public auction pricing mechanism both parties are price takers; this is one of the main features of a competitive market structure. Apart from Tanzania, timber auctioning is also applied in Russia, Malaysia, Indonesia, Ghana and Cameroon (FAO, 1983).

Although this approach is theoretically preferable to royalty fee and tendering, as it attempts to ensure full stumpage value recovery, it faces some challenges. According to FAO (1979a), usually buyers do not have more production information than producers themselves and, where there are few buyers, such buyers may collude to lower the price. Furthermore, the producers do not entirely escape the obligation of collecting information on stumpage value, as it must set a floor price, which covers the production costs and make a reasonable profit. Like tendering, auctioning also works better in a competitive market structure comprised many buyers bidding competitively.

2. 2.3.1 Factors used to determine the teak saw-logs floor prices

Management costs, government levies, logging costs and marginal profit, were the main factors used to calculate the floor prices of the teak saw-logs auctioned at Mtibwa and Longuza teak plantation forest (FDB, 2002b). The values of these costs are presented in Tables 3a and 3b below.

Table 3a: Factors used to calculate floor price of teak saw-logs based on 1957 royalty fees

Log diameter (in cm)	Royalty rate (TAS/m ³)	Forest management costs (TAS/m ³)	Logging Cost (TAS/m ³)	Total Cost (TAS/m ³)	Marginal Profit 15% of total cost (TAS/m ³)	Minimum /floor price (TAS/m ³)
11-20	10 000	3400	11 300	24 700	3705	28 405
21-25	20 000	3400	11 300	34 700	5205	39 905
26-35	30 000	3400	11 300	44 700	6705	51 405
> 35	50 000	3400	11 300	64 700	9705	74 405

Source: Mtibwa and Longuza forest plantation files

Table 3b: Factors used to calculate floor price of teak saw-logs based on 2002 royalty fees

Log diameter (in cm)	Royalty rate (TAS/m ³)	Forest management costs (TAS/m ³)	Logging Cost (TAS/m ³)	Total Cost (TAS/m ³)	Profit margin 15% of total cost (TAS/m ³)	Minimum /floor price (TAS/m ³)
11-20	30 000	3400	11 300	44 700	6705	51 405
21-25	50 000	3400	11 300	64 700	9705	74 405
26-35	60 000	3400	11 300	74 700	11 205	85 905
> 35	80 000	3400	11 300	94 700	14 205	108 905

Source: Mtibwa and Longuza forest plantation files

- **Forest plantation management costs**

Since 1986 customers who were allowed to harvest timber in state owned plantation forests in Tanzania used to pay TAS 3400/m³ harvested to cover for the costs of the plantation forest management activities (i.e. establishment, tending, protection and road maintenance). This amount of money is

deposited in a special account popularly known as Logging and Miscellaneous Deposit Account (LMDA) managed by the FBD. This account was established after an agreement between the Ministries of Finance and Natural Resources and Tourism that such amount should be ploughed back to the harvested plantation forest for its maintenance. However, it was argued that this rate does not reflect the current forest management cost it is fixed for, because the government charges the same amount to all plantation forests regardless their differences in species composition, management techniques, rotation periods and locations. Secondly it has not been reviewed since it was set in 1986 while a lot of operational costs have increased.

- **Government levies**

Government levies are legally set levies paid to the government for every cubic metre of timber harvested. These levies are charged according to timber species and sizes. Normally they are the royalty fee rates. Table 1 shows the royalty fee as stipulated in the Forest Ordinance of 1957 CAP 389 and Forest Act No. 14 of 2002 for teak saw-logs only.

- **Logging costs**

The logging costs involve the costs incurred during the execution of the pre and post felling stock activities, (i.e. felling, trimming, scaling, skidding and sorting the logs according to mid-diameter classes and piling them into heaps normally called lots). Thereafter, the volume of each lot was determined using Huber's formula (FBD, 2002b).

$$V = \frac{\Pi d_m}{4} L$$

Whereby V= volume of log, m³
 d_m= diameter at mid-length of log in m
 L= length of the log, m
 Π= 3.14

Timber customers are charged TAS 11 300/m³ if the logging activities are pursued by the FBD.

However, the FBD is currently reviewing the LMDA and the logging cost rates. Interviewed foresters at FBD admitted that these rates were intuitively set and, currently they are below the estimates for the costs they are fixed for, because a number of socio-economical changes have happened in Tanzania while the rates have remained static. However the main challenge in the review of these rates is lack of well defined criteria to be used. Therefore, before reviewing these rates the FBD must first draw well defined criteria that will be used in setting such rates. Also, the FBD must suggest specific time interval to review both the rates and the criteria. That will establish a foundation of regularly reviewing both the rates and the criteria to use in setting them. For example, the royalty fees rates have been applied for 45 years since 1957 to 2002. This had negatively affected the floor prices of teak saw-logs auctioned between 1988/1999 and 2002/2003 because they used the royalty fee rates of the Forest Ordinance of 1957, whose royalty fees range between TAS 10 000 to TAS 50 000/m³; while, the auctions conducted

between 2003/2004 and 2004/2005 used the royalty fees of the Forest Act of 2002 whose range lay between TAS 30 000 to TAS 80 000/m³ (Tables 3a and 3b column 1).

- **Marginal profit**

The marginal profit is set as 15% of the total cost of LMDA plus logging cost and Government levies. Other important costs but not included in the calculation of the floor price are advertisement costs and auction supervisory costs.

- **Advertisements costs**

Like in the tendering pricing method, the availability of the teak saw-logs in any of the two plantations was advertised in different mass media (newspapers, radio and television stations) (FBD, 2002a). However, unlike the tendering approach, in auctioning only timber volumes exceeding 100 m³ their availability and intention to sell by public auctioning were advertised in the national mass media while small quantities of less than 100 m³ were locally advertised and auctioned to neighbouring communities to avoid high advertisement costs (Mamkwe, P.A personal communication, 2006). Other details in the advertisements are the same as those found in tendering advertisements. Usually, the actual auctioning takes place two weeks after the advertising date. An average of twelve prospective buyers competed in each auction (Appendix vi).

- **Supervision cost**

Supervision costs are costs incurred by producers during the organization of the auction. The FBD head office used to send more than one officials as witnesses to every auction conducted in the two plantations.

2.2.3.2 How the actual auctioning was conducted

According to Mamkwe (personal communication 2006), for the first two auctions conducted at Mtibwa plantation forest in 1998/1999 and 1999/2000, the auction conductor announced publicly the floor price of each lot, and thereafter prospective buyers competed by raising the price until there was no more bids. The buyer with the highest bid-price won the contract to purchase the timber consignment in the auctioned lot and had to pay 25% of the amount bided on the same day and the remaining 75% within 14 days. Thereafter, the FDB provided to the winner a transit pass, which allowed the buyer to transport the logs from the forest log-yard to the buyer's storage site. Transit passes were not charged. However, this auctioning style resulted into lots of small diameter logs to remain unsold. To curb the problem of having leftover logs to happen again in the subsequent auctions all logs in the forest log yard were treated as one lot and auctioned as single consignment. Therefore, customers bided for what was available and not to solitary lot as it used to be.

2.2.4 Stumpage appraisal

Stumpage appraisal values are charges linked to the consumer price index (CPI) or to board (normally Freight On Board (FOB)) price. In this method, the stumpage value

is calculated as a residual value of the price of its finished product minus all non-timber production cost (FAO, 1983). This value represents the maximum amount that an efficient buyer is willing to pay for the timber available at the production site. Stumpage appraisal timber pricing mechanism is very common in USA, Great Britain, Canada, Malaysia, Papua New Guinea and Liberia (FAO 1981). Monela and Kowero (1991) commented that despite Royalty fee, tendering and public auction are the most commonly applied timber pricing mechanisms in Tanzania; however, stumpage appraisal or residual approach timber pricing mechanism can also be effectively applied in the country.

2.2.4.1 Factors affecting stumpage appraisal method

Generally, stumpage value of timber determined through the stumpage appraisal method is affected by the type of timber species, quality, size and quantity, haulage means, distance and condition. Other aspects include logging method and terrain, the type of the product to be derived from the timber in question and the product market conditions (FAO, 1983). Therefore, with high quality, big size, large quantity timber located at generally flat terrain close to the market, and the high price of end products; the stumpage value of this timber will obviously be higher and vice versa.

According to Gregory (1987), calculating the stumpage value of timber using the appraisal method is more complex than the other methods because the market value of timber varies between regions, species, quality and production costs, which also vary with distance to market, local site conditions and forest management requirements. The author cautioned further that to come-up with a fair and accurate

timber stumpage price using the appraisal method, there must be high degree of record keeping on production costs and selling. Furthermore, stumpage value estimates involves information provided by the private sector, which in many cases, are reluctant to divulge its real costs (Ngaga, 1991). Auctioning approach has been used as a way of solving the difficulties involved in measuring stumpage value using the residual approach.

Like the other timber pricing mechanisms, the stumpage appraisal method faces the challenge of how to select the best revenue collecting system that will capture the timber value without introducing perverse incentives, the incentives which might be in conflict with other forest regulations used in charging standing timber, volume extracted and/or profit, that have different impacts on forest utilization. For example, charging using levies per unit volume or per tree extracted would encourage the maximum utilization of each tree harvested; while charges based on per unit area (concession) will encourage the maximum utilization of each hectare of forest. The former may encourage harvesters to extract only the most valuable species, known as 'high grading'; while the latter may undermine other forestry regulations, such as minimum size class restrictions.

2.2.5 The transactions evidence

According to FAO (1983), besides deriving stumpage values basing on market prices of logs and other timber production cost estimates and an allowance for profit, stumpage values may also be arrived directly from transactions evidence of sales of standing timber. This method of stumpage evaluation is relatively straight forward

but requires the existence of a competitive market in which standing timber is sold to a large number of actively competing independent firms. Consequently, it will be of limited application to developing countries, because of limited competing firms.

In the Transactions evidence method, stumpage prices received from the sales of standing timber are used as the basis for stumpage evaluation. A sample of a larger number of sales is analysed by, for example, regression analysis or other statistical techniques, to identify the effect of various factors on the stumpage prices received and the magnitude of these effects. Factors such as species, size, quality, stand density, haulage distance, or end use are evaluated and the significant variables identified. These variables and the magnitude of their influence on the prices then serve for the appraisal of stumpage values of other stands.

Like the stumpage appraisal method, the transactions evidence is also used in both developed and developing countries. However, the developed countries have complex approaches of calculating timber stumpage price while the developing countries have simple models. These differences are brought about by the variation in problems, constraints and objectives existing between the two development blocks of the World.

One advantage of the transaction evidence approach is that it avoids problems associated with collecting detailed information on logging costs, and predicting technological change and cost changes necessary for the stumpage value approach. However, one of the drawbacks of the method is that it is useful if the past data have

been obtained from competitive sales, otherwise if the past sales were characterized by uncompetitive behaviour, the transaction evidence approach is not applicable. This approach could have been in trial basis in Tanzania by now if the FBD could have kept and managed well all the records of its forest products sold by auctioning or tendering. However, there is foreseeable possibility of applying the approach in the future if the division will continue with its efforts of keeping and managing well the present timber sales data it obtains from the auctioning and tendering systems.

According to Kjaer and Foster (1996); and FAO (1979b), the royalty fee, public auctioning, tendering and stumpage appraisal timber pricing mechanisms have been used separately or in combination in many countries in the World. For example, Royalty has been used in almost all African countries, Malaysia and Brazil while auctioning and tendering have been employed in USA, China, Malaysia, Cameroon, Ghana, and Tanzania. The stumpage appraisal is common in USA, Brazil, Indonesia Costa Rica, Ghana, and Cameroon.

2.3 Price theory

According to Frank and Bernanke (2001); Gregory (1987); and Price (1989), price theory is concerned with the analysis of the ways in which prices are determined in a market, and the role they play in solving the problems of resource allocation. Market concept is the central point when discussing price theory. But, market commands two meanings: One, as a place; where buyers and sellers meet and function, goods and services are offered for sale, and transfer of title occurs. Second, market means the aggregate demand by potential buyers of a product or service. In economic theory market implies a set of conditions and forces which determine prices (Stanton, 1975).

However, the two meanings have a common feature of buyers being able to bargain with sellers to facilitate effective trade transactions between them (Ngaga, 2005).

However, according to Colander (2004) and Kerin *et al.*, (2004), there are three major types of economic market structures namely pure competitive market, mixed economies and centrally planned economies each of which has a characteristic pricing system as follows:

2.3.1 Pure competitive market

Pure competitive market structure uses perfect market pricing mechanism. This system of price determination is based on the market forces of demand and supply only. The salient features of pure competitive market include a large number of producers and buyers trading a product which is undifferentiated to the extent that no individual or group of sellers or buyers can significantly influence the product's price by changing the quantity produced or purchased. In pure competitive market there are no barriers to entry or exit the market. In such a situation, there is high mobility of resources and information dissemination among buyers and sellers. Under pure competitive markets, buyers and sellers are price takers rather than price makers. That is, sellers cannot sell their products above the market price. Price in pure competition market is a function of demand and supply. However, in reality it is very difficult to find such a market, it is used to enable people know the nature of the trend of events in a market (Gregory, 1987).

2.3.2 Mixed economies

Mixed economies use the imperfect market pricing system in price determination. However, under mixed economies, prices are affected by interferences such as Monopoly, Oligopolistic and State laws and regulations governing prices.

2.3.2.1 Pure monopoly market

Market structure is actually a continuum, with pure competition on one end and pure monopoly on the other. In a pure monopoly market there is only one seller of a unique product with no close substitute. The single seller can be the government or a private firm regulated or non-regulated. However, monopoly in the sense of controlling sales is not particularly significant until it is accompanied by the power to control price (Gregory, 1972). Price is handled differently in a pure monopoly market structure. For example, a government monopoly tends to set low prices, while a regulated monopoly tends to set prices under the influence of the government. However, non-regulated monopoly is at liberty to set prices as long as it is acceptable to the market. Other structures on the market continuum include monopolistic competition and oligopolistic competition.

2.3.2.2 Monopolistic competition market

Monopolistic competitive market consists of one industry of a larger number of firms that produce slightly differentiated products that are reasonably close substitutes for one another (Frank and Bernanke, 2001). Also in monopolistic competition market, there are many buyers and sellers who trade over a range of prices rather than a single market price. However, there are some barriers to entry such as advertising

patents. In this type of market structure, there are many competitors such that a firm is less affected by competitors' marketing strategy compared to oligopolistic market structure.

2.3.2.3 Oligopolistic competition markets

An oligopolistic industry is the one that produces a product for which only a few rival firms produce close substitute products. Oligopolistic competition market structure consists of a few sellers who are highly sensitive to each competitor's price and their marketing strategies (Gregory, 1972). The product can be homogenous or heterogeneous. There are high barriers to entry in the form of patents, control over raw materials, and proprietary knowledge. An oligopolistic industry is never sure about returns on permanent basis through price cut. Always, when an oligopolistic industry develops pricing and marketing strategies, it must pay much attention to its competitors' and customers' behaviour. Pure monopoly, monopolistic competition and oligopolistic competition markets are on the sale side, while monopsony and oligopsony markets are characterized by different degrees of buyers' influence in the market.

2.3.3 Centrally planned economy

Centrally planned economies use the central price fixing system to determine prices. This system is common in the communist and many developing countries whereby pricing is part and parcel of the national policy of equitable distribution of the national wealth. Under such economies, the production sector (forest inclusive) is controlled by the state and prices are also fixed by the state. Production is meant to fulfilling the needs of the people and, the price is the tool for distributing the

commodities to the people. The fixed prices take into account, the production cost of the commodity, the purchasing power of the people, and the target set for economic growth.

Sometimes the state fix prices in order to protect buyers in general or the poorer section of the population. In this case, a state fixes a maximum (ceiling) price of a good or service. Also, a state can fix prices for the sake of protecting agricultural producers of a certain crop against a fall in their income due to bumper harvests. Sometimes, prices of some products (in most cases cigarettes and alcohols) are fixed in order to check their consumption and imports in the case of balance of payments difficulties. Also, the government may impose subsidies (support price) on certain goods or services in an attempt to keep-down the cost of living or to encourage output.

2.4 The market structure for teak timber

Traditionally, Tanzania is selling its timber as standing volume and timber prices have been set by the central government under the centrally planned economy. But, teak timber has been sold either as standing volume or saw-logs. When teak timber was sold as standing volume the government used either royalty fee or tendering pricing mechanisms under the centrally planned and competitive market structures respectively. When the timber was sold as saw-logs the government used the public auctioning pricing mechanism which also falls under the competitive market structure such as tendering. However, in reality the market structure in which the teak saw-logs were sold had some features which violated the main conditions that make a market to be considered a pure competitive market. The features which

violated the concept of pure competitive market structure included the government's monopoly in the supply of the teak saw-logs a feature of the monopolistic market structure. Furthermore, the logs from Mtibwa and Longuza plantation forests were easily differentiated by buyers a feature of the oligopolistic and monopolistic market structures. And lastly, there were few buyers in the market (auctioning participants) to the extent of not being sure that the market price had been determined only by the forces of supply and demand rather than by other factors such as buyers' collusion. Therefore, the teak saw-logs auctioned in Tanzania was sold under the imperfect market structure of the mixed economy which was influenced by features of monopolistic and oligopolistic market structures as well as government interference. The same market structure is prevailing to the standing volume being sold under the tendering pricing mechanisms.

2.5 Pricing Objectives

The producers' pricing objectives must be identified in order to determine the optimal pricing. According to Paish (1970); and Stanton (1975), the common pricing objectives are, profit maximization, target return, sale growth, meeting market share, meeting competition, and non-price competition as follow.

2.5.1 Profit maximization

Profit maximization takes two folds. The first; is the one which takes into account revenue and costs only. This objective may not be the best course if it results into low profits in the long-run. The second, is the one which maximizes profit margin,

this objective attempts to maximize the unit profit margin recognising that quantity will be low in the long-run.

2.5.2 Target return

An organization that has other revenue sources may seek only partial cost recovery. So, it sets a certain percent of return to its investment costs.

2.5.3 Sale growth

Sale growth seeks to maximize the number of units sold or the number of customers served in order to decrease long-term cost.

2.5.4 Meeting market share

Meeting market share is an objective that seeks to maximize current revenue with no regard to profit margins. The underlying objective often is to maximize long-term profit by increasing market share and lowering cost.

2.5.5 Meeting competition

In situations such as market decline and overcapacity, the goal may be to select a price that will cover costs and permit the firm to remain in the market. In this case, survival may take a priority over profits. Meeting competition is therefore considered as a temporary objective.

2.5.6 Non-price competition

A firm may seek price stabilization in order to avoid price wars and maintain a moderate but stable level of profit. For new products, the pricing objectives that often are applied are either maximization of profit margin or maximization of

quantity (market share). To meet these objectives, skim pricing and penetration pricing strategies are often used.

2.6 Pricing methods

After deciding on the pricing objective and studying the market situation, a producer can set the specific price level. Frank and Bernanke (2001) and Stanton (1975) identify five pricing methods namely: cost-plus pricing, target return, value based pricing, psychological pricing, and price discounts. These pricing methods are explained below.

2.6.1 Cost-plus pricing

Cost-plus pricing is the most elementary and popular pricing technique. The procedure is simple to apply. Producers just add a standard mark-up as a profit margin to the production cost of their products or services. The method is popular because, it is considered to be fair to both the buyers and the seller. Sellers are certain to cover their production costs. However, the method ignores demand and competition.

2.6.2 Target return pricing

Target return pricing method sets the price of a product in order to achieve a target return on investment.

2.6.3 Value-based pricing

Value-based pricing method bases the price of a product on the effective value of the customer relative to alternative products.

2.6.4 Psychological pricing

Psychological pricing method is based on factors such as signals of product, quality, popular price point and what the customer perceives to be fair.

2.6.5 Price discounts

Price discounts include quantity discount, cumulative quantity discount, seasonal discount, cash discount, trade discount and promotional discount.

2.7 Monitoring and control of timber export (including teak saw-logs) in Tanzania

Tanzania has permitted and restricted exports of some forest products (URT, 2002).

2.7.1 The forest products permitted for export

The forest products which are permitted for export are as follows.

- Sawn-timber from both soft and hardwood species.
- Semi or full processed products such as wood carvings and handcrafts furniture, door and window frames and shutters, beds, chairs, tables, cupboards, wattles bark, extracts and gums
- Bees' products such as honey, beeswax, propolis, bee pollen and royal jelly

2.7.2 The forest products restricted for export

The forest products which are restricted for export are as follows.

- Logs of all hard and soft woods unless special permit is granted by the FBD;
- Charcoal, and
- Sandalwood (*Osyris santallum*).

In its efforts to strengthen the monitoring and control of the export of forest products, the MNRT has introduced a scanning process for all containerised forest products at the harbour port in Dar es Salaam. The Ministry has also established a special area at Kurasini International Container Depot (KICD) for the same purpose. However, the inspection of the export forest products involves other state organs like the Intelligence Department (ID).

2.8 Conditions for export of forest products

Any trader intending to export forest produce from Tanzania must apply for the Export Permit provided by the FBD of the MNRT (URT, 2002). However, in order to be granted with such a certificate, an exporter must fill in an application form which should be attached with the statement of the amount, species and type of product applied for export in that fiscal year, a copy of Certificate of Registration from the Registrar of Companies, Trading License (oriented to timber export), Income Tax Clearance Certificate from Tanzania Revenue Authority (TRA), order enquiries from buyers (customers) indicating tentative prices agreed in USD or any international convertible currency, the statement of Export Returns transacted during the previous year as certified by the banker (this applies to applicant wishing to renew the export permits) and Certification of Registration to trade in forest products from FBD. Then, the Director of Forestry and Beekeeping (DoFB) will issue a Letter of Approval for Export. However, the forest products must be inspected, graded, stuffed and scanned.

CHAPTER THREE

METHODOLOGY

3.1 Study areas description

The study was conducted mainly in the major teak saw-logs production forest plantations of Mtibwa and Longuza in Morogoro and Tanga regions respectively. However, saw-logs trading information was collected from the offices of teak saw-logs traders and FBD in Dar es Salaam.

3. 1.1. Mtibwa teak forest plantation

Mtibwa teak forest plantation is within Turiani Division in Mvomero District, Morogoro Region. The plantation covers an area of 856 ha and was established in 1961. Mvomero District lies between latitudes 5-7° S and longitudes 37– 38° E. The altitude ranges from 380 to 520 m above the sea level with an annual rainfall ranging from 1500 to 2000 mm and mean temperature range of 15–29°C. The district is therefore within the humid to sub-humid zone. The land is generally plain and is surrounded by Nguru Mountains (Malende, 1987). The uncultivated lowlands are covered with grassland, shrubs and some leguminous plants. Mtibwa plantation forest is situated North-west of Dar es Salaam. The forest plantation can easily be reached by road from Dar es Salaam (312 km) especially during the dry season. Mvomero District experiences bimodal rainfall pattern. Short-rains start in mid-

September and end in December while long-rains start in mid-March to late May. Dry seasons are from June to August and January to March.

3.1.2 Longuza teak forest plantation

Longuza teak forest plantation is in Muheza District, Tanga Region. Teak was first introduced at the area in 1957. The project covers 1709 ha and is situated on the lower slopes of East Usambara Mountains. Longuza forest plantation lies between latitudes 4°55' and 5°10' S, and longitudes 38°40' and 39° E. The altitude in the plantation ranges from 160 to 560 m above the sea level (Hamza *et al.*, 1999). In the lower slopes, soils are brown clay loams while in the upper slopes soils are reddish clay and clay loam.

The natural vegetation is composed of mainly *Antiaris usambarensis*, *Khaya anthotheca*, *Trichilia emetica* and *Sterculia appendiculata*. Normally the area experiences two rain seasons; short rains which usually start in every October to December and long rains which start from March to May. The mean annual rainfall stands at 1535 mm and the mean monthly temperature ranges between 21°C and 28°C. Longuza plantation forest is situated north of Dar es Salaam. The forest plantation is accessible by road all the year around and, it is 334 km from Dar es Salaam.

3.1.3 Dar-es Salaam Region

Dar-Es Salaam Region is situated at an altitude of about 14 m above the sea level. The region is bordered by the Indian Ocean on the east and surrounded by the Coast Region on the other sides. Dar es-Salaam Region has a total land of 1 350 km²; out of this about 20 km² is forest reserves and 900 km² is suitable for agriculture. Dar-es

Salaam is a commercial city, with a population of 2.5 million and an annual average growth rate of 4.3% (URT, 2003). Administratively, Dar es Salaam is divided into three municipalities namely Kinondoni, Temeke and Ilala. Dar-es Salaam has a coastal climate typical of equatorial regions, characterized as “hot and humid”, with small seasonal and daily variations in temperature. The region has a mean temperature of 35°C during the months of January to March, which decreases to 25°C during June to August. The rainfall regime is bimodal with two rainy seasons and two dry seasons. Short rains which start in October to December with monthly average rainfall of about 567 mm, and long rains which start in March and end in May with a monthly mean rainfall of about 250 mm. Dar-es Salaam is inhabited by people of different ethnic backgrounds from different parts of the country. About 945 km² of the total area of the region comprises rural setting which is suitable for agriculture. However, 80% of the residents depend on food from other regions, because food produced within the region is not enough to meet the demand. Dar-es Salaam dwellers are employed workers, farmers and/or peasants and business persons who are permanently or temporally living in the city. The city is linked to other parts of the country by three trunk roads (Dar-es Salaam- Tunduma, Dar-es Salaam- Mwanza and Dar-es Salaam – Tanga) and three railway lines (TAZARA, Central and Moshi – Tanga) and the city is served by a network of 1150 km of roads with a density of 0.83 km/km².

3.2 Data Collection

Both primary and secondary data sources were used. The data were collected in two phases namely preliminary survey and actual survey.

3.2.1 Preliminary survey

Preliminary survey was conducted so as to provide a general picture of the research areas. The aim was to identify locations of the research sites and find the possibility of reaching teak saw-logs producers and those traders who have participated in the different auctions conducted in the main study areas. During the preliminary survey, the questionnaires were tested to find out if they answer the research questions. Amendments were done whenever necessary.

3.2.2 Actual survey

The research questionnaires were designed to obtain both quantitative and qualitative data. Both open and closed-ended questions were used in order to obtain the required information. Three types of questionnaires were designed and administered to three different target groups namely; the forest plantations (producers), teak traders (customers) and Forest and Beekeeping Division (FBD) (monitor and controller of both producer and customer) (Appendices i - iii). Producers provided information on the number of auctions and when they were conducted in the respective plantation forests, the amount of timber sold (number of logs and their total volumes) in each auction, the estimated number of participants and winners and how the auctions were conducted. They also provided information and values of the factors used to determine every auction's floor price (i. e. royalty fee, LMDA, the profit margin and logging costs). They further provided data on the amount of revenues accrued from each auction (i. e. final selling value) (Appendix i). The teak saw-logs customers (winners of every auction) provided data on their respective winning years, the

amount of timber they purchased and exported, and the per cubic metre trading costs, which included investment/fixed (preparatory and purchase costs), transport, overhead (which combined export and administrative costs) and their profit margins (Appendix ii). The traders also provided the FOB price per cubic metre. However, both teak saw-logs producers and exporters provided information on problems associated with the production and the exportation of the logs.

The FBD provided data on how it supervised the auctions, and how it regulates, monitors and control timber trading business in the local and international markets (Appendix iii). Literature and reports provided information on procedures and factors to use in calculating timber stumpage value using stumpage appraisal method and the limitations of the pricing approach. The actual survey was done by visiting Mtibwa and Longuza teak plantation forests, FBD headquarters and the teak saw-logs auctions' winners (exporters). However, because all auctioned teak saw-logs were exported, no teak saw-miller was visited.

3.2.2.1 Primary data collection

The primary data were collected between October – December 2006 using structured and semi-structured questionnaires administered to different stakeholders involved in both teak saw-logs production and trading, also critical field observations were employed. Supplementary information was collected through personal observations in the study areas with the purpose of cross-checking information obtained from the questionnaire. Most information can be obtained by close observation on what is

happening on the ground and in such a situation the researcher has to be keen on what the respondent is reporting and what the researcher is seeing.

3.2.2.2 Secondary data collection

Secondary data were obtained from official documents provided by the offices of Mtibwa and Longuza forest plantations in Morogoro and Tanga regions respectively, the FBD and teak saw-logs traders in Dar-es Salaam Region. The data were also collected from literatures, reports, and other relevant documents from training institutions including Sokoine University of Agriculture (SUA) Morogoro. Internets were also visited and browsed for available literature on international marketing of teak saw-logs. Furthermore, various banks based in Dar-es Salaam were visited in order to collect the interest rates they charge to loaners of enterprises.

3.3 Data analysis

3.3.1 Stumpage appraisal method

The collected data were analysed using the stumpage appraisal methods of determining timber stumpage prices. This method is essentially a calculation of the maximum price that a buyer could afford to pay for a particular lot of timber at logging site, (Leslie, 1971). The main reflection of the stumpage appraisal pricing mechanism is that the price for a raw material with a derived demand is limited to the residual of the price of the processed product minus all costs of production, including profit as a cost in economic terms. This concept can be expressed in the simple stumpage formula provided by Pearce and Stenzel (1972) as: $\text{Stumpage value} = \text{selling value} - \text{operation costs} - \text{margin for profit and risk}$. However, Leslie (1971) provides a formula that stumpage value can be expressed more fully;

$$S = \frac{YP}{100} - \left\{ L + \frac{Y}{100} \left[M + \frac{0.DF}{V} + 0.R. \frac{(F + W)}{V} \right] \right\}$$

- Where**
- S = stumpage price per unit volume round-wood
 - P = weighted average selling price of product
 - Y = weighted average recovery percent
 - L = direct milling cost per unit volume round-wood
 - M = direct milling cost per unit volume of product
 - D = depreciation rate per cent
 - R = allowance for profit and risk as a per cent
 - F = fixed capital investment
 - W = working capital
 - V = volume of output.

3.3.2 Economic comparison

Economic comparison was then made to determine which pricing mechanism among the three (i.e. Royalty fee, Public auctioning and Stumpage appraisal) yields more revenue to teak saw-log producers than the others. First, a mathematical comparison of the price per cubic metre of the teak saw-logs calculated using royalty fee pricing mechanism was compared with price per cubic metre obtained from public auction. Then, both prices per cubic metre from royalty fee and public auctioning pricing mechanisms were compared with the calculated prices per cubic metre if the teak saw-logs could have been sold using the prices obtained from stumpage appraisal pricing mechanism. Secondly, the average prices per cubic metre of both plantations

calculated from the three timber pricing mechanisms were plotted against their years. From the comparison, one can exactly tell which pricing mechanism yields more revenue to teak growers than the others and to what degree.

3.4 Limitations of the study

The majority of teak saw-logs traders were reluctant to provide financial data associated with their business to the extent of causing unnecessary difficulties during data collection. To obtain the needed information the researcher had to visit and revisit tirelessly the traders' offices. This situation increased pressure of activities against the limited resources of time and finance of the study. However, the data were finally obtained after the traders were assured that the information they would provide is meant for academic research and their right of privacy would be highly respected.

CHAPTER FOUR
RESULTS AND DISCUSSION

4.1. Factors influencing auctioning and stumpage appraisal of teak saw-logs

4.1.1 Factors influencing auctioning

4.1.1.1 Source of the logs

It was found out that most of the teak saw-logs exporters preferred logs from Longuza forest plantation rather than logs from Mtibwa plantation forest. Eighty percent (80%) of the interviewed foresters noted that teak saw-logs exporters expressed special interests to logs from Longuza plantation forest and only 5% reported that the customers preferred logs from Mtibwa plantation while 15% of the respondents reported that customers had no preference (Table 4). They further observed that bidders bided competitively to win logs auctioned at Longuza plantation forest.

Table 4: Responses by foresters on source of the logs as one of the factors which influenced auctioning of the teak saw-logs

Factor	No. of respondents	Percentage
Source of the logs		
• Mtibwa plantation forest	2	5
• Longuza plantation forest	32	80
• Any source	6	15
Total	40	100

When exporters were asked for the reasons of their preference of logs from Longuza plantation forest they generally noted that logs auctioned at that plantation had few defects such as checks or splits at their ends compared to logs auctioned at Mtibwa plantation. They further observed that logs bought from Longuza plantation were of

higher quality and therefore, captured higher prices in the market than those purchased at Mtibwa plantation forest. This observation supports the results on Tables 19 and 20 which show that the purchase prices and FOB prices of the teak saw-logs auctioned at Longuza plantation in 2001/2002 and 2002/2003 were higher than the values of logs auctioned at Mtibwa plantation forest in the same years. Interviewed foresters from Longuza plantation forest reported that all logs auctioned at the plantation were harvested from dead trees. This report supports Myanmar's plantation teak trees girdling technique. Myanmar girdles its plantations teak trees and leaves them for three years before harvesting (Wint, 2000). This technique is believed to reduce timber defects such as end-splits or checks which, in most cases, happened to green harvested teak trees (Figure 2).



Figure 2: Splits at one end of a teak log at Mtibwa plantation forest

4.1.1.2 Floor price

Responses from foresters (100%) showed that the floor prices for the teak saw-logs auctioned at Mtibwa and Longuza plantation forests were low (Table 5). This

observation supports the findings in Tables 14a and 14b which show that the average floor prices per cubic metre in 2002/2003 for teak saw-logs auctioned at Mtibwa and Longuza forest plantations were TAS 23 202/m³ and TAS 54 159/m³ respectively, while the average purchase prices were TAS 47 099/m³ for logs from Mtibwa plantation and TAS 68 201/m³ for logs harvested from Longuza plantation. This implies that the traders were willing to buy the teak saw-logs beyond the producers' minimum prices by 51% for logs auctioned at Mtibwa plantation forest and 21% for logs auctioned at Longuza plantation forest. Interviewed foresters observed that one of the reasons for having low floor prices was that the logs auctioning floor prices were determined by the use of low royalty fees, LMDA and logging rates (Tables 3a and 3b). The foresters observed that these rates did not reflect the true values of the saw-logs. They further observed that price as an indicator of the value of a product has a significant influence to the minds of the buyers. Therefore, the floor price an auction conductor started with had a significant influence on the final selling price of teak saw-logs in the market.

Table 5: Responses by foresters on floor price as one of the factors influencing auctioning of the teak saw-logs

Factor	No. of respondents	Percentage
Floor price		
• High	0	0
• Moderate	0	0
• Low	40	100
Total	40	100

Further observations show that the FOB price and stumpage appraisal value in 2002/2003 for the logs auctioned at Mtibwa plantation were TAS 250 000/m³ and TAS 198 640/m³ respectively (Table 18a). On the other hand, logs purchased from

Longuza plantation in 2002/2003 had an average FOB price and appraisal stumpage value of TAS 270 000/m³ and TAS 208 078/m³ respectively (Table 18b). However, Table 14a indicates that the floor price for logs auctioned at Mtibwa plantation in 2002/2003 was only 9% of the price of the logs in the international market (FOB price). The results in Tables 14a and 18a on the other hand, show that the floor price of the logs was 12% of its actual value in 2002/2003. Furthermore, the floor price for logs auctioned at Longuza plantation in 2002/2003 (last auction) was 18% of its price in the international market (Table 14b), while Tables 14b and 18b show that the floor price was 23% of its actual value in 2002/2003. This implies that, the floor prices were relatively low. In the opinion of the foresters interviewed at the two plantations, starting with low floor prices in the auctions might have developed an impression to the minds of bidders that the logs were of low quality hence there was no need for them to bid competitively.

On the other hand, the majority of the interviewed teak saw-logs exporters (87.5%) reported that the floor prices of the logs auctioned in the two plantations were moderate (Table 6). These results indirectly indicate that the teak saw-logs customers were willing to buy the logs at prices above the floor price. This observation is supported by the results in Tables 14a and 14b which show that all auctioned logs were purchased above the set floor prices. However, 12.5% observed that the prices were high (Table 6). This is a common complain by businessmen, who always wish to buy high quality products at relatively low prices and sell them at high prices in order to maximize profit.

Table 6: Responses by exporters on floor price as one of the factors influencing auctioning of the teak saw-logs

Factor	No. of respondents	Percentage
Floor price		
• High	1	12.5
• Moderate	7	87.5
• Low	0	0
Total	8	100

4.1.1.3 Number of bidders

All interviewed foresters (100%) observed that the number of bidders who participated in the teak saw-logs auctioning at the two plantations was small (Table 7). They further observed that, the situation had negatively affected some auctions; because bidders were not competitive enough to raise the prices. The foresters reported that auctions attended by rich and many bidders were competitively live and therefore reduced collusion possibilities among bidders. Foresters from Longuza plantation further commented that in lively competitive auctions the saw-logs were raised to high prices and vice versa. This comment supports the results in Table 16b, which show two scenarios on how the number of bidders influenced auctioning of the teak saw-logs conducted at Longuza plantation forest. The Longuza foresters cited the 2002/2003 auction as the most uncompetitive auction. In that auction, bidders raised the floor price of 301 m³ consignment by only TAS 1 000 000. The consignment had a floor price of TAS 15 000 000 and was sold at TAS 16 000 000 (Table 16b). The respondents also noted that the most competitive auction conducted at their plantation was in 2001/2002, when bidders raised the floor price of 206 m³ consignment of teak saw-logs by TAS 11 050 000. The consignment had a floor price of TAS 15 000 000 and was sold at TAS 26 050 000 (Table 16b). The two

auctions final prices differed by TAS 10 050 000. This then, indicates that bidders were ten times competitive in the 2001/2002 auction compared to the 2002/2003 auction. The 2002/2003 auction comprised a consignment of a bigger volume than the 2001/2002 auction and the government expected to collect more revenue from the 2002/2003 auction than from the 2001/2002 auction (Table 16b). However, the Longuza respondents noted that one of the causes of these two situations was the difference in the number of bidders who participated in the two auctions. The 2001/2002 auction was attended by bidders from 15 different companies, while the 2002/2003 auction attracted bidders from only four companies. So, the foresters believe that there was collusion among bidders in the 2002/2003 auction. According to FAO (1983), the possibility of collusion among bidders is one of the drawbacks of auctioning pricing mechanism.

Table 7: Responses by foresters on number of bidders as one of the factors influencing auctioning of the teak saw-logs

Factor	No. of respondents	Percentage
Number of bidders who participated in the auction		
• Big	0	0
• Small	40	100
Total	40	100

4.1.1.4 Timber size, quality and quantity

The study revealed that most of the exported teak saw-logs (87.5%) were medium sized (Table 8). According to interviewed exporters, all the logs auctioned at Mtibwa and Longuza plantation forests between 1998/1999 and 2005/2006 were exported to India. This report supports the observation that teak products from Tanzania have potential market in India (MNRT, 2001). The exporters further revealed that all teak

saw-logs from Tanzania exceeded the minimum size required by saw-millers in India (2.5 m long and 20 cm mid-diameter). However, J. Kisanga one of the eight exporters revealed that the consignment he purchased in 2005/2006 comprised big logs. According to foresters from Mtibwa plantation the logs that Kisanga purchased were harvested from mature trees. On the other hand, 100% of the teak saw-logs exporters noted that although the supply of the teak saw-logs was monopolized by the state, it was still qualitatively low and quantitatively small (Table 8). The exporters also complained that the logs were inconsistently supplied. They further complained that this situation affected their businesses negatively because, they sometimes failed to honour their customers' big orders, as a result, some of their orders expired before exportation was done; this situation reduced their good trade reputation.

These observations support Ngaga *et al.* (1999) general comments that Tanzania has not established a strong timber production base to enable exports and attain uninterrupted flow. The teak saw-logs exporters commented that a good quality timber originates from a well managed plantation forest whereby all silvicultural practices such as pruning, thinning and felling were well and properly conducted. They therefore suggested, to improve the quality and quantity of teak timber from Tanzania's plantation forests. The state has to articulate some of the techniques which Myanmar (Burma) follows in managing her teak plantations. For example, Myanmar girdles its plantation teak trees and leaves them for three years before felling. This teak tree harvesting technique reduces the risk of having logs with many or big splits at their ends as it happened to many green harvested teak trees (Figure

2). Myanmar's teak products fetch higher prices in the international markets (Wint, 2000). On the other hand, interviewed forest officials from the FBD confirmed that most of saw-logs harvested from plantation forests in Tanzania are of low quality because the majority of the compartments were not properly tended due to insufficient personnel, funds and working equipments.

Table 8: Responses by exporters on timber size, quality and quantity as factors influencing the auctioning of the teak saw-logs in Tanzania

Factor	No. of respondents	Percentage
Size		
• Big	1	12.5
• Medium	7	87.5
• Small	0	0
Total	8	100
Quality		
• High	0	0
• Medium	8	100
• Low	0	0
Total	8	100
Quantity		
• Large	0	0
• Small	8	100
Total	8	100

4.1.1.5 Market structure

Only 10% of the interviewed foresters reported that the teak saw-logs in Tanzania were auctioned in a pure competitive market structure of a free economy (Table 9). They argued that auctioning operates more effectively in pure competitive market structure. They further argued that Tanzania tried her best to create a pure competitive market environment during the auctioning of the teak saw-logs at Mtibwa and Longuza forest plantations. The foresters explained that advertisement on the availability of the auctioned logs was done in different mass media and there were no restrictions for prospective buyers to participate in the auctioning. However,

25% of the interviewed foresters revealed that there was monopoly in the supply side of the teak saw-logs (Table 9). These respondents admitted that in Tanzania, there were no restrictions in the production of timber but, to date the state dominates timber supply. On the other hand, 65% of the interviewed foresters had the opinion that teak saw-logs in Tanzania were auctioned in the imperfect market structure of the mixed economy and therefore, interfered by monopoly, oligopoly and state laws and regulations governing prices. They observed that the auctioned teak saw-logs came from two sources but, owned by the state (Monopoly). Furthermore, logs from the two sources (plantations) were easily differentiated (oligopoly and monopolistic competition). These features therefore, deviated from the theories of pure competitive market structure in which auctioning operates more effectively (Refer section 2.3.1).

Table 9: Responses by foresters on market structure as one of factors influencing the auctioning of the teak saw-logs in Tanzania

Factor	No. of respondents	Percentage
Market structure		
• Pure competitive	4	10
• Pure monopoly	10	25
• Imperfect	26	65
Total	40	100

4.1.1.6 Advertisement and promotion

Table 10 shows that the majority (80%) of the interviewed foresters commented that the teak saw-logs were satisfactorily advertised. These foresters argued that before an auction is conducted, the availability of the teak saw-logs was advertised in various print and electronic mass media (Appendix v). However, consignments which did not exceed 100 m³ their availability and the intension to auction them were advertised to

the surrounding local communities to avoid high advertisement cost. On the other hand, the remaining 20% of the interviewed foresters had the opinion that the logs were not satisfactorily advertised. The latter argued that the act of advertising consignments with less than 100 m³ to the surrounding local communities discriminated potential bidders who could have actively participated in the auctions and raise the prices of the consignments. It was found out that of the 12 teak saw-logs auctions conducted, five auctions in Tanzania comprised consignment of less than 100 m³ (Tables 16a and 16b).

Table 10: Responses by foresters on advertisement and promotion as one of the factors influencing the auctioning of the teak saw-logs in Tanzania

Factor	No. of respondents	Percentage
Advertisement		
• Satisfactory	32	80
• Not satisfactory	8	20
Total	40	100
Promotion		
• Satisfactory	2	5
• Not satisfactory	38	95
Total	40	100

On the other hand, most of the interviewed foresters (95%) admitted that there were no serious efforts made to promote to the international markets the availability of teak saw-logs in Tanzania in terms of their quantity and quality (Table 10). They noted that the promotion of forest products concentrated to the local markets, and the most promoted forest products were products of the secondary and tertiary levels including for example lumber, fibreboards and chipboards. They further noted that the only notable international forest products promotional activities done by FBD was its participation to the locally conducted annual international exhibitions (Saba

Saba) taking place at Mwalimu Nyerere memorial grounds in Dar es Salaam. It was found out that FBD participated only once, at the international exhibition which took place in Tokyo Japan in 2003/2004.

4.1.2 Factors influencing stumpage appraisal

This study revealed that the stumpage appraisal is the least known (12.5%) timber pricing mechanism among many foresters in Tanzania (Table 11). The most known (100%) timber pricing mechanisms were royalty fee and public auctioning, followed by tendering (62.5%) (Table11). The observation supports Monela and Kowero (1991) comments that royalty fee, tendering and public auctioning were the most commonly applied timber pricing mechanisms in Tanzania. It was found out that stumpage appraisal timber pricing method is less known among many foresters in Tanzania because the approach is not covered in diploma and certificate levels' syllabus, while the forestry working force is dominated by certificates and diploma holders.

Table 11: Responses by foresters on the knowledge they have on timber pricing mechanisms

Factor	No. of respondents	Percentage
Type of pricing mechanism		
• Royalty fee	40	100
• Public auctioning	40	100
• Tendering	25	62.5
• Stumpage appraisal	5	12.5

However, those few foresters who were conversant with the stumpage appraisal method, identified the sizes, quantity and quality of harvested trees, logging technique, terrain and stand density, and the final price of the logs as the factors that

could have influenced the stumpage value of the teak saw-logs to be calculated through the stumpage appraisal method (Table 12). However, interviews with the teak saw-logs exporters, revealed that the purchasing costs, transport means, haulage distance and its condition, the logs FOB prices, depreciation rate, profit and risk allowances were additional factors influencing the appraisal stumpage values of the teak saw-logs.

4.1.3 Size, quantity and quality

Results in Table 12 show that all five out of 40 interviewed foresters (12.5%) confirmed that sizes, quantity and quality of the logs had an influence on the appraisal stumpage values of the teak saw-logs auctioned between 1998/99 to 2005/2006. The respondents observed that under normal circumstances, big-good logs fetch higher prices in the market. This observation supports the results in Tables 18a and 18b, which show an increasing trend of both FOB price and the appraisal stumpage value of the teak saw-logs. However, the observation is not in favour of the results in Tables 16a and 16b (10th column), which show a fluctuation of the auctioning final prices.

Table 12: Responses by foresters on factors influencing the appraisal stumpage value

Factor	No. of respondents	Percentage
Timber size, quality, and quantity	5	100
Logging techniques	5	100
Terrain	5	100
Stand density	5	100

4.1.4 Logging technique, ground and stand conditions

Table 12 also shows that all the five foresters conversant with the stumpage appraisal timber pricing mechanism were aware that the logging techniques employed, terrain and stand density were among the factors influencing the appraisal stumpage value of the teaks saw-logs. These foresters observed that the type of logging technique used influenced the felling costs, and the ground and stand conditions, and these had an impact on skidding costs. They elaborated that trees felled by modern logging tools had high felling costs and vice versa; while densely stocked stand locate on steep terrain had high skidding costs. Felling and skidding costs form the logging costs. Logging costs were one of the components used to determine the floor price of the teak saw-logs (Table 3a and 3b). The floor price had an influence on the purchase price which was part of the exporters' investment costs. The investment cost was one of the costs deducted from the FOB price of the teak saw-logs when calculating the appraisal stumpage value of the logs (Tables 18a and 18b). Therefore, logging technique, ground and stand condition had an indirect influence on the appraisal stumpage value of the teak saw-logs.

Table 13: Responses by exporters on factors influencing the appraisal stumpage value

Factor	No. of respondents	Percentage
Transportation means		
• Truck	8	100
• Railways	0	0
• Waterways	0	0
Total	8	100
Haulage distance		
• Long	8	100
• Short	0	0
• Medium	0	0
Total	8	100
Haulage distance condition		
• Good	0	0
• Fair	8	100
• Bad	0	0
Total	8	100

4.1.5 Transport means, haulage distance and condition

The results in Table 13 show that all teak saw-logs that the exporters purchased from both plantations were transported to Dar es Salaam by trucks, whereas the export was done through the port harbour. However, the exporters argued that they incurred higher costs by transporting the logs using trucks than if they could have used railways or waterways because there was a continuous increase in trucks fuel, oils, lubricants and spares. The exporters also reported that the sources of teak saw-logs (plantation forests) were located far from the export point. However, all the export respondents observed that the haulage distance condition was fairly good (Table 13). All these factors increase the transport costs of the teak saw-logs. For example, it was found out that in average terms, transport costs of the teak saw-logs contributed 45% and 42% of the total trading costs for the logs auctioned at Mtibwa and Longuza plantation forests respectively (Tables 17a and 17b). The trading cost is one of the factors deducted from the FOB prices of the teak saw-logs during the calculation of the appraisal stumpage value of the logs (Tables 18a and 18b).



Figure 3: A truck full of teak saw-logs from Mtibwa plantation forest

4.1.6 Freight on Board (FOB) price

The Freight on Board (FOB) prices were the bases of calculating the appraisal stumpage value of the teak saw-logs. Other factors influencing the appraisal stumpage value of the saw-logs were deducted from the FOB prices (Table 18a and 18b). Under normal circumstances logs of high FOB prices had bigger appraisal stumpage values and vice versa.

However, the FOB prices for teak saw-logs in the international market differ according to their sources, market place and their qualities. For example, the average FOB prices per cubic metre of teak saw-logs from Myanmar's plantation forests exported to Great Britain was 200£/m³, which was equivalent to about 500USD/m³ in 2006, while plantation teak saw-logs from Guatemala and Ghana exported to India in the same year had an average FOB price of 255US\$/m³ and 200USD/m³ respectively (Wint, 2000). According to Tanzania's teak saw-logs exporters and officials from the FBD, the average FOB price for teak saw-logs exported to India was 300UDS/m³ in

2006. This shows that if the teak plantations in Tanzania were well managed they could have produced high quality timber and, could have competitively penetrated the international market compared to other non-native teak producing countries in Africa.

Table 14a: Floor, Final and FOB prices for logs purchased at Mtibwa plantation forest

Customer name	Trigon Exporters	Trigon Exporters	Mohamed Enterprise	Adept Impex	Ceilmac (T) Ltd	Fibreboard (2000) Ltd	Ceilmac (T) Ltd	J. Kisanga
Year	1998/99	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Floor price (TAS/m3)	47 544	40 000	43 478	33 465	23 202	56 980	41 176	80 000
Purchase price (TAS/m3)	59 826	45 200	58 090	39 764	47 099	112 536	49 412	108 000
FOB price (TAS/m3)	216 000	230 000	240 000	240 000	250 000	270 000	270 000	300 000

Table 14b: Floor, Final and FOB prices for logs purchased at Longuza plantation forest

Customer name	Samata Ltd	Ceilmac (T) Ltd	Olam (T) Ltd	Ceilmac (T) Ltd
Year	2001/02	2002/03	2002/03	2002/03
Floor price (TAS/m3)	72 816	56,524	62,500	49 834
Purchase price (TAS/m3)	126 446	90,800	83,638	53 136
FOB price (TAS/m3)	270 000	270 000	270 000	270 000

4.1.7 Depreciation and profit and risk allowances

The depreciation and profit and risk allowances were useful during calculating the appraisal stumpage value as shown in Tables 18a and 18b. However, it was found out that financial institutions in Tanzania charged interest rates ranging between 18% and 21% to their loaners (Table 15). Eighteen percent (18%) was selected as the depreciation rate used when calculating the appraisal stumpage value of the teak saw-logs in this study, because, a wise loaner will always opt to loan from a financial institution which charges the lowest interest rate. It was also found out that all the teak saw-logs exporters set 15% of their investment capital as the rate that covered profit and risk allowances (Table 15).

Table 15: Interest rates charged by financial institutions and Profit and risk allowances set by Teak saw-logs exporters

Factor	Interest rate	Profit and risk allowance
NMB	18%	
CRDB	18%	
EB	21%	
ACB	21%	
Teak saw-logs exporters		15%

4.2 Teak saw-logs production and trading cost

4.2.1 Teak saw-logs production costs

According to interviewed foresters (producers), the main costs incurred during the production of teak saw-logs were; forest management and logging costs.

4.2.1.1 Forest management costs

It was found out that in both Mtibwa and Longuza plantation forests, the officials adhered to the government set LMDA rate of TAS 3400/m³ (Tables 16a and 16b 5th column). It was further found out that the per cubic metre floor and the purchase prices of logs auctioned at Mtibwa plantation forest in the most recent auction (2005/2006) was TAS 80 000/m³ and TAS 108 000/m³ respectively (Table 14a). Therefore, the LMDA rate for logs auctioned at Mtibwa plantation forest contributed about 4% and 3% respectively of the floor and purchase prices in that year. For the case of Longuza plantation forest, the most recent auction (2002/2003) floor price of the teak saw-logs was TAS 49 834/m³, while the purchase price of the logs was TAS 53,136/m³. Therefore, the LMDA rate contributed 7% of the average floor price and 6% of the average purchase price of the saw-logs (Tables 14b). This finding supports the observations made by both foresters and the logs exporters in section 4.1.1.1 that Longuza plantation forest produced logs of higher value than those produced at Mtibwa plantation forest.

Table 16a: Teak saw- logs production costs at Mtibwa plantation forest

Year	No. of logs	Volume (m ³)	Royalty (TAS)	Forest management costs (TAS)	Logging Cost (TAS).	Profit margin (TAS.)	Auction floor price (TAS)	Final Auction price (TAS)	Final price (TAS/m ³)	Winner
1998/1999	1 883	631	15 383 850	2 144 054	7 125 825	3 698 057	30 000 000	37 750 000	59 826	Traigon Exports
1999/2000	1 120	375	9 147 551	1 274 898	4 237 161	2 198 940	15 000 000	16 950 000	45 200	Traigon Exports
2000/2001	136	46	1 113 456	155 183	515 755	267 659	2 000 000	2 700 000	58 696	Mohamed Interprice
2001/2002	1656	254	3 858 222	862 138	2 865 341	1 137 855	8 500 000	10 100 000	39 764	Adept Impex Cielmac Ltd
2002/2003	5070	862	14 180 530	2 904 504	9 653 208	4 010 936	20 000 000	40 600 000	47 099	Fibreboard 2000 Ltd
2003/2004	1605	351	7 338 150	1 192 417	7 119 433	2 347 500	20 000 000	39 500 000	112 536	Cielmac Ltd
2004/2005	540	85	7 943 390	288 510	1 272 840	525 711	3 500 000	4 200 000	49 412	Dsm
2005/2006	240	100	7 311 790	339 575	1 598 000	1 387 405	8 000 000	10 800 000	108 000	J.Kasanga
TOTAL	12 250	2 704	60 276 939	9 161 279	34387563	15 574 062	107 000 000	162 600 000		
Average	1 532	338	22 315	3400	12 731	5766	39 613	60 133		

Table 16b: Teak saw-logs production costs at Longuza plantation forest

Year	No. of logs	Volume (m ³)	Royalty (TAS)	Forest Management costs (TAS)	Logging Cost (TAS)	Profit margin (TAS)	Auction floor price (TAS)	Final Auction price (TAS)	Final price (TAS/m ³)	Winner
2001/2002	666	206	4 828 710	701 253	2 359 100	1 183 359	15 000 000	26 050 000	126 446	Samata Ceilmac (T) Ltd
2002/2003	894	168	5 194 270	571 214	1 921 630	1 153 077	10 000 000	15 255 000	90 800	Olam (T) Ltd
2002/2003	160	48	1 499 006	164 846	554 560	332 762	3 000 000	4 005 000	83 638	Ceilmac (T) Ltd
2002/2003	1031	301	9 291 060	1 021 737	3 437 245	2 062 506	15 000 000	16 000 000	53 136	Ceilmac (T) Ltd
TOTAL	2691	723	20 813 046	2 459 050	8 272 533	4 731 704	43 000 000	61 310 000		
Average	673	181	28 777	3400	11,438	6,642	59 454	84 800		

4.2.1.2 Logging costs

This study revealed that the logging costs for Mtibwa and Longuza plantation forests in 2002/2003 were TAS 11 199/m³ and TAS 11 419/m³ respectively (Table 16a and 16b). However, these logging costs differed from the state set rate of TAS 11 300/m³. The true logging cost for logs produced at Mtibwa plantation was 1% below the official rate. This logging cost contributed 49% of the floor price and 24% of the final price in that year's auction. On the other hand, the actual logging cost for logs sold at Longuza plantation in 2002/2003 was 1% higher than the official rate of TAS 11 300/m³, and it contributed 23% and 21% to the floor and final prices respectively.

4.2.2 Teak saw-logs trading costs

The saw-logs trading costs comprises investment, transportation, export and overhead costs (Table 16a and 16b).

4.2.2.1 Investment costs

It was found out that the most recent auction's (2005/2006) investment costs for teak saw-logs purchased at Mtibwa forest plantation was TAS 120 000/m³ (Table 17a). This investment cost is 47% of the total trading cost incurred by the exporter (J Kisanga). For the case of Longuza plantation, the most recent auction's (2002/2003) investment cost was TAS 75 000/m³ (Table 17b). This investment cost is 33% of the total trading cost incurred by the exporter (Ceilmac (T) Ltd). According to the exporters the investment costs comprise the costs they incurred when they travelled to either Mtibwa or Longuza plantation forests for the purposes of assessing the logs on sale in order to decide whether or not to participate in the actual auctioning. They

also noted that they had to travel again to the plantations during the auctioning days. Another component of the investment costs was the cost paid to FBD if an exporter beat other bidders at an auction and became the winner.

Table 17a: Teak trading costs for the teak saw-logs purchased at Mtibwa plantation forest

Customer name	Trigon Exporters	Trigon Exporters	Mohamed Enterprise	Adept Impex	Ceilmac (T) Ltd	Fibreboard (2000) Ltd	Ceilmac (T) Ltd	J. Kisanga
Year	1998/99	1999/2000	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06
Investment cost (TAS/m ³)	88 250	80 500	81 250	81 700	67 000	113 000	69 500	120,000
Transport cost (TAS/m ³)	70 000	80 000	80 000	80 000	85 000	85 000	100 000	84,000
Export cost (TAS/m ³)	21 000	24 000	28 000	26 000	30 000	26 000	40 000	21,000
Overhead cost (TAS/m ³)	15 000	18 000	20 000	20 000	25 000	25 000	50 000	30 000
Total	194 250	202 500	209 250	207 700	207 000	249 000	279 500	255 000

Table 17b: Teak trading costs for the teak saw-logs purchased at Longuza plantation forest

Customer name	Samata Ltd	Ceilmac (T) Ltd	Olam (T) Ltd	Ceilmac (T) Ltd
Year	2001/02	2002/03	2002/03	2002/03
Investment cost (TAS/m ³)	146 000	115 800	112 400	74 900
Transport cost (TAS/m ³)	70 000	80 000	80 000	90 000
Export cost (TAS/m ³)	30 000	30 000	30 000	30 000
Overhead cost (TAS/m ³)	30 000	30 000	40 000	30 000
Total	276 000	255 800	262 400	224 000

4.2.2.2 Transport cost

It was found out that the transport costs of the teak saw-logs differed between auctions conducted in the same plantation and between the plantations (Tables 17a and 17b). However these transportation costs were increasing with time. This trend supports the exporters' observation in section 4.1.2.3 that transportation by trucks is expensive due to the continuous changes in prices of fuel, lubricants and spares. For example, the most recent auction's (2005/2006) transport cost for teak saw-logs purchased at Mtibwa plantation forest was TAS 84 000/m³ (Table 17a). This cost is 33% of the total trading cost incurred by J. Kisanga in 2005/2006. On the other hand, the most recent auction's (2002/2003) transport costs for the teak saw-logs purchased at Longuza plantation forest is TAS 90 000/m³ (Table 17b). However, this cost contributed 40% of the total trading cost incurred by Ceilmac (T) Ltd in 2002/2003.

4.2.2.3 Export costs

According to the teak saw-logs exporters, the export costs included grading, custom duty, storage and package costs. Grading and custom duty fees were fixed by the government while storage and package costs were fixed by the service providers.

Exporters paid TAS 20 000 per consignment whose value does not exceed US\$ 300 or TAS 300 000. Such consignment was considered as gifts, personal effects, trade sample or non-commercial consignments. However, consignments whose values exceed US\$ 300 or TAS 300 000 were considered as commercial consignments and an exporter had to pay TAS 50 000 as a grading fee per consignment. A consignment measures either 20m³ or 20 tonnes.

This study found out that the 2005/2006 (the most recent auction) export cost for teak saw-logs purchased at Mtibwa plantation was TAS 21 000/m³ (Table 17a). This contributed 8% of the total trading cost incurred by the winner of the auction conducted in that year. However, the exporter who won the latest (2002/2003) auction conducted at Longuza plantation forest, paid TAS 30 000/m³ (Table 17b). This export cost contributed 13% of the total trading costs incurred by Ceilmac (T) Ltd. From these data then, all exported teak saw-logs consignments were for commercial purposes.

4.2.2.4 Overhead cost

According to teak saw-logs export respondents the overhead costs included administrative and personnel emolument. It was found out that the overhead costs fluctuated among customers and between the two plantations. The highest overhead cost for logs purchased at Mtibwa plantation was in 2004/2005 when Ceilmac paid TAS 50 000/m³ (Table 17a). According to Ceilmac (T) Ltd officials, this high overhead cost was brought about by the abrupt suspension of saw-logs exportation (including teak saw-logs) made by the government in 2004/2005. However, the

overhead costs stood at TAS 30 000/m³ in the plantations' most recent auctions. These costs contributed 12% and 13% of the total trading costs for Mtibwa and Longuza plantations respectively.

4.3. Calculating the appraisal stumpage values per cubic metre of the teak saw-logs

Tables 18a and 18b present the appraisal stumpage values of the teak saw-logs auctioned at Mtibwa and Longuza plantation forests between 1998/1999 and 2005/2006 using Leslie (1972) formula below (Definitions are provided in Chapter Three).

$$S = \frac{YP}{100} - \left\{ L + \frac{Y}{100} \left[M + \frac{0.DF}{V} + 0.R. \frac{(F+W)}{V} \right] \right\}$$

From the formula

- The weighted average recovery percent ($Y/100$) = 1, because in this study the customer bought saw-logs and not standing timber and the stumpage value calculated was for teak saw-logs and not standing timber or sawn-wood.
- The direct milling cost per unit volume of round-wood (L) is 0 because the materials studied were saw-logs.
- The direct milling cost per unit volume of product (M) is also 0 because the purchased logs are not further processed before selling. That is, the purchased and sold products are in the same form.

Therefore, $S = P - \{[0.DF + 0.R.[F + W]]\}$

Table 18a: The appraisal stumpage value (TAS/m³) of the teak saw-logs auctioned at Mtibwa plantation forest

Year	Depreciation (D) in %	Profit and risk (R) in %	Investment /fixed cost (F) (TAS/m ³)	Working cost (W) (TAS/m ³)	FOB price (P) (TAS/m ³)	Stumpage value (S) (TAS/m ³)
1998/99	18	15	88 250	152 750	216 000	163 965
1999/2000	18	15	85 500	174 000	230 000	175 610
2000/01	18	15	81 250	178 000	240 000	186 488
2001/02	18	15	81 700	173 300	240 000	187 044
2002/03	18	15	67 000	195 000	250 000	198 640
2003/04	18	15	133 500	210 000	270 000	194 445
2004/05	18	15	69 500	298 000	270 000	202 365
2005/06	18	15	140 000	232 000	300 000	219 000
Average			93 338	201 694	252,000	190 945

Table 18b: The appraisal stumpage value (TAS/m³) of the teak saw-logs auctioned at Longuza plantation forest

Year	Depreciation (D) in %	Profit and risk (R) in %	Investment /fixed cost (F) (TAS/m ³)	Working cost (W) (TAS/m ³)	FOB price (P) (TAS/m ³)	Stumpage value (S) (TAS/m ³)
2001/02	18	15	146 000	187 300	270 000	193 725
2002/03	18	15	115 800	186 200	270 000	203 856
2002/03	18	15	112 400	207 500	270 000	201 783
2002/03	18	15	74 900	178 000	270 000	218 583
Average	18	15	112 275	189 750	270 000	204 487

One of the observations in Tables 18a and 18b is that the appraisal or residual stumpage value of the teak saw-logs generally increased with time, a trend slightly also shown by the logs FOB prices. However, in 2003/04 there was a slight fall in the stumpage value of the teak saw-logs purchased at Mtibwa forest plantation. This situation was caused by the sudden suspension of exportation of saw-logs (including teak saw-logs) imposed by the government in 2004/2005 due to illegal and severe forest harvesting for saw-logs especially from the southern part of the country's natural forests. The situation affected negatively the timber export industry including teak saw-logs exports because it increased the working costs and consequently reduced the calculated appraisal stumpage value. Furthermore, the data also show

that teak saw-logs from Longuza forest plantation had higher value than logs from Mtibwa plantation. For example, teak logs from Longuza plantation had FOB price of TAS 270 000/m³ in 2001/2002 while those logs from Mtibwa plantation had FOB price of TAS 250 000/m³ a difference of about 7% in the same year.

4.4 Comparison between royalty fee, auction and stumpage appraisal values

After calculating the appraisal stumpage value of teak saw-logs auctioned between 1998/1999 and 2005/2006, a comparison was made among royalty fee, public auctioning and stumpage appraisal timber values in order to know which pricing mechanism could have generated more income to the teak saw-logs producers than the others. The comparison was based on prices per cubic metre of each pricing mechanism (Tables 19 and 20 and Figure 4).

Table 19: Comparison of Price/m³ of Royalty, Auction and Stumpage appraisal timber pricing mechanisms for teak saw-logs auctioned at Mtibwa plantation Forest

Year	Royalty fee (TAS/m³)	Auctioning (TAS/m³)	Stumpage appraisal (TAS/m³)	FOB price (TAS/m³)	Royalty fee as % of Auctioning	Royalty fee as % of Stumpage appraisal value	Auctioning as % of stumpage appraisal value	Stumpage appraisal value as % of FOB price
1998/99	24 395	59 860	163 965	216 000	40	14	36	76
1999/2000	24 395	45 170	175 610	230 000	54	14	26	76
2000/01	24 395	58 333	186 488	240 000	41	13	31	77
2001/02	15 216	39 800	187 044	240 000	38	8	21	78
2002/03	16 452	47 059	198 640	250 000	34	8	23	83
2003/04	20 924	112 628	194 445	270 000	18	11	58	75
2004/05	27 440	46 496	202 365	270 000	55	14	24	78
2005/06	55 759	108 000	219 000	300 000	51	25	41	73
Average	26 121	56 060	190 945	252 000	40	14	34	77

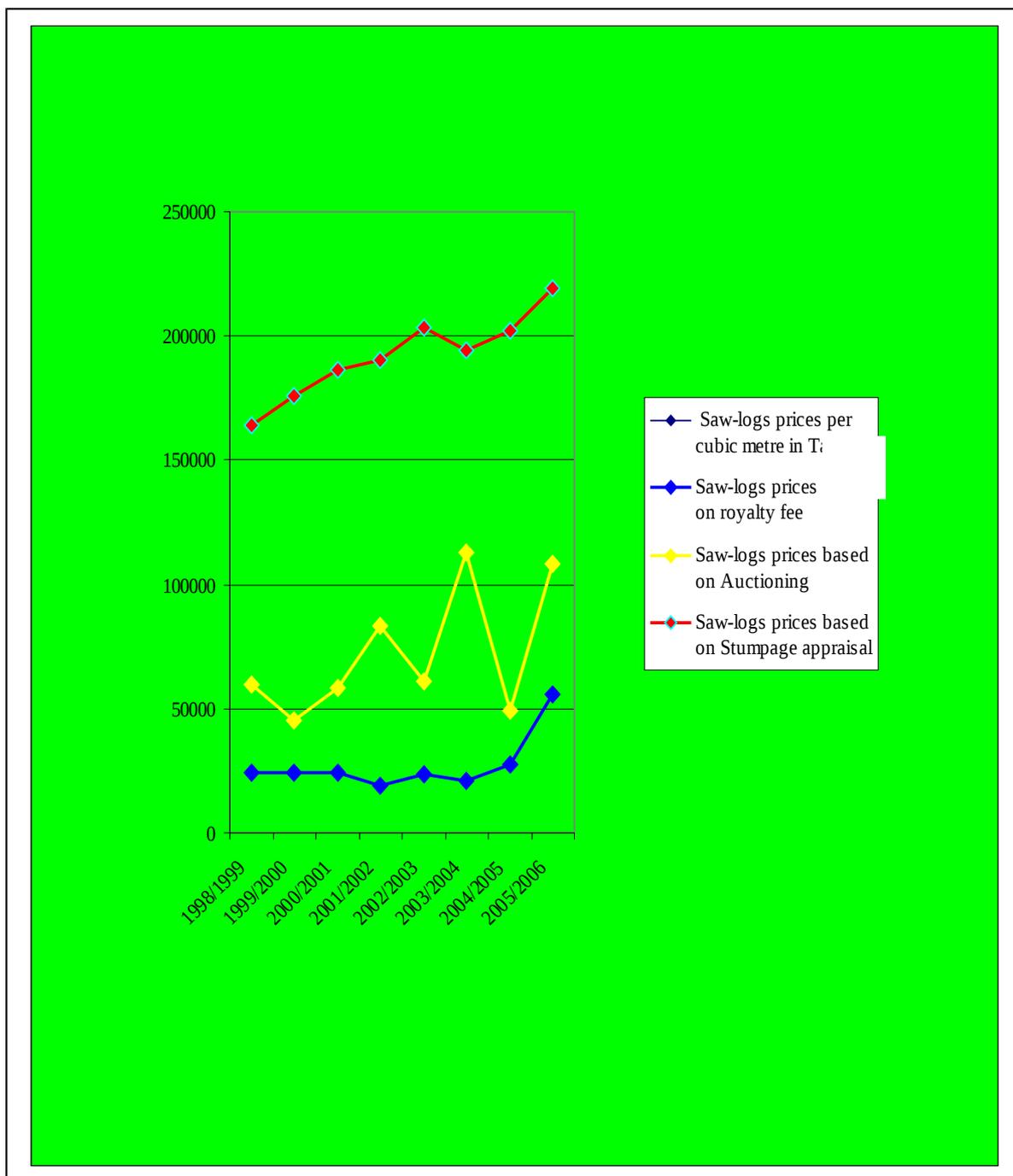


Figure 4: Comparison among royalty fee, Auctioning and Stumpage appraisal pricing mechanism

The results in Table 19 show two situations, one, if the teak saw-logs in 2005/2006 (the latest auction) were sold using royalty fee the revenue per cubic metre that could have been accrued would have been 51% of the revenues per cubic metre accrued by auctioning. Second the same royalty fee revenue would have been 25% of the revenues that would have been accrued if the logs were sold using stumpage appraisal method. The first situation supports observations by Iddi (2003) that by auctioning the forest products the government increased its revenue. Furthermore, the revenue accrued through auctioning logs was 41% of the appraisal stumpage value of the teak saw-logs in 2005/2006. On the other hand, the stumpage appraisal value of the logs in the same year was 73% of the FOB price of the logs. This observation indicates that the appraisal stumpage pricing approach determines timber value at a stump site closer to its market price than the royalty fee and public auctioning pricing mechanisms. This observation is supported by FAO (1983) comment, that the appraisal stumpage value represents the maximum price that an efficient buyer is willing to pay for the timber available at the production site. FAO also observes that the appraisal stumpage value is used as the floor price during timber auctioning in the USA.

Table 20: Comparison of Price/m³ of Royalty fee, Auction and Stumpage appraisal timber pricing mechanisms for teak saw-logs auctioned at Longuza plantation forest

Year	Royalty fee (TAS/m³)	Auctioning (TAS/m³)	Stumpage appraisal (TAS/m³)	FOB price (TAS/m³)	Royalty fee as % of Auctioning	Royalty fee as % of Stumpage appraisal value	Auctioning as % of stumpage appraisal value	Stumpage appraisal value as % of FOB price
2001/02	23 412	126 302	193 725	270 000	18	12	65	71
2002/03	30 918	90 801	203 856	270 000	34	15	44	75
2002/03	30 918	82 604	201 783	270 000	37	15	41	75
2002/03	30 918	52 241	218 583	270 000	59	14	24	81
Average	26 211	65 060	204 487	270 000	33	14	43	75

Table 20 presents the case for Longuza plantation forest. If the logs could have been sold by using royalty fee pricing method in the last auctioning in 2002/2003, the government could have accrued only 59% of the revenue it collected by auctioning the logs; and 14% of the appraisal stumpage value of the logs. However, in the same auctioning, the final price was 24% of the appraisal stumpage value. And the stumpage appraisal value is 81% of the FOB price of the logs. The royalty fee per cubic metre in Longuza plantation was constant in the last three auctions because these auctions were conducted in the same year. But, the purchase price per cubic metre showed a descending trend; a situation explained by foresters working at the plantation as being caused by uncompetitive auctions. The appraisal stumpage values showed an increasing trend, although the FOB prices had a constant value of Tsh. 270 000/m³ in all the four auctions conducted in the plantation. The reason for this was that these auctions were conducted in two successive years hence there were no significant economical and social changes to influence a change in price.

The per cubic metre royalty fees in Tables 19 and 20 in 2002/2003 were Tsh. 16 452/m³ and Tsh. 30 918/m³ for teak saw-logs purchased at Mtibwa and Longuza plantation forests respectively. This is a difference of Tsh. 14 466/m³. This means that the royalty fee for logs purchased at Mtibwa plantation is 53% of the royalty fee of logs purchased at Longuza in that year. On the other hand, the purchase prices for logs purchased at Mtibwa plantation in 2002/2003 was TAS 47 099/m³ while, for the logs purchased at Longuza plantation, the price was TAS. 53 135/m³ (Tables 14a and 14b). It means therefore that the purchase price for logs purchased at Mtibwa plantation is 89% of the price of the logs purchased at

Longuza plantation in the same year. Furthermore, the FOB prices for the two plantation forests stood at TAS 250 000/m³ for Mtibwa plantation and TAS 270 000/m³ for Longuza plantation (Tables 19 and 20). Therefore, the FOB price per cubic metre for logs purchased at Mtibwa plantation is 92% of FOB price of the logs purchased at Longuza plantation. The data prove the fact that the teak saw-logs from Longuza plantation forest had higher values than those from Mtibwa plantation forest; and for this reason, many exporters preferred logs from Longuza plantation forest (Table 4 section 4.1.1.1).

However, before suggesting whether or not to raise the price of the teak saw-logs to the appraisal stumpage value basing on the data provided by exporters we must find out the impact of the decision we will opt on the teak saw-logs trading. So, comparisons between the logs' trading costs and the appraisal stumpage value against the FOB price were made to find out if the business will be economically viable if charges of the logs are based on the appraisal stumpage value. For example the total trading cost (TAS 255 000/m³) of the teak saw-logs auctioned in 2005/2006 at Mtibwa plantation forest (Table 17a) was compared against the logs FOB price (TAS 300 000/m³) in Table 14a. It was found out that the trading cost was 85% of the FOB price, meaning that the trader made a profit of 15% of his investment capital by purchasing the logs through auctioning. On the other hand, the appraisal stumpage value of the same logs was found to be 73% of the FOB price (Table 19). This last comparison suggests that for an exporter to realise profit under the auctioning pricing mechanism trading costs should not exceed 27% of the FOB price. However, the trading cost was found to be 85% of the FOB price (from first comparison), a value

which is far above the maximum allowable percentage (27%) if an exporter decided to remain in business even if he makes no profit. The above information then, suggest that charging the teak saw-logs basing on the appraisal stumpage value will negatively affect the exporters despite the fact that it will increase revenues to producers.

But, Table 2 (2nd row, 3rd column) show that the winner of the 2005/2006 tendering paid TAS 174 000/m³ of standing teak trees at Mtibwa plantation forest regardless the logging cost that he will incur. However, this purchase price is 86% the of appraisal stumpage value (TAS 202,365/m³) of logs auctioned in the same year (Table 19). Furthermore, if adding the government set logging costs (TAS 11,300/m³) to the purchase price (TAS 174 000/m³) and the total sum (TAS 185,300/m³) is compared to the appraisal stumpage value of the logs (TAS 202 365/m³) auctioned in 2005/2006 it shows that this total sum is 92% of the appraisal stumpage value. This data suggest two situations, one, even if the teak saw-logs prices are raised to the stumpage value the exporters will still realise profit in their business. Second, one can develop doubt on the degree of accuracy of the data provided by the private sector. This observation supports Ngaga (1991) comments that the private sector, in many cases, is reluctant to disclose its real costs. The private sector treats profit as a secret information of their companies. And in most cases the private sector exaggerates its trading costs to seal off the actual profit it makes out of its business. However, no one has yet established to what extent the private sector exaggerates/increases its trading costs.

Therefore, this study suggests that the prices of the teak saw-logs be raised to the appraisal stumpage values. However, to avoid such unreliable data (provided by the private sector) in the future, the calculation of the appraisal stumpage values should be based on raw data rather than on the secondary data provided by the private sector. That is, a researcher or FBD staff has to be provided with a number of sample trees, process them to the final product. And therefore, the data provided by the private sector should be a compliment to the raw data collected from the forests.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The current study generally found out that although Tanzania sold her teak saw-logs by public auctioning and accrued more revenues than what it could have accrued if it used the royalty fee pricing mechanism, however, the country has not yet established suitable conditions for pure competitive market structure to operate effectively in which public auctioning and/or tendering pricing mechanisms are favoured most. Therefore, in order to accrue more revenues than those which can be realised by the use of royalty fee and, public auctioning or tendering pricing mechanisms, the appraisal stumpage value pricing mechanism could be used as a means of setting floor prices during the application of public auctioning and/or tendering pricing mechanisms. The study also found out that the government undercharges her teak saw-logs management costs in the local market to the extent of not reflecting the actual values they are set for. The undercharging was caused by the low government rates of royalty fees and LMDA and, logging costs. The exporters on the other hand, exaggerated their trading costs to seal off their profit. Such situations caused unfair teak saw-logs trading transactions in Tanzania.

The study found out further that the calculated stumpage values of the teak saw-logs in Tanzania obtained through royalty fee, public auctioning and/or tendering and appraisal stumpage values pricing mechanisms differ significantly. The highest value was that obtained from appraisal stumpage approach followed by public auction

and/or tendering and the least being from royalty fee. However, despite the benefits of the application of the appraisal stumpage value pricing mechanism, many foresters in Tanzania are not conversant with the approach compared to royalty fee, auctioning or tendering approached. Also, the study revealed that the appraisal stumpage value estimates timber value at production site closer to the market price therefore, using it will make timber producers generate more revenues.

5.2 Recommendations

1. The government should review the royalty fees, LMDA and logging rates so that they present the actual value they are set for. Also, the government should set well-defined criteria that should be followed when reviewing these rates and the duration in which the rates should be in use.
2. The government should use the appraisal stumpage values as a floor price when auctioning publicly or tendering its timber. However, before adopting that approach, the government should undertake a special research programme to determine the appraisal stumpage value of her plantation forests timber.
3. The FBD should review the training syllabus for certificate and diploma courses to incorporate the application of stumpage appraisal timber pricing mechanism.

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APPENDICES

Appendix i: Questionnaire for teak saw-logs producers

A. Identification variables

Questionnaire number -----

- 1. Date of interview -----
- 2. Name of respondent -----
- 3. Address of respondent -----
- 4. Position in the plantation -----

B. Information about teak saw-logs production

- 1. Name of the teak plantation forest -----
- 2. When was it established -----
- 3. What is the current total area of the plantation-----
- 4. Has auctioning of teak saw-logs took place in your plantation
Yes ()
No ()
- 5. If **yes**, how many auctions of teak saw-logs have been conducted at your plantations?
 - a. Once
 - b. Twice
 - c. Three times
- 2. Who were the winners
- 3. How many bidders participated in each auction
- 4. Was the auction fairly conducted

Yes ()

No ()

5. Was it competitive enough?

Yes ()

No ()

6. What are your reasons for the question above-----

7. What other timber pricing mechanisms (Out of auctioning) do you know which can be applicable in Tanzania

i. -----

ii. -----

iii. -----

iv. -----

8. What activities and their costs were involved in teak saw-logs production

i. Activity ----- Cost (TAS/m³) -----

ii. Activity ----- Cost (TAS/m³) -----

iii. Activity ----- Cost (TAS/m³) -----

iv. Activity ----- Cost (TAS/m³) -----

9. What is the recovery ratio of your product (from standing timber to saw-logs)

10. What were the prices per cubic metre (TAS/m³) -----

15. What are the problems you experienced in the production of teak saw-logs

i. -----

ii. -----

iii. -----

iv. -----

16. What is your opinion to improve the production of teak saw-logs in

Tanzania?

Name of the plantation forest -----

Appendix ii: Questionnaire for teak saw-logs exporters

B. Identification variables

Questionnaire number -----

5. Date of interview -----
6. Name of respondent -----
7. Address of respondent -----
8. Position in the company -----

B. Information about trading of teak saw-logs

6. How many times have you purchased teak saw-logs from national forest plantations?
 - a. Once
 - b. Twice
 - c. Three times
7. From which plantation
 - Mtibwa teak plantation forest
 - Longuza teak plantation forest
8. how do you get information on the auctioning of the teak saw-logs
 - i. Direct visit to the plantation
 - ii. Other timber traders
 - iii. Mass media
9. Does your company further process the teak saw-logs

Yes ()

No ()

10. If **Yes** what are your final products

- -----
- -----

11. What is the costs per cubic metre (Tsh/m³)-----

12. What is the recovery ratio of your product (from round wood to finished good) ---

13. If **not** what are you doing with the logs you purchased

- a. -----
- b. -----
- c. -----

14. Where have you sold the logs you purchased

- The local market ()
- International market (exports) ()

15. What were the prices per cubic metre (TAS/m³) in the local market-----

16. What were the prices (TAS/m³) in the international market (FOB) -----

17. Have you insured your company

Yes ()

No ()

18. What is the insurance rate of your company ----- %

19. What other activities and their costs per cubic metre involved in the teak business after purchase

- (i). Activity ----- Cost (TAS/m³) -----
- (ii). Activity ----- Cost (TAS/m³) -----
- (iii). Activity ----- Cost (TAS/m³) -----

15. Have you experienced some in your business?

Yes ()

No ()

16. If **yes**, which are the major problems?

(i). -----

(ii). -----

(iii). -----

17. What is your opinion to improve the teak saw-logs business in Tanzania?

Appendix iii: Questionnaire for FBD

A. Identification variables

Questionnaire number -----

9. Date of interview -----

10. Name of respondent -----

11. Address of respondent -----

12. Position in the Division -----

B. Information about teak saw-logs production

1. What are the sources of teak saw-logs auctioned in Tanzania
2. What are production activities and the costs involved in the production of the teak saw-logs
3. How does the government cover the these management costs it incurred
4. What the common timber pricing mechanisms used in Tanzania
5. What other timber pricing mechanisms but not used in Tanzania
6. What are the procedures of each pricing mechanisms
7. What are the reasons in question 5
8. How many times have the division auctioned teak saw-log in Tanzania
9. How do you judge the floor price
 - a. High
 - b. Medium
 - c. Low
10. How do you judge the number of bidders who participated in the auctions
 - a. Big
 - b. Small

11. Which market do the logs were subjected in

12. Do you satisfactorily advertise the availability of the logs

a. Yes

b. No

13. What factors influence appraisal stumpage value

14. How do you monitor export of timber including teak saw-logs?

15. What other services do the FBD provides to timber exporters other than the supply of logs

- -----
- -----

16. What information a timber trader has to provide in order to be provided with an export license

- -----
- -----

16. What other institutions are involved in the teak saw-logs business in Tanzania

17. What are the roles of these institutions

18. What is the freight on board (FOB) price of teak -----

Appendix iv: A sample of public auctioning advertisement

THE UNITED REPUBLIC OF TANZANIA
MINISTRY OF NATURAL RESOURCES AND
TOURISM
SALE OF TEAK LOGS

The Ministry of Natural Resources and Tourism intends to sell by public auction 948 of Teak logs (245 M³) located at Longuza Forest Plantation, Muheza, in Tanza Region.

The logs may be viewed from 7.30 a.m to 3.30 p.m on 15th August 2002 to 30th August, 2002 on working days at Longuza Forest Plantation.

The auction will be carried out in public 2nd September, 2002 at 9.00 hours local time at Longuza Forest Plantation, Muheza, Tanga Region.

The successful bidder(s) shall be required to pay by Banker's Cheque of cash 25% of the offer on 2nd September, to the Project Manager, Longuza. Full payment of the remaining amount must be "paid to Permanent Secretary, Ministry of Natural Resources and Tourism, within 14 days from the date of auction. Failure to comply with this condition shall automatically nullify the sale without notice.

PERMANENT SECRETARY
MINISTRY OF NATURAL RESOURCES AND TOURISM

Appendix v: Transit Pass Specimen

UNITED OF REPUBLIC OF TANZANIA

Schedule C
Form of the Transit Pass
(Rule5)

The forest Ordinance

(The Forest Rules, 1995)

TRANSIT PASS FOR FOREST PRODUCE No 00005326

Office of the (Seal) -----Number-----

Date-----

1. Mr/Ms(Name) -----being the purchaser (specify
type of licence) -----Date -----
For the forest produce hereunder

Description of Forest Produce	Specie and size of individual logs/timber/pole	Quantity

Is allowed to remove the afore stated produce from (name of forest area) -----
to (name of town/district)-----

2. The forest produce bears/does not bear the personal hammer mark of (name) -----
----- Designation ----- (station)----- as
indicated in A below.
3. The forest produce bears/does not bear the property hammer mark as indicated in B
below.
- A B
4. This Transit Pass along with the forest produce described above shall be presented
for checking and verification at checkpoints (name of checkpoint)-----
5. Mode of Transport allowed Road/Rail/Waterways

This Transit Pass shall expire on (date) -----

Appendix vi: List of auctions' participants

- i. A.M Ismail
- ii. Adept Impex
- iii. Burtain sawmills
- iv. Cielmac co. Ltd
- v. Fibreboard 2000 Ltd
- vi. H.D. Banker
- vii. J. Kisanga
- viii. Micco import & Export
- ix. Olam (T) Ltd
- x. Ozam (T) Ltd
- xi. Tradex internation Ltd
- xii. Traigon Ltd