

# Working Conditions and Productivity Under Private and Public Logging Companies in Tanzania

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## *Abstract – Nacrtak*

*Industrial timber harvesting in plantation forests in Tanzania was solely performed by public agencies until mid 1980's. During that period harvesting operations were labour-intensive and semi-mechanized, coupled with low production rates and high production costs. Following the privatization of forestry industries, logging is currently being carried out by private companies. This study was carried out to assess and compare working conditions, physical workload and productivity in logging operations under private and public logging regimes. Data were collected in Sao Hill Forest plantations from a clear felling operation being carried out in a 26 years old Pinus patula stand. Time study was undertaken for tree cutting, skidding, manual bunching and loading operations. Physical workload data were obtained through heart rate measurement by using portable electronic heart rate monitor. Working conditions were assessed through ergonomic checklist administered to 45 loggers. The results indicated that the productivity in tree cutting averaged 4.7m<sup>3</sup>/h and 3.4m<sup>3</sup>/h for chainsaw and crosscut operations respectively, while in bunching and loading the respective values of 5.1m<sup>3</sup>/h and 11.3m<sup>3</sup>/h made higher production on the private regime as compared to the public. The working conditions were generally poor with low safety, inadequate payment and poor working tools coupled with high labour turnover. The physical workload was 78% and 65% heart rate increase for crosscut saw and chainsaw crews. This is a slight increase compared to the public logging regime estimated at 65% and 57% increase for cross-cut saw and chainsaw respectively. However, the increased productivity observed in the private regime was not due to improved working conditions, but rather a result of the workers' higher engagement and placed effort in performing production tasks. Training of the crews, improvement of payments, supervision and provision of safety gears are recommended for improved production and reduced occupational health hazards.*

*Keywords: Workers safety, physical workload, costs, timber harvesting, Tanzania.*

## 1. Introduction – Uvod

Industrial timber harvesting in plantation forests in Tanzania started in the 1970's after most plantations attained their rotational age. Harvesting operations were solely performed by public agencies with all the crews or workers being public servant of the government of Tanzania (Ahlback 1986). Most of the logging operations during this period were labour-intensive and semi-mechanized (Dykstra 1983). Tree cutting was done manually using two-man crosscut saw, axes, bow saws and a less labour-intensive chainsaw method. Logs were skidded to the landings by either hand drawn sulkies, farm tractors fit-

ted with one or two-drum logging winch(es), crawler tractors, articulated wheeled skidders, or frame-steered forwarders (Nshingo 1988). Log hauling from plantations to mills was done by farm tractors with trailers, 7 to 10 ton flat-bed trucks, or logging trucks with semi or full log trailers. Manual and mechanized loading and unloading was the most common (Migunga 1996). Long distance transport was mainly by either straight trucks or a few tractor-trailer units.

Studies by (Migunga 1982, Ally 1987, Fue and Ole-Meiludie 1989, Mialla 1989; Habyalimana 1990, Malisa 1992, Migunga 1996, Abeli and Shio 1996,

and Silayo et al. 2007) showed that harvesting production rates had been relatively low with high operating costs. This was due to a number of challenging conditions, which included poor working conditions; high energy demands and relatively low pays which required necessary improvements.

Therefore, since 1985, Tanzania has been undertaking a number of economic and market reforms in order to raise the economic growth and hence improve the performance of different sectors. One of the reforms was privatisation of production sectors, including forestry (Mayawalla 1994). Through privatisation, some of the wood-based industries have been liquidated or sold, and some have entered into joint ventures or leased to private investors (Ngaga et al. 1999). Privatisation of wood industries, which depend largely on logging operations for supply of wood raw material, was expected to bring higher operation efficiency to improve production and lower production costs due to improved supervision and working conditions.

However, studies have shown that even after privatisation of forest industries, logging operations continued to be both labour-intensive and semi-mechanized (Mahenge 2001, Phillip 2001, Ole Meiludie et al. 2002) with slight increase in productivity. Studies show a 28.5% increase in logging productivity in private logging at a 25% decrease in tree cutting costs by using crosscut saw and a 32.6% increase in cutting productivity at a 17.5% decrease in costs by using chain saw (Phillip 2001). However, facts were lacking to establish if the perceived increase in productivity in the private regime was hand in hand with improved working conditions. There was no evidence however, to whether the private companies introduced any new technology in timber harvesting in Tanzania. To pursue this knowledge gap, a study was carried out to assess working conditions, physical workload and productivity in logging operations under private logging companies at Sao Hill Forest Project Plantations, essentially to support or dispute the positive correlation of the three working elements.

## 2. Materials and methods – Materijal i metode

### 2.1 Description of the study area – Opis područja istraživanja

This study was carried out in Sao Hill Forest Plantations (SHFP) with a significant number of private logging companies and a respectable volume of timber harvesting compared to other forest plantations in the country. SHFP supply wood to about 500

small, fixed and mobile sawmills and to four big companies namely Mena Wood Company (MWC), Sao Hill Timber Ltd (SHTL), Mufindi Paper Mills (MPM) and Sao-Hill Industries. Two companies, Mena Wood Company (MWC) and Sao Hill Timber Ltd (SHTL) were sampled for this study because they carry out significant logging activities in these plantations.

Sao Hill plantation forests cover about 135,000 ha of land, of which about 45,000 ha have been planted (Sumari 2008, Mandalo 2010 Personal Communication). The main tree species planted are *Pinus patula*, *P. eliotii*, *P. caribea*, *P. cassia*, *Eucalyptus saligna*, *E. maidenii*, *E. grandis* and *Cupressus lusitanica*. The mean annual increment (MAI) for *Pinus* species is 20 m<sup>3</sup>/ha with a rotation age of 25 years, while MAI for *Eucalyptus* species is 25 m<sup>3</sup>/ha with a rotation age of 10 years (MLNRT 1989, Sumari 2008). The allowable cut per year is estimated to be 1,000,000m<sup>3</sup> for the period 2008/09 and 2009/10 (Sumari 2008, Mandalo 2010, SHFP Planning officer personal communication).

SHFP is located between latitudes 8°18'–8°13' S and longitudes 35°06'–35°20' E in the southern highlands of Tanzania, Mufindi district, Iringa region. The plantations are on rolling terrain interacted with some low hills and wide flat-bottomed valleys at an altitude varying from 1,400 to 2,000 m above sea level (Fue et al. 1999). The climate is characterised by rainy season from November to April and dry season from May to late October. The mean annual rainfall is 1,300 mm ranging from 725 mm to 1,400 mm. The temperatures are fairly cool, the mean monthly minima vary between 10° to 18°C and maxima varying between 23° to 28°C (Miguna 1996).

### 2.2 Data collection – Prikupljanje podataka

The study used two sets of data collected in different timber harvesting regimes. This information involved office records and publications for the public regimes that were available in the logging company. Another set of information was collected for the current private regime. However, it also involved collection of some data from the existing records. The data sets collected for these two regimes of the state owned and private owned were about 11 years apart. For the current regime, the data were collected in the compartment number S16 b–P76 of a 26 years old *Pinus patula* stand, which was being clear felled by Mena Wood Company (MWC) and Sao Hill Timber Limited (SHTL). This compartment had a total of 76 ha.

Time studies were performed for tree cutting, skidding, manual bunching and loading in order to

establish production rates. It involved recording productive and non-productive work element times in centiminutes using a continuous snap-back timing method. Data were also collected for ground slope in percentage using a clinometer, skidding and manual bunching distances in metres using speedometer of the tractor and measuring tapes respectively; log mid-diameter and length were measured using a calliper and measuring tape respectively.

Physical workload was determined by measuring heart rate of the logging crews by using Polar Sport Tester. The recording of heart rate of the crews was taken one at rest, and the other was the maximum reading of continuous observation during work.

The data on working conditions were obtained through ergonomic checklist (Apud et al. 1989) and through field observation. The information assessed through ergonomic checklist was administered to 45 workers (30 workers from SHTL and 15 from MWC) intended to take care of age experience and the training of the workers; quality and availability working tools; supervision, working time and break; general safety and health aspects; social security, workers' welfare and food.

### 2.3 Studied crews – *Istraživane radne grupe*

Tree cutting, skidding and loading crews employed by the respective companies were studied. For tree cutting operation two crews of one-man and three crews consisting of two individuals each were studied for chainsaw and crosscut saw cutting operations respectively. On the other hand skidding was done using modified farm tractor and a crew of three men. This involved a driver, and two choker men. The skidder involved travelling empty, choking, travelling loaded and un-choking. Logs were choked and unchoked manually and the skidding distance at an average distance of 160 m, on a 2.4% slope and load size of 0.23 m<sup>3</sup>/trip. Two men performed log bunching while loading into hauling trucks was performed manually by six people.

### 2.4 Data analysis – *Analiza podataka*

Statistical analysis was performed using Microsoft Excel spreadsheet to find descriptive statistics (mean, upper and lower values) on workload and time studies. Descriptive statistics on working conditions were obtained using Statistical Package for Social Sciences (SPSS).

### 2.5 Classification of workload – *Klasifikacija radnoga opterećenja*

Workloads were classified according to Grandjean (1980) i.e., into very low, low, moderate,

**Table 1** Classification of workload based on the percentage heart rate increase

**Tablica 1.** Klasifikacija radnoga opterećenja na osnovi povećanja frekvencije srca

Workload <i>Radno opterećenje</i>	Percentage of heart rate increase <i>Postotno povećanje frekvencije srca</i>
Very low, resting <i>Vrlo nisko, odmaranje</i>	0
Low - <i>Nisko</i>	0-36
Moderate - <i>Umjereno</i>	36-78
High - <i>Visoko</i>	78-114
Very high - <i>Vrlo visoko</i>	114-150
Extremely high - <i>Izrazito visoko</i>	Over 150

Source: Grandjean (1980)

high, very high and extremely high based on the percentage heart rate increase as shown in Table 1.

The percentage of heart rate increase was calculated as shown in Equation 1.

$$PHRI = \left( \frac{WHR - RHR}{RHR} \right) \times 100 \quad (1)$$

Where:

*PHRI* Percentage of heart rate increase, %

*WHR* Work heart rate, beats/min

*RHR* Resting heart rate, beats/min.

### 2.6 Logging Productivity – *Proizvodnost pridobivanja drva*

Logging productivity was derived from the time and motion studies of the tree cutting operation. Multiple regression analysis was used to develop productive time models that can be used to estimate tree cutting time as a function of the selected independent variables. The models developed were then used to estimate production rates of the tree cutting crews. These equations were combined with the log volumes calculated from field measurements.

The Smalian's formula was used to compute log volumes because it takes advantage of parabolic shapes of the specimen where many logs and sections of trees approximate this shape (Cris 1999). The formula states that the volume of a log can be closely estimated by multiplying the average of the areas of the two log ends by the log's length, as follows:

$$V = \left( \frac{A_1 + A_2}{2} \right) L \quad (2)$$

Where:

*V* the volume of the log in cubic metres, m<sup>3</sup>

$A_1$  the area of the small end in square metres,  $m^2$   
 $A_2$  the area of the large end in square metres,  $m^2$   
 $L$  the length of the log in metres, m

Since productivity is frequently measured in terms of output of goods or services in a given number of »man-hour« or »machine-hours« (ILO 1979, Samset 1992), the volume produced in a given cutting operation and the time estimated from regression models were therefore used to compute productivity in  $m^3/hr$  (Equation 3).

$$P = \frac{(T_{vol}) \times (F) \times (60)}{T} \tag{3}$$

Where:

$P$  productivity for a given logging operation,  $m^3/ha$   
 $T_{vol}$  total volume of all logs for a given logging operation  
 60 number of minutes in a workplace hour  
 $F$  proportion of productive time per workplace hour, (Equation 4)

$T$  total productive time (minutes) (estimated using the derived regression models).

$$F = \frac{100 \times D}{100} \tag{4}$$

Where:

$F$  a fraction measuring the proportion of productive time  
 $D$  delay time expressed as percentage of workplace time

### 3. Results and discussion – *Rezultati i rasprava*

#### 3.1 Working conditions – *Radni uvjeti*

##### 3.1.1 Age, experience and training of the workers *Dob, iskustvo i uvježbanost radnika*

Most of the crews were young of an average age of 25 years. They had shorter experience averaging 2 years and lack formal training in logging and other forest operations. When compared with the public

**Table 2** Response of the workers on working conditions during logging operations at Mena Wood Company and Sao Hill Timber Ltd (N=45).

**Tablica 2.** *Odgovori radnika o radnim uvjetima na pridobivanju drva u poduzećima Mena Wood Company i Sao Hill Timber (N = 45)*

Question - Pitanje	Response, (except for age and experience of the worker), % Odgovor (osim za dob i iskustvo radnika), %	
		Yes
Age of the worker, years - <i>Dob radnika, godine</i>	Range: 18-42; Mean: 25 <i>Raspon: 18-42; Prosjek: 25</i>	
Working experience, years - <i>Radno iskustvo, godine</i>	Range: 0.1-11; Mean 2 <i>Raspon: 0.1-11; Prosjek: 2</i>	
No formal training in logging/forestry <i>Bez formalnog osposobljavanja u pridobivanju drva/šumarstvu</i>	-	100
No protective gears and auxiliary tools - <i>Bez zaštitne opreme i pomoćnih alata</i>	-	100
No safety regulations - <i>Bez sigurnosnih pravila</i>	-	80
No first aid services - <i>Bez službe prve pomoći</i>	-	100
Exposed to any obvious accident risk - <i>Izloženost očitom riziku nesreće</i>	-	100
Workers encountered accident on job - <i>Radnici kojima se dogodila nesreća na radu</i>	-	52
No prescribed breaks at work - <i>Bez propisanih odmora pri radu</i>	-	100
No compensation against accidents and sickness - <i>Bez naknade za nesreće i bolesti</i>	-	100
Presence of close supervision - <i>Postojanje čvrstoga nadzora</i>	-	21
Poor quality of food (ugali and beans) - <i>Hrana loše kakvoće (grah)</i>	-	100
Long working time (start at 7.00 am end at 2.00 pm) - <i>Dugo radno vrijeme (od 7.00 do 14.00)</i>	-	80
Tool handles not appropriate and liable to break - <i>Neodgovarajući i neispravan alat</i>	-	70
Blunt crosscut saws and axes - <i>Tupe šumske pile i sjekire</i>	-	54
Workers having health problem (e.g. Backache) - <i>Radnici sa zdravstvenim problemima</i>	-	76
Late payment (at least a month waiting) - <i>Kasne isplate (najmanje mjesec dana čekanja)</i>	-	94
Payment not adequate and need of improvement - <i>Neadekvatne plaće i potrebna poboljšanja</i>	-	100

logging regime, the workers in this study were one year younger and less experienced, where experience and age of the workers were three years and 26 years old respectively (Malisa 1992). The average of 2-year work period observed in this study is an indication of high labour turnover, which may be a result of the existing working conditions, and heavy workload that sounds unfit for old age crews. According to Fue et al. (1996), younger workers tend to work faster because they are more energetic compared to older workers. However, by being less experienced and less professionally skilled they tire quickly and are therefore more vulnerable to occupational health risks.

According to (Ole-Meiludie and Fue 1990; Shemwetta et al. 2002) the lack of formal training in forestry operations may have an effect on productivity and physical workload due to poor working methods, awkward working postures and inappropriate machine maintenance techniques. Christie (2006) reported that awkward working postures with a predominance of trunk flexion, adopted for long periods during work, are very likely to lead to the development of musculoskeletal injuries. Furthermore, untrained forest workers are more exposed to hazards because their ability to make quick and intelligent decisions in dealing with hazards is limited.

### 3.1.2 Quality and availability of working tools *Kvaliteta i upotreba radnih sredstava*

Logging crews were not provided with protective gears, felling levers, wedges or lifting devices (Table 2).

This means that the crews were more liable to excessive stress and accidents. The observed situation was different to that of the public logging regime, where Migunga (1982, 1996) reported that workers were given and used protective gears such as helmets, boots and gloves. As regards to logging crews, 70% complained that the quality of cutting tools (axes and saws) was poor. It was also noted that skidding ropes were old and worn out, causing lacerations to the bare hands of the crews.

### 3.1.3 General safety – *Opća sigurnost*

Assessment of safety at work showed that about 50% of the workers had suffered some kind of accident. None of the suffered individual was given a »professional« first aid services, as only 20% acknowledged the presence of safety regulations (Table 2). Fue et al. (1999) made similar observations during the public logging regime. For example, although the average tree height was 22 m, at least 20 crews were allocated a hectare for felling at SHTL. As a result, the crews worked too close to each other (7 m

apart, which is lower than safe working distance of 28 m). According to Accident Compensation Corporation (2003), in tree felling, minimum safe working distance from any other person is the equivalent of twice the height of the tree being felled. This situation is most likely to result in accidents by falling trees/branches. Inadequate safety reduces work performance due to time lost as a result of forest worker waiting for recovery after an accident. To reduce this risk, companies should engage a safe number of workers in close quarters according to the actual requirements of safe working distance.

### 3.1.4 Supervision, working time and break *Nadzor, radno vrijeme i odmori*

Only 21% of the workers acknowledged the presence of close supervision. This indicates that there were no established working conditions to be supervised. It was revealed that 80% of the worker/crews complained that the working time, which was between seven and eight hours per day, was too long. The study revealed as well that despite the longer working period a day there were no scheduled breaks (Table 2). This may contribute to high labour turnover observed. According to Slappendel et al. (1993), working continuously results in fatigue, which increases accidents, illnesses, discomfort and consequently reduced productivity, and hence, high labour turnover.

### 3.1.5 Motivation, social security and food for the workers – *Motivacija, socijalna sigurnost i hrana za radnike*

Tree cutting, bunching and loading crews were paid by piece rate, while skidding crews were paid per month basis. Therefore, since the same level of payment was given per tree felled, smaller trees were mostly felled compared to larger ones. As a result, felling was done haphazardly resulting into difficulties in carrying out subsequent operations like limbing, bucking and skidding. Therefore, there is a need of improving supervision and changing the payment system from wage based to task based (like volume produced), to encourage systematic production. In case of social security, it was learned that there were no compensations to accidents and sickness. Meanwhile the crews were not satisfied with the quality and quantity of the food provided and the salary (Table 2). Unfortunately, there were no responsible organs that took care of the welfare of logging crews which are mainly casual labourers. There is a need for the government to set practical rules and regulations through which the rights of the forest workers in general can be safeguarded.

**Table 3** Physical workload in logging operations at Mena Wood Company and Sao Hill Timber Ltd**Tablica 3.** Fizičko opterećenje radnika pri pridobivanju drva u poduzećima Mena Wood Company i Sao Hill Timber

Logging operation <i>Radna operacija pridobivanja drva</i>	Heart rate at rest, beats/min <i>Frekvencija srca u mirovanju, otkucaji/min</i>	Physical workload (heart rate increase), % <i>Fizičko opterećenje (povećanje frekvencije srca), %</i>
Tree cutting by chainsaw at MWC <i>Sječa motornom pilom u MWC</i>	75	65
Tree cutting by crosscut saw at SHTL <i>Sječa dvoručnom šumskom pilom u SHTL</i>		78
Bunching manually at MWC <i>Ručno usnopljavanje u MWC</i>		70
Loading manually at MWC <i>Ručni utovar u MWC</i>		32
Choker setting at SHTL <i>Postavljanje omči i kopčanje u SHTL</i>		69

### 3.1.6 Physical workload – Fizičko opterećenje

Results on physical workload of the logging crews are shown in Table 3.

The overall physical workload was 78% and 65% heart rate increase for crosscut saw and chainsaw respectively. The findings for chainsaw operations are closely related to the findings by Christie (2006) who conducted a field investigation of physical workload imposed on harvesters in South African Forestry. Generally, the results showed that there was a slight increase of physical workload in the private logging regime as compared to the public logging regime which was estimated at 65% and 57% of the heart rate increase for crosscut saw and chainsaw respectively. The heart rate levels observed in this study were all higher than the 50% set as a higher level than the resting heart rate, which signifies an acceptable workload in manual material handling and repetitive tasks. This involves such work tasks as lifting, carrying, pushing and pulling of various external loads according to (Stellman 1998). Astrands and Rodah 1989, Ilmarinen 1992, Stellman 1998, Shimaoka et al. 1998, Hsin-Chieh and Mao-Jiun 2010, which suggests that the recommended Relative Aerobic Strain (RAS) is 20–35%, which is equivalent to the acceptable heart rate of 50% from the resting states during an eight hour working day.

Observations showed that crosscut saw pinching occurred often. This situation was contributed mainly by poor felling patterns which could be associated by the level of skills for the felling crews. As a result, the crews used excessive energy on trying to pull out the saw, which caused high workload in turn. Since there were no wedges, pinched saws were released manually, which involved log or tree pulling or lifting. Since *Pinus* tree species which were being felled are naturally characterised by sticky res-

ins and the fact that the saws were not well maintained, manual driving of the crosscut saw could have as well contributed to high workload and saw pinching.

In skidding operations, choker setting involved log lifting and/or digging a hole under the log, carrying and pushing logs in order to pass chain chokers through. This was done without using lifting tools, which increased physical workload. Results show that the maximum heart beats per minute for choker setters was 148; this observation was much higher than the recommended maximum absolute values for men and women, which is 90–112 beats per minute in manual handling, dynamic muscular, and repetitive work (Louhevaara 1999) like this one. The higher workload in these operations was due to inappropriate tree cutting that could not form »log bedding» and terrain characteristics, which inhibits easier log chocking or rolling activity. The number of skidding and loading crews was also found insufficient to cope with the volume and the speed of the hauling system. The managements should therefore increase the size of bunching crew and train workers in log bunching techniques, in order to reduce the workload.

Based on the physical workload classification by Grandjean (1980) as shown in Table 1, the workload in this study ranged from moderate to high, compared to moderate workload observed during public regimes. In essence, high physical workload should have reflected low productivity, but despite higher physical workload upon the workers observed in this study, the productivity was still higher than in the public logging regime. According to Bedny et al. (2001) short-term productivity increases may be achieved at serious long-term costs of overloading the work force. On the other hand, low productivity

can be the result of suboptimal exploitation of worker potential. In this study, it was learnt that the lack of alternative jobs and the fear of losing employment provides room for the private managements to exploit logging crews to produce more on »expense« of their working conditions.

### 3.2 Logging productivity – *Proizvodnost pridobivanja drva*

It was observed that logging operations were performed both manually and semi-mechanized. Tree felling and bucking was done by using chainsaw at MWC, while crosscut saw was used at SHTL. Delimiting was done by axes. Modified farm tractors performed skidding, while log bunching and loading were done manually. It was found that the average tree height was 22 m with an average Dbh of 32 cm. Bucking was supposed to be done at 4.2 m log length, although it was learnt that crews mostly use visual estimates, which through trial and error results into higher variations. In this case log lengths varied between 3.9 to 5.1 m, with an average of 4.3 m.

Logging productivity (Table 4) in these operations was higher compared to the public logging regime, where past studies showed 2.1 m<sup>3</sup>/h and 2.9 m<sup>3</sup>/h in tree cutting by crosscut saw and chain saw respectively. The production rate in loading operation was 9.1 m<sup>3</sup>/h higher by 34% when compared to the production rates during public regime. Since working conditions were inferior and workload was high, the increased productivity observed in this

**Table 4** Productivity in logging operations at Mena Wood Company and Sao Hill Timber Ltd

**Tablica 4.** *Proizvodnost pridobivanja drva u poduzećima Mena Wood Company i Sao Hill Timber*

Logging operation <i>Radna operacija pridobivanja drva</i>	Productivity, m <sup>3</sup> /h <i>Proizvodnost, m<sup>3</sup>/h</i>	
	Range <i>Raspon</i>	Mean <i>Prosjeak</i>
Tree cutting by chainsaw at MWC <i>Sječa motornom pilom u MWC</i>	1.3-5.6	4.7
Tree cutting by crosscut saw at SHTL <i>Sječa dvoručnom šumskom pilom u SHTL</i>	1.1-5.2	3.4
Loading at MWC <i>Uovar drva u MWC</i>	3.8-23.3	11.3
Bunching at MWC <i>Usnopljavanje u MWC</i>	3.9-5.8	5.1
Skidding at SHTL <i>Privlačenje drva u SHTL</i>	5.8-11.4	6.5

study may not be due to improved working conditions and reduced workload, but rather a result of the workers' higher engagement and placed effort in performing production tasks. Their acceptance of such conditions is the consequence of poor employment possibilities.

## 4. Conclusions and recommendations *Zaključci i preporuke*

### 4.1 Conclusions – *Zaključci*

The working conditions in the studied private companies were inferior and physical workload was high compared to the public logging regime. The workers had no formal training in forestry or logging techniques. Therefore, they were exposed to poor working methods, awkward body posture and inappropriate tool maintenance techniques and low pays, which may not be attractive to good workers. Therefore, this observation lead to a general conclusion that the increased productivity in private companies was not due to improved working conditions in private logging companies, but rather is a result of the workers' higher engagement and placed effort in performing production tasks due to poor employment possibilities. Observations further showed that the managements aimed at increasing outputs with little or no efforts of improving the working conditions.

### 4.2 Recommendations – *Preporuke*

Declining working conditions in logging operations could be improved by setting and implementing practical occupational safety and health regulations by government agencies.

The grievances of forest workers could be well presented by formulation of a forest workers' union;

Deliberate efforts are required to introduce new technology in timber harvesting in the Tanzanian forestry.

Forest workers who are currently working in the field must be imparted with professional hands on skills from instead of relying solely on the on the job learning from co-workers.

Training institutes should conduct an educational awareness on the importance of training in forestry or logging to the management of logging companies and to young men who are the major source of labour in logging operations in the country.

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## Sažetak

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### *Radni uvjeti i proizvodnost privatnih i javnih šumskih poduzeća u Tanzaniji*

*Industrijsko pridobivanje drva iz šumskih plantaža u Tanzaniji započelo je sedamdesetih godina prošloga stoljeća kada je većina plantaža dostigla rotacijsku starost. Radove na pridobivanju drva obaavljala su isključivo javna poduzeća s radnim ekipama i radnicima koji su bili javni službenici i zaposlenici države. Većina je šumskih poslova u tom razdoblju bila intenzivna i polumehanizirana, s niskom razinom proizvodnosti i visokim troškovima. Razlog tomu bili su mnogi izazovni uvjeti, koji su uključivali nepovoljne radne uvjete, visoke energetske zahtjeve i relativno niske plaće šumskih radnika. Kao način unapređenja proizvodnih, radnih i životnih uvjeta radne snage u šumarstvu tanzanijska je vlada u kasnim osamdesetim godinama prošloga stoljeća odlučila privatizirati šumsku industriju. Privatizacijom su neka poduzeća, vezana uz šumarstvo i drvenu industriju, likvidirana ili prodana, a neka su ušla u zajednička ulaganja ili su ih zakupili privatni investitori.*

*Istraživanja su pokazala da su i nakon privatizacije šumske industrije radovi na pridobivanju drva ostali radno intenzivni i polumehanizirani s malim povećanjem proizvodnosti. Ipak, nedostajali su podaci koji bi potvrdili da li je povećana proizvodnost istodobno popraćena i boljim radnim uvjetima. Također nije bilo dokaza da su privatna poduzeća uvela nove načine pridobivanja drva u Tanzaniji. Ovo je istraživanje provedeno s namjerom da se procijene i usporede radni uvjeti, fizičko opterećenje i proizvodnost pridobivanja drva u privatnim i državnim ili javnim šumskim poduzećima. Istraživanje je provedeno u šumskim plantažama Sao Hill, području s najvećim površinama šumskih plantaža i posađenih vrsta listača i četinjača. Područje se nalazi na južnim brdskim dijelovima zemlje gdje oko 500 malih, fiksnih i mobilnih pilana prerađuje drvo s plantaža. Podaci su prikupljeni u čistim sječama borovih sastojina (*Pinus patula*) starim 26 godina. Radove su obaavljala dva šumska poduzeća čije su radne ekipe praćene u istraživanjima. To su poduzeća Mena Wood Company (MWC) i Sao Hill Timber Limited (SHTL).*

*Za sječju, ručno usnoplavanje i utovar drva izrađena je studija vremena. Sječja je obaavljana na dva uobičajena načina, motornom pilom i dvoručnom poprečnom šumskom pilom. Promatrana su dva rukovatelja motornim pilama i tri radne ekipe (sve s dva radnika) s dvoručnim šumskim pilama. S druge strane privlačenje je obaavljala ekipa od tri radnika pomoću adaptiranoga poljoprivrednoga traktora. To uključuje vozača traktora i dva pomoćna radnika na kopčanju. Dva su pomoćna radnika vezivala izrađene sortimente u snopove, dok je utovar u prikolicu za vuču ručno obaavljalo šest radnika koji su također obuhvaćeni istraživanjima. Mjerenja su obuhvatila prsni promjer stabala, visinu stabala i duljinu trupaca. Podaci o fizičkom opterećenju radnika dobiveni su mjerenjem frekvencije*

srca pomoću prijenosnoga elektroničkoga pulsomjera. Stajališta i fiziološka opažanja radnika dobivena su iz ergonomske upitnika koji je ispunilo 45 radnika. Podaci su analizirani u programu Microsoft Excel i u softverskom paketu za društvene znanosti (Statistical Package for Social Sciences – SPSS).

Rezultati pokazuju da proizvodnost pri sječi iznosi 4,7 m<sup>3</sup>/h za motornu pilu i 3,4 m<sup>3</sup>/h za dvoručnu šumsku pilu. Pokazatelji za vezivanje i utovar iznose 5,1 m<sup>3</sup>/h odnosno 11,3 m<sup>3</sup>/h. Takvi nalazi upućuju na veću proizvodnost privatnih poduzeća u usporedbi s onom postignutom u državnima. Radni su uvjeti općenito loši s niskom razinom sigurnosti, neprimjerenim plaćama radnika, nedostatnim radnim sredstvima te značajnom fluktuacijom radne snage. Ista je situacija postojala i u državnim poduzećima, što govori da se nisu dogodile očekivane promjene i poboljšanja. Nitko od radnika, ni u kojem obliku, nije prošao stručno osposobljavanje za rad u šumi. Naprotiv, od novoangažiranih radnika i ekipa se očekuje da uče od iskusnijih na terenu.

Procjena razine sigurnosti pri radu je pokazala da je oko 50 % radnika iskusilo neki oblik nesreće i ozljede na radu. Nitko od ozlijeđenih nije primio profesionalnu prvu pomoć, a samo ih je 20 % navelo postojanje određenoga oblika sigurnosnih pravila pri radu. Nadalje, utvrđeno je da se pridobivanje drva obavlja bez čvrstoga i stručnoga nadzora. Procjena je fizičkoga opterećenja pokazala značajno povećanje frekvencije srca kod svih radnika i ekipa odnosno radova. Fizičko opterećenje iznosi 78 %-tno povećanje frekvencije srca pri sječi dvoručnom pilom i 65 % pri sječi motornom pilom. Takvi rezultati pokazuju blago povećanje fizičkoga opterećenja radnika u privatnim poduzećima u odnosu na ono od 65 % i 57 % utvrđeno u državnim poduzećima. Općenito fizičko opterećenje utvrđeno ovim istraživanjem veće je od prihvatljive razine 50 %-tnoga povećanja frekvencije srca iznad razine u mirovanju kod ručnih radova.

Rezultati pokazuju postojanje veće proizvodnosti u privatnim šumskim poduzećima nego u državnima. Međutim, povećanje proizvodnosti nije posljedica poboljšanih radnih uvjeta, već je rezultat snažnijega angažiranja radnika i uložena truda u obavljanje radnih zadataka, a sve zbog općenito loših mogućnosti za pošljavanje. Za unapređenje stanja preporučuje se primjena i pridržavanje sigurnosnih i zdravstvenih pravila u šumarstvu. Također se ističe važnost stručnoga osposobljavanja te preporučuje nabava i primjena sigurnosne opreme, stručni nadzor radova, poboljšanja u plaćanju i socijalnom standardu radnika kao način unapređenja šumske proizvodnje i smanjenja rizika pri šumskom radu.

Ključne riječi: šumarstvo, pridobivanje drva, sigurnost pri radu, fizičko opterećenje, troškovi, Tanzanija

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